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# MOBILIZING CLIMATE INVESTMENT

*Annex 1 - Energy Efficiency in Thailand*

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*This case study is an annex to the report Mobilizing Climate Investment: the role of international climate finance in creating readiness for scaled-up low-carbon energy (<http://www.wri.org/publication/mobilizing-climate-investment>) and presents a more detailed description of the case study which is summarized in the report.*

## CONTEXT

In the early 1990s, Thailand had one of the fastest growing economies in Asia with a gross domestic product (GDP) growth of over 10 percent per year, and annual growth in the power sector projected at 14 percent (about 2GW) per year (Singh and Mulholland 2000). The government of Thailand identified energy conservation as the least costly way to meet rapidly rising energy demand (Foran 2006). However, a number of barriers to energy efficiency existed, including lack of information and awareness among industry and consumers of the benefits, limited incentives for adoption, lack of awareness in the financial sector, and insufficient government staff with the requisite skills to develop and implement energy efficiency standards.

## EFFORTS TO CREATE AN ENABLING ENVIRONMENT

The government has been proactive in developing programs to facilitate adoption of energy efficiency and conservation measures and creating the institutional framework for their effective implementation. A 1992 Energy Conservation Promotion Act established energy efficiency requirements for industry and created an Energy Conservation Promotion Fund (ECPF), which receives revenue from a dedicated sales tax levied on petroleum products (UNEP 2006) (box 2). When the Energy Conservation Promotion Act came into effect, the Department of Energy Development and Promotion had few staff and limited management and implementation capacity. The government implemented intensive staff and management training programs with funding from the ECPF (Brulez and Rauch 1999) and support from the German agency for international cooperation, GIZ (Meyer et al. 2007). The programs integrated industry expertise by involving relevant private sector actors in developing training programs and marketing concepts, and thereby also strengthened communication between government and industry.

In 1991, the government of Thailand approved a national five-year demand-side management (DSM) plan. The plan, which begun implementation in 1993, aimed to promote the development, manufacture, and adoption of energy-efficient equipment and processes in the country, as well as to build sufficient institutional capability within Thailand's electric power sector and the energy-related private sector to deliver cost-effective energy services throughout the economy (World Bank 2000; Singh and Mulholland 2000). Activities included voluntary negotiations with manufacturers—combined with aggressive public awareness and marketing campaigns—to promote energy efficiency in end-use markets; bulk distribution of high-efficiency products and other information dissemination activities, such as labeling, energy audits, and demonstrations; developing and promulgating building and appliance codes to enforce minimum efficiency standards; integrating supply-side and demand-side planning in the electricity planning process; and developing and training energy management companies and DSM program contractors (World Bank 2000). A DSM office was established within the Electricity Generating Authority of Thailand to develop, implement, and evaluate national DSM programs and measures.

## BOX 1 | HIGHLIGHTS

- In 1992 the government of Thailand established an Energy Conservation Promotion Fund to raise funds for energy efficiency through a tax on petroleum products. This fund provided the government with an independent source of funding to promote energy efficiency, while simultaneously reducing demand for fossil fuels.
- A demand-side management plan implemented by the government with international support was effective in promoting energy efficiency among industry, raising consumer awareness, and strengthening government capacity, and exceeded its own energy savings targets.
- A government-established revolving fund—which provided credit lines to banks for energy efficiency project loans—was effective in strengthening financial sector capacity and leveraging additional finance, with an estimated additional \$2 leveraged for every dollar committed by the fund.
- A 20-year energy efficiency development plan, funded through ECPF with approximately \$560 million over five years, aims to reduce energy consumption by 20 percent by 2030.

The DSM plan was designed and implemented with support from the World Bank, through a Global Environment Facility (GEF) grant of \$9.5 million plus \$5.4 million from the government of Australia and a loan of up to \$25 million from the Overseas Economic Cooperation Fund of Japan/Japan Bank for International Cooperation (World Bank 2006). The Electricity Generating Authority of Thailand also provided \$31.6 million of its own funds, largely from its automatic tariff mechanism (World Bank 2000). The International Institute for Energy Conservation, an international non-government organization (NGO), prepared the DSM plan based on DSM initiatives in North America (World Bank 2000), which the government then revised to fit the local context (Singh and Mulholland 2000). During implementation of the plan, the Electricity Generating Authority of Thailand engaged several full-time advisors in order to reduce consultant costs, improve knowledge transfer to local staff, and improve the quality and relevance of the outputs. This approach was more effective than hiring external consultants, who were expensive and lacked knowledge of the local context (World Bank 2000).

The DSM plan exceeded its own targets to reduce peak demand by 238 MW and achieve annual cumulative energy savings of 1,427 GWh by the end of 1998. By 2000 the plan had reduced peak demand by 566 MW and achieved cumulative annual energy savings of 3,140 GWh (Singh and Mulholland 2000). It was also achieved at a much lower cost than originally anticipated—under \$60 million (World Bank 2000), compared to the \$189 million originally budgeted. The DSM office had grown from 40 staff in 1993 to about 177 trained and skilled staff in 2000 (Singh and Mulholland 2000). The office fostered public/private partnerships with manufacturers, DSM contractors, energy service companies (ESCOs), and electricity consumers to support its program efforts, and worked effectively with other government agencies to jointly develop energy efficiency programs (World Bank 2000). A second phase of the DSM plan was launched in 2000 with funding from Electricity Generating Authority of Thailand (from its own budget) and from ECPF. The second phase targeted residential, commercial, and industrial sectors, as well as energy efficiency promotion for small- and medium-sized businesses and education and learning programs (ESCAP 2010). By 2012, the DSM activities had resulted in an estimated 2,600 MW peak demand reduction and 15,700 GWh of energy savings.<sup>1</sup>

In 2002 the government set up an Energy Efficiency Revolving Fund using funds allocated from ECPF to provide credit lines to banks, which would then provide loans at low interest rates for energy efficiency projects in industry and buildings. The initiative started with six banks and expanded to 11 in the second phase in 2006 (Energy Futures Australia/DMG Thailand 2005). By the second phase, banks had gained sufficient familiarity with energy efficiency projects to take on more of the financing cost with fewer concessions. By 2010, the revolving fund had financed 335 energy efficiency projects and 112 renewable energy projects, with a total investment of \$453 million. The estimated annual energy cost savings were \$154 million, providing an average payback of about three years (IEA 2011). By 2012, every dollar committed by the ECPF helped mobilize an estimated two dollars from other investors. The revolving fund has been successful in incentivizing the participation of commercial banks in

## BOX 2 | ENERGY CONSERVATION PROMOTION ACT

The government of Thailand passed the Energy Conservation Promotion Act in 1992. The law required large energy users—companies with over 1MW peak energy demand or that consume more than 20 TJ of energy annually—to conduct energy efficiency audits and develop and submit plans for energy efficiency improvements. It also established a voluntary program for smaller facilities that use less energy. Furthermore, it established an Energy Conservation Promotion Fund to provide loans, grants, and subsidies to promote and facilitate energy conservation measures. This fund was supported by revenues from a dedicated tax (of approximately \$0.001 per liter) levied on all petroleum products sold in the country. This tax raised about \$50 million per year (UNEP 2006).

financing energy efficiency projects by providing them initially with interest-free credit lines, and by assisting them in gaining a better understanding of energy efficiency projects (IEA 2011).

Despite this success, access to financing for energy efficiency remains a challenge for ESCOs.<sup>2</sup> ESCOs are generally small companies with limited financial capacity. Banks are not always familiar with ESCOs and may, therefore, be less willing to lend to them, which in turn makes it difficult for ESCOs to access the revolving fund. To address this barrier, the government has recently established a fund to provide specialized financing (including equity financing) to ESCOs to promote energy efficiency activities (Limaye in press).

Thailand is now scaling up investment in energy efficiency. It has recently launched a 20-year energy efficiency development plan, which will be funded through the ECPF with approximately \$560 million over five years. The plan aims to reduce energy consumption by 20 percent by 2030. It includes a combination of mandatory requirements for equipment, appliances, vehicles, and buildings; support for voluntary measures by business and consumers; public awareness campaigns; support for technology development; and support for capacity building for energy efficiency promotion for public and private sector organizations (Ministry of Energy 2011).



## THE ROLE OF INTERNATIONAL SUPPORT

Energy efficiency reforms in Thailand have been government-driven and energy efficiency programs have largely been financed by government revenues through ECPF (UNEP 2006). However, the government has received strategic support from a number of international partners which has been instrumental in helping create the enabling conditions for investment. By ensuring its own source of revenue from ECPF, the government was not reliant on international support, and was able to enter into negotiations with international partners positioned to advance its objectives and set the terms of engagement.

The International Institute for Energy Conservation conducted early technical analysis on the potential for energy conservation that informed the government's DSM strategy (Foran 2006). The World Bank was also instrumental in supporting its design and implementation. In addition, Electricity Generating Authority of Thailand made use of international advisors to provide specific skills and expertise where local skills were lacking (Singh and Mulholland 2000).

In 2001, the World Bank (with an interest-free loan from GEF and the Montreal Protocol Fund) supported a private commercial bank, the Industrial Finance Corporation of Thailand, in promoting energy efficient building air conditioning systems (World Bank 2001). Although this project did not include support for readiness activities, the demonstration effect sparked a greater interest in energy efficiency in industry and the financial sector, and led to an Industrial Finance Corporation of Thailand proposal to the Department of Alternative Energy Development and Efficiency (formerly the Department of Energy Development and Promotion) to establish a simplified loan program for energy efficiency, which resulted in the establishment of the revolving fund the following year (IEA

2011; Energy Futures Australia/DMG Thailand 2005). DANIDA, the Danish international development agency, provided some technical assistance and funding to help set up the fund.<sup>3</sup>

Thailand has received readiness support from several other international partners for a number of initiatives that aimed to address some of the barriers that had not been targeted or adequately addressed through previous initiatives, including technical assistance from the Asian Development Bank (ADB) to strengthen capacity for implementing energy efficiency measures within the Provincial Electricity Authority and municipalities (ADB 2008) and support from the United Nations Development Programme (UNDP) and the United Nations Industrial Development Organization (UNIDO), with GEF funding, to support energy efficiency measures in commercial buildings and industry and strengthen the capacity of industry and the financial sector (UNIDO 2011; UNDP 2011). It is one of six participating countries in a regional UNDP-implemented project to promote energy efficiency standards and labeling, a five-year project started in 2008 with \$7.8 million from GEF (UNDP no date). Thailand has recently completed a revised Clean Technology Fund (CTF) investment plan. The plan includes a component to increase private sector involvement in energy efficiency and promote market transformation; and investment and advisory support to scale up energy efficiency projects in Thailand's large corporate, small- and medium-sized enterprise (SME), commercial, residential, and municipal sectors, and to incentivize local financial institutions to undertake financing for energy efficiency projects (Clean Technology Fund 2011). Thailand will also benefit from a planned regional project on energy efficiency supported by the ADB.<sup>4</sup>





## OBSERVATIONS AND INSIGHTS

Thailand has successfully achieved its energy savings objectives and garnered international support to advance its energy efficiency agenda. Key insights include:

- Strong government leadership was a key factor in Thailand's success in scaling up energy efficiency. The government invested a lot of its own resources into energy efficiency programs, thereby signaling its commitment. This enabled the government to align support from international partners with its own objectives, thereby maximizing the effectiveness of this support.
- The government was able to raise significant amounts of funding to support its energy efficiency objectives through a sales tax on petroleum products and thus was not completely reliant on international support. This independent income stream allowed the government to enter negotiations with international partners in a strong position to advance its objectives and set the terms of engagement.
- International support has focused on addressing key needs, especially training and awareness-raising targeting government, industry, and the financial sector, as well as on demonstration and assessment of energy efficiency options. There was minimal international involvement in policy making.
- Close coordination with the private sector in developing the DSM plan and emphasis on education and public awareness resulted in strong cooperation and buy-in from industry and strong public support for the plan.
- International support was sustained over long periods of time (five years and more), thereby facilitating knowledge transfer to local staff and ensuring continuity. The government made use of a number of long-term expert advisors to provide technical support in specific areas where local expertise was limited, rather than relying on short-term consultants.
- By providing low-interest credit lines to banks, the revolving fund was instrumental in strengthening commercial banks' awareness of and capacity to lend to energy efficiency projects, thereby facilitating increased access to finance for energy efficiency projects.
- Thailand has been able to transition smoothly from readiness activities such as capacity building, awareness raising, and demonstration to large-scale projects and investments. However, building an enabling environment for investment is an ongoing process, and even the large-scale projects—such as the twenty-year plan and the CTF investments—include small elements of readiness activities.

Table 1 | Milestones in the Development of Thailand's Energy Efficiency Sector

YEAR	MILESTONE	YEAR	MILESTONE
1989	International Institute for Energy Conservation opened an office in Bangkok and facilitated a study tour of U.S. energy conservation measures for 10 government and utility staff (Foran 2006).	2003	UNEP implemented a regional project for nine countries (including Thailand) with \$1.96 million from the Swedish Development Cooperation Agency (SIDA) to support energy efficiency in Asian businesses (UNEP 2006).
1992	The government of Thailand passed the Energy Conservation Promotion Act, creating the Energy Conservation Promotion Fund (ECPF).	2005	The government of Thailand introduced a program to offer tax incentives to businesses for energy efficiency improvements (UNEP 2006).
1991	National demand-side management (DSM) plan approved by Parliament	2008	The Asian Development Bank (ADB) provided a grant of \$1 million in technical assistance for mainstreaming energy efficiency measures in Thai municipalities, including strengthening the capacity of the Provincial Electricity Authority and municipalities and piloting energy efficiency projects.
1993	DSM plan received a grant of \$9.5 million from GEF, \$5.4 million from Australia, and a loan of up to \$25 million from Japan.	2011	UNDP supported a project (with \$3.6 million from GEF) to improve energy efficiency in the Thai commercial building sector, including strengthening policies and regulatory regimes; strengthening capacity in financial institutions; implementing building demonstration projects; and strengthening the capacity of professionals for energy efficiency in buildings.
1993	Intensive staff and management training programs to strengthen the capacity of the Department of Energy Development and Promotion to implement the Energy Conservation Promotion Act, supported by €6.4 million from the government of Germany through GIZ.	2011	UNIDO supported a project (with \$3.6 million in GEF funds) to encourage industry adoption of energy efficiency standards, including training and awareness programs targeted at industry and supporting industry and capacity building of financial institutions.
2000	Second phase of DSM plan launched with funding from the government of Thailand.	2011	The revised Thailand Clean Technology Fund (CTF) Investment Plan (with an estimated \$170 million in CTF financing proposed for the full plan) included a component to support private sector energy efficiency initiatives.
2001	World Bank (with an interest-free loan of \$2.5 million from GEF and \$2.5 million from the Montreal Protocol Fund) supported the Industrial Finance Corporation of Thailand, a private bank, for the development of energy efficient building air conditioning systems.	2011	Thailand launched a 20-year energy efficiency development plan, which will be funded through the ECPF with approximately \$560 million over five years. The plan aims to reduce energy consumption by 20 percent by 2030.
2001	DANIDA supported projects on energy efficiency promotion in building and industry and revising energy building codes. <sup>5</sup>		
2002	Institutional restructuring to create a new Ministry of Energy, incorporating the Department of Energy Development and Promotion (formerly under the Ministry of Science, Technology and Environment), which became the Department of Alternative Energy Development and Efficiency.		
2002	An Energy Efficiency Revolving Fund was established using funds allocated from the ECPF to provide credit lines to banks to provide loans for energy efficiency projects.		

## LIST OF ACRONYMS

ADB	Asian Development Bank
CTF	Clean Technology Fund
DANIDA	Danish International Development Agency
DSM	Demand-side management
ECPF	Energy Conservation Promotion Fund
ESCO	Energy service company
GDP	Gross domestic product
GEF	Global Environment Facility
GIZ	German agency for international cooperation, Deutsche Gesellschaft für Internationale Zusammenarbeit
NGO	Non-government organization
SIDA	Swedish Development Cooperation Agency
SME	Small and medium-sized enterprise
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization

## ENDNOTES

1. Personal communication with Peter du Pont, Nexant Inc., Thailand.
2. Personal interview with in-country expert.
3. Personal interview with Peter du Pont, Nexant Inc., Thailand (formerly Chief Technical Advisor for DANIDA).
4. Personal interview with international expert.
5. Personal interview with Peter du Pont, Nexant Inc., Thailand (formerly Chief Technical Advisor for DANIDA).

## REFERENCES

- ADB (Asian Development Bank). 2008. "Mainstreaming Energy Efficiency Measures in Thai Municipalities." Technical assistance report. Manila: ADB.
- Brulez, D., and R. Rauch. 1999. "Energy Conservation Legislation in Thailand: Concepts, Procedures and Challenges." In: *Energy Efficiency: Compendium on Energy Conservation Legislation in Countries of the Asia and Pacific Region* Bangkok: Economic and Social Commission for Asia and the Pacific.
- CTF (Clean Technology Fund). 2011. "Clean Technology Fund: Update of Investment Plan for Thailand."
- Energy Futures Australia/DMG Thailand. 2005. *Thailand's Energy Efficiency Revolving Fund: A Case Study*. Prepared for the Asia-Pacific Economic Cooperation Energy Working Group. Available at: <http://efa.solsticetrial.com/admin/Library/David/Published%20Reports/2005/ThailandsEnergyEfficiencyRevolvingFund.pdf>. Accessed on 17 January 2013.
- ESCAP (Economic and Social Commission for Asia and the Pacific). 2010. *Assessment Report on Energy Efficiency Institutional Arrangements in Asia*. Available at: <http://eeasia.unescap.org/PDFs/Assessment-Report.pdf>. Accessed on 17 January 2013.
- Foran, T. 2006. "Thailand's Politics of Power System Planning and Reform." Available at: [http://www.sea-user.org/download\\_pubdoc.php?doc=3366](http://www.sea-user.org/download_pubdoc.php?doc=3366). Accessed on 17 January 2013..
- IEA (International Energy Agency). 2011. *Joint Public-Private Approaches for Energy Efficiency Finance: Policies to scale-up private sector investment*. Paris: International Energy Agency.
- Limaye, D. "Energy efficiency" In World Bank. *How to Use Public Funds to Leverage Commercial Financing for Clean Energy In East Asia: Lessons From International Experience*. Forthcoming. Washington, DC: World Bank.
- Meyer, W., P. Rakkwamsuk and K. Kubaha. 2007. *Ex-post evaluation 2007. Energy Efficiency Promotion Project (ENEP), Thailand*. Eschborn; Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ).
- Ministry of Energy, 2011. "Thailand 20-Year Energy Efficiency Development Plan (2011 - 2030)." Bangkok: Ministry of Energy Thailand.
- Singh, J and C. Mulholland. 2000. "DSM in Thailand: a case study." Domestic Use of Energy Conference 2001.
- UNDP (United Nations Development Programme). 2011. "Promoting Energy Efficiency in Commercial Buildings in Thailand." Project document. New York: UNDP.
- UNDP (United Nations Development Programme). n.d. "Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency (BRESL)." UNDP project document.
- UNEP (United Nations Environment Programme). 2006. "Improving energy efficiency in industry in Asia—A Review of Financial Mechanisms."
- UNIDO (United Nations Industrial Development Organization). 2011. "Thailand energy efficiency industrial project." Vienna: UNIDO.
- World Bank. 2000. "Thailand promotion of electricity energy efficiency project." Project completion report. Washington, DC: World Bank.
- World Bank. 2001. "Project appraisal document for building chiller replacement project." Washington, DC: World Bank.
- World Bank. 2006. "World Bank GEF Post-Implementation Impact Assessment: Thailand Promotion of Electrical Energy Efficiency Project." Washington, DC: World Bank.



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