



Frankfurt School  
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INSTITUTIONS SUPPORT PROGRAMME

**CASE STUDY: THE THAI  
ENERGY EFFICIENCY  
REVOLVING FUND**



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NCFISP helps national climate finance institutions become “Fit for the Funds” through an exchange of knowledge, experience, and good practice in the field of climate finance. Through the programme national climate finance institutions in the early stages of development, especially those operating in Least Developed Countries, receive a range of practical services to develop technical know-how, innovative financing approaches and joint pilot projects. This case study is part of a series that is intended to provide examples of institutional arrangements and management structures of national climate institutions or dedicated public climate finance mechanisms and facilitate an exchange between countries and institutions.

The information presented here was compiled through secondary research and interviews with Dr. Prasert Sinsukprasert, Director of Planning Division, the Department of Alternative Energy Development and Efficiency within the Government of Thailand’s Ministry of Energy, and through project examples provided by Dr. Sinsukprasert’s staff. We would like to thank Dr. Sinsukprasert and his staff for their valuable contribution to this case study. Furthermore, we would like to thank Virginia Sonntag-O’Brien, Joyce Lee, Sabrina Heckler, Laura Druce and Sarun Panyatham for their valuable comments on the case study.

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## ABBREVIATIONS

DEDE	Department of Alternative Energy Development and Efficiency
EE	Energy Efficiency
EERF	Energy Efficiency Revolving Fund
ENCON	Energy Conservation Program
ESCO	Energy Service Companies
GoT	Government of Thailand
ICI	International Climate Initiative
IFCT	Industrial Finance Corporation of Thailand
MRV	Measurement, Reporting and Verification
NCFISP	National Climate Finance Institutions Support Programme
PB	Participating Bank
PFM	Public Finance Mechanism
RE	Renewable Energy
REDP	Renewable Energy Development Program
THB	Thai Baht
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value added tax

## 1. INTRODUCTION

Even though most Energy Efficiency (EE) technologies are commercially competitive<sup>1</sup> barriers still exist to their deployment and scale-up. To harness adequate funding to cover upfront costs and encourage private sector investment, financial commitments made by the public sector are often channeled via financial mechanisms. These mechanisms, known sometimes as “public funding mechanisms” (PFMs) or “public finance instruments” (PFIs)<sup>2</sup>, help to align market actors, correct market failures and reduce the perceived and actual risk of low-carbon investments. As such, financial support mechanisms can enhance national government policy actions in combating climate change.<sup>3</sup>

In general, PFMs cover a broad range of mechanisms such as grants, loans and credit lines, guarantees or technical assistance and are mostly used by national governments, development finance institutions and commercial banks.<sup>4</sup> For the purpose of climate finance many PFMs are employed to mobilise, in addition to public funding, private financing to accelerate the development, commercialisation, and deployment of climate-oriented projects, programmes and institutions and build commercially sustainable markets.<sup>5</sup>

Launched by the Government of Thailand (GoT) in 2003 as part of its Energy Conservation Programme, the Thai Energy Efficiency Revolving Fund (EERF) works to overcome barriers within the Thai financial sector to stimulate adequate financing for EE and reduce the country's GHG emissions. Because of its success in leveraging private capital with government financing, the EERF can be considered a model financial support mechanism for jump-starting investments in EE.

To offer a sufficient background to the development of the EERF, the following three sections provide an overview of the macroeconomic situation and the evolution of climate change policies in Thailand. Section three gives an overview of the EERF, its funding sources, design, administration, and impacts, including project examples and energy savings. The key points and features are presented in section four.

## 2. THAILAND: MACROECONOMIC AND POLICY CONTEXT

The design and implementation of a PFM varies according to the national context. Therefore, this chapter first offers an overview of the macroeconomic situation in Thailand and second presents the evolution of the climate change policy framework and policy drivers that resulted in the foundation of the EERF.

### 2.1 MACROECONOMIC SITUATION

In general, key economic indicators in Thailand significantly improved during the last decade. Nevertheless, Thailand remains vulnerable to external factors. With a GNI per capita (Atlas method) of USD 4,150 in 2010, Thailand is categorised as an upper middle income country by the World Bank Group.<sup>6</sup> The predicted GDP growth of 6.1% in 2010 is driven by high external demand.<sup>7</sup> Thailand's foreign reserves remain high with a predicted USD 135,415 million in 2010 (year-end). Public debt is at a

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<sup>1</sup> European Commission, Financing Energy Efficiency: Forging the Link Between Financing and Project Implementation

<sup>2</sup> UNEP/SEFI (2008), Public Finance Mechanisms to Mobilise Investment in Climate Change Mitigation - An Overview of Mechanisms being used today to help scale up the climate mitigation markets, with a particular focus on the clean energy sector.

<sup>3</sup> Neuhoff et al (2009). Structuring International Financial Support to Support Domestic Climate Change Mitigation in Developing Countries, Climate Strategies. University of Cambridge, Cambridge, UK.

<sup>4</sup> KAUL, Inge. CONCEIÇÃO, Pedro (2006). *The New Finance: Responding to Global Challenges*. Published for the United Nations Development Program. Oxford, England.

<sup>5</sup> UNEP/SEFI (2008), Public Finance Mechanisms to Mobilise Investment in Climate Change Mitigation - An Overview of Mechanisms being used today to help scale up the climate mitigation markets, with a particular focus on the clean energy sector

<sup>6</sup> World Development Indicators (2010).

<sup>7</sup> The World Bank Group (2010): Thailand. Economic Monitor. June 2010.

reasonable level. The public debt to GDP ratio is expected not to exceed 50% (45.5% in September 2010) and to decline slowly in 2015. Commercial banks as well as Thai companies are financially healthy. Despite the global financial crisis, Thai banks exceeded statutory capital adequacy ratio (CAR) in 2010. Moreover, non-performing loans (NPL) declined steadily. The commercial sector continued to achieve profits, despite the national political circumstances, due to its robust level of manufacturing exports.<sup>8</sup> The Royal Government of Thailand's guiding policy is sufficiency economy – a balance of economic, social and environmental affairs including public participation - and is continued until present.

The total emissions in terms of CO2 equivalent in 2000 was 229 million tons and 263 million tons in 2004, an average increase of 3.7% per year.<sup>9</sup> The structure of emission sources has not changed from 2000-2004. With 70% the energy sector was the largest contributor, while the remaining proportion was shared among crops and livestock (23%), forest (net sink) and waste management. Estimations for future emissions expect an even stronger increase due to its continued economic development and population growth. Thailand has policies in place aimed at reducing its overall emissions.

## 2.2 EXISTING POLICY FRAMEWORKS

As noted in its First and Second National Communications to the UNFCCC, Thailand's greatest challenge posed by climate change is increasing climate variability and extreme weather events. The country has made significant progress in increasing its technological capacity to conduct climate change impact analysis and vulnerability assessments, however, its sectors of agriculture, water resources, infrastructure, human health and coastal resources are still at risk.<sup>10</sup>

Realising the seriousness of climate change the GoT signed the **United Nations Framework Convention for Climate Change (UNFCCC)** in 1992 and ratified it in 1994 as a Non-Annex I country (entered into force on 28 March 1995). The GoT established a **National Sub-committee on Climate Change** in 1994 to develop Thailand's climate change policy and guided Thailand's positions in the climate change negotiation process.<sup>11</sup> As a party to the UNFCCC, Thailand submitted its initial **National Communication** in 2000 to the UNFCCC and its second in March 2011.<sup>12</sup> Under the National Environment Board, the sub-committee was the respective policy making body during climate change negotiations and led the way to the **ratification of the Kyoto Protocol** on 28 August 2002. In 2006, the sub-committee was upgraded to become the **National Climate Change Committee** chaired by the Prime Minister and serves as national focal point for the UNFCCC (see Figure 1 below).<sup>13</sup>

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<sup>8</sup> Ibid

<sup>9</sup> The total emissions in terms of CO2 equivalent are using the GWP factors given by the IPCC for CH4 and N2O; Office of Natural Resources and Environmental Policy Planning (2010), p. 10.

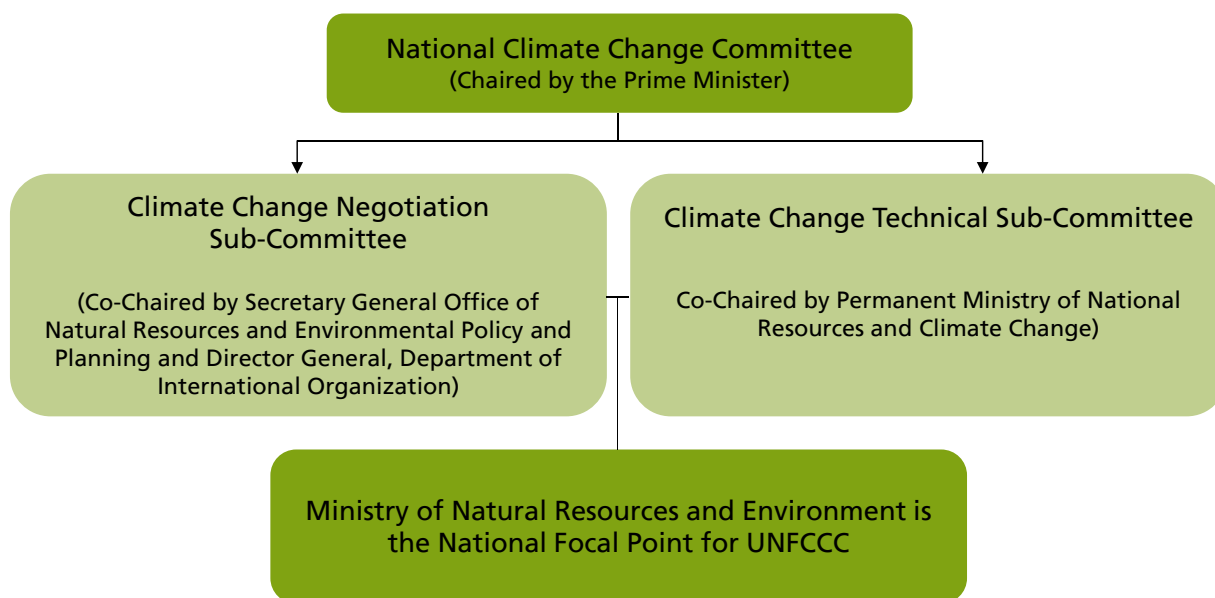
<sup>10</sup> The Government of Thailand (2011). Thailand's Second National Communication; (2000) Initial Communication

<sup>11</sup> Office of Natural Resources and Environmental Policy and Planning and Ministry of Natural Resources and Environment (2011), p.36 f.

<sup>12</sup> Both national communications are online at <http://unfccc.int>.

<sup>13</sup> Office of Natural Resources and Environmental Policy Planning (2010), p. 36f.

**Figure 1: Structure of the National Climate Change Committee**



Source: Office of Natural Resources and Environmental Policy Planning (2010).

Thailand's policy on climate change was drafted to ensure that the country's commitments and obligations to the UNFCCC and the Kyoto Protocol are fulfilled and are consistent with national long-term development goals.

Since 1961, Thailand has been establishing consecutive five-year national economic and social development plans at the national level. Additionally, the GoT prepares action plans for environmental quality management on a regular basis (Enhancement and Promotion of the National Environmental Quality Act; B.E. 2535). Since the seventh economic and social development plan (1992-1996), climate change issues contained in the action plan (1992 to 1996) have been integrated and both five-year plans run in parallel. Therewith, the government tries to provide **complementary frameworks for sustainable development** ensuring consistent planning efforts.

Since 1997 (eighth plan, 1997 to 2001), the core development objective is to ensure the people's welfare applying a holistic bottom-up approach. The GoT aims to **balance economic, social and environmental affairs including public participation**. The subsequent ninth plan adopted *sufficiency economy* as the guiding national philosophy for development, and the tenth plan explicitly makes reference to **upgrading and protection of environmental resources**. Furthermore, the tenth plan states that *"Thailand must [...] increase efficiency in energy usage and develop alternative energy sources to meet the domestic demand for energy"*.<sup>14</sup>

Realising the **seriousness of climate change**, while taking into consideration the **importance of energy for national development**, the GoT is building energy security in parallel to environmental issues. The increase in energy use along with the development of alternative energy sources – as part of Thailand's Renewable Energy (RE) Policy – are overseen by the Ministry of Energy. The **guiding principles for the Energy Sector** are: Establish sustainable energy security, expedite and promote alternative energy, monitor energy prices and ensure appropriate levels in regards to the wider investment situation, effectively save energy and promote energy efficiency and support energy development while simultaneously protecting the environment.<sup>15</sup>

However, the day-to-day management of sustainable energy related issues is with the Department of Alternative Energy Development and Efficiency (DEDE), which is part of the Ministry of Energy. DEDE's

<sup>14</sup> National Economic and Social Development Board (2007), p. 3.

<sup>15</sup> Dede (2010 b), Introduction.

specific duties include the oversight, promotion and monitoring of EE and RE development to ensure that it is economically as well as socially beneficial.

The primary legislation guiding Thailand's EE, conservation and RE policy was initiated by the Energy Conservation Promotion Act (ENCON Act; B.E. 2535), passed in 1992. The ENCON Act further initiated the **Energy Conservation (ENCON) Program**.

The Act outlines three areas for energy conservation programmes:<sup>16</sup>

- A compulsory programme for large energy users (Designated Facilities), which comprise approximately 4,500 large commercial and industrial facilities (buildings and factories).
- A voluntary programme that applies to smaller facilities, primarily targeting small and medium-sized enterprises (SMEs), and covers a range of activities such as research, development and demonstration, information campaigns, and other special projects.
- Establishment of the **Energy Conservation Promotion Fund (ECON Fund)**: The main objective of the Energy Conservation Promotion Fund (ENCON Fund) is to provide financial support to designated factories and buildings for investment in and operations of energy conservation programmes. At the same time, the ENCON Fund can also be used to support other agencies that wish to undertake energy conservation, including RE projects, energy-related research and development, human resource development and training, and public awareness campaigns. The Fund is financed by a tax on petroleum products (THB 0.04/USD 0.001 per litre) with approx. USD 50 million per year since 1992.

The ENCON Program is comprised of three major sub-programmes, namely the Renewable Energy Development Program (REDP), the Energy Efficiency Improvement Program, and the Strategic Management Program (see Table 1). The Energy Conservation Program recently ended its Phase 3 (2005-2011), under which the energy saving has been adjusted from 10.8% to 20% by focusing mainly on energy saving promotion in the industrial and transport sector.<sup>17</sup>

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<sup>16</sup> Kingdom of Thailand (2007): Energy Conservation Promotion Act (No.2), B.E. 2550, Section 7. Accessed via: [http://thailaws.com/law/t\\_laws/tlaw0072.pdf](http://thailaws.com/law/t_laws/tlaw0072.pdf) on January 16th 2012.

<sup>17</sup> Ministry of Energy (2009), p. 5ff.



**Table 1: ENCON Sub-Programs**

<b>RENEWABLE ENERGY DEVELOPMENT PROGRAM (REDP)</b>
The 15-Year <b>Renewable Energy Development Plan</b> (REDP) for 2008 to 2022 is strongly interlinked with the policy of sufficient economy, i.e. energy security. Thailand's average primary energy import was 60.8% for the period 1988 to 2008, with rising tendency. In order to reach the estimated energy demand of 97,300 ktoe by 2022, while limiting the need for energy imports as far as possible, the GoT plans to develop RE potential and targets 20.3% of RE in total energy consumption by the end of the REDP period. This is an increase of 3,858 MW in power generation and of 4,426 ktoe in thermal output. 10.3% of this total shall be derived from biofuels and natural gas for vehicles. To reach these targets, total investments (both public and private) are estimated to amount to approximately USD 15.7 billion and shall be co-financed by national energy initiatives. Almost 80% shall be mobilised by the private sector, and about 10% derived from public budget and state enterprises, respectively. <sup>18</sup>
<b>ENERGY EFFICIENCY IMPROVEMENT PROGRAM</b>
The <b>Energy Efficiency Improvement Program</b> aims at saving 10.8% (equivalent to 7,820 ktoe) of energy consumption by 2011. Focal areas for the Program are the energy intensive transport and industry sector. The Program focuses on awareness-raising for efficient energy use as well as conducting a study and R&D. Furthermore, one component of the Program specifically addresses the lack of qualified personnel and offers capacity building and training.
<b>STRATEGIC MANGEMENT PROGRAM</b>
The <b>Strategic Management Program</b> aims at policy research providing recommendations on energy supply and demand. The program is responsible for monitoring and managing the ENCON Program. The program is the decision making entity with regard to improvements of the other two programs.

Source: APEC (2010), p.11f.

**DEDE** is responsible for regulations, supervision, promotion and assistance with regard to the Energy Conservation Promotion Act to ensure nationwide actions to save energy by the designated facilities. To streamline its operations the DEDE appoints an energy manager who then submits data on energy use to DEDE every six months. The energy manager is also responsible for conducting energy audits, providing the audit reports to DEDE (subsidised by DEDE), and developing and submitting plans and targets for improving EE measures to DEDE.

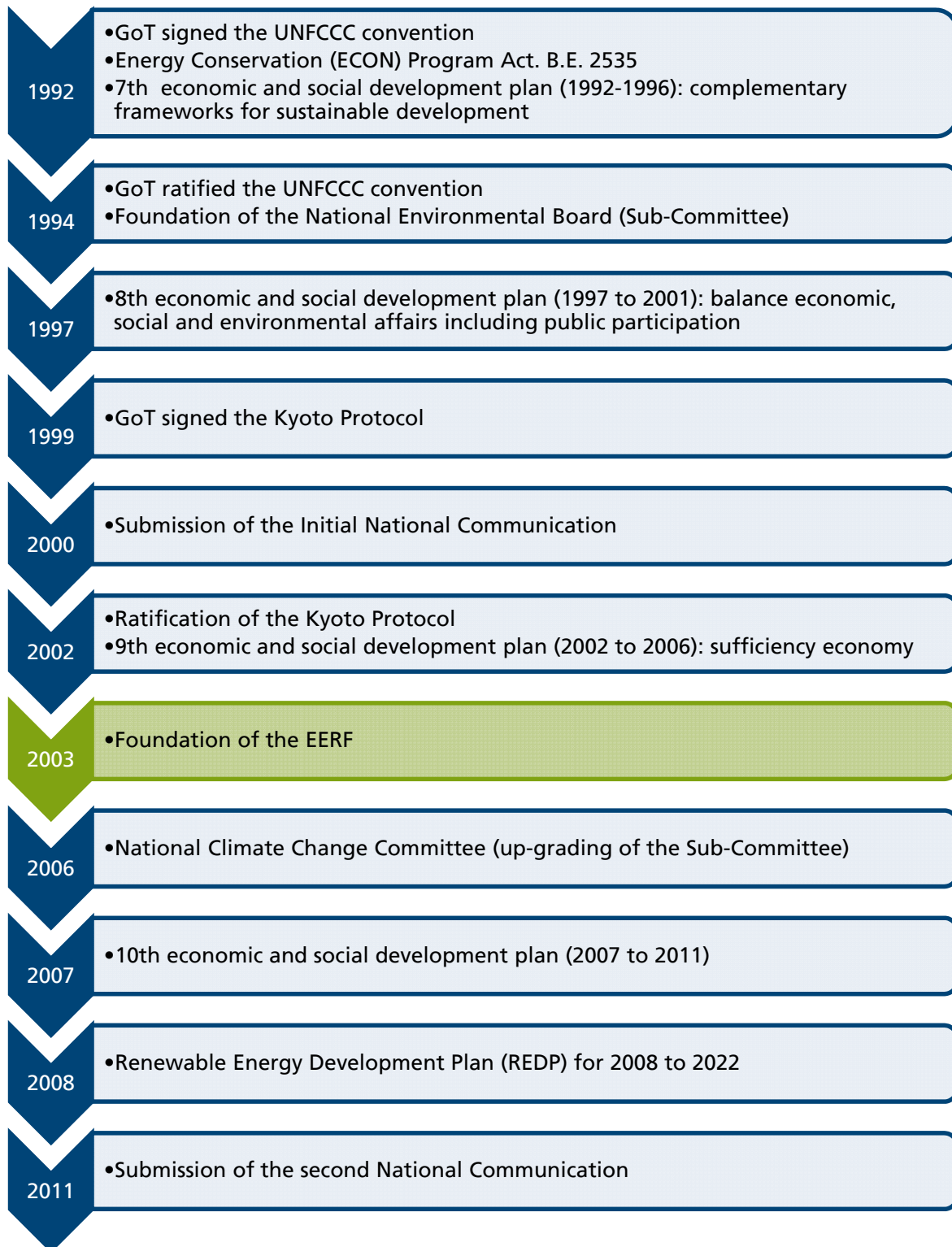
DEDE recognised after the first years in operation that excessive bureaucracy and paperwork associated with the requirements for auditing and reporting impeded the actual implementation of EE projects. To increase EE the DEDE introduced two major new initiatives in 2003: a subsidy programme for funding EE projects and the **Energy Efficiency Revolving Fund**, which was designed to facilitate and promote investment in EE by engaging the commercial finance sector in providing low interest loans for EE projects.<sup>19</sup>

<sup>18</sup> Ministry of Energy (2009), p. 7ff.

<sup>19</sup> Energy Futures Australia/ DMG Thailand (2005), p. 3.

The development of Thailand's climate change policy and policy drivers that helped lay the foundation for the EERF are summarised in Figure 2.

**Figure 2: Milestones of Thailand's climate change policy since 1992.**



### 3. ENERGY EFFICIENCY REVOLVING FUND (EERF)

The Thai Energy Efficiency Revolving Fund (EERF) began operations in 2003 as part of the framework of the Energy Conservation Program and was established to address key barriers within the Thai financial sector to stimulate lending for EE measures.<sup>20</sup> Some of these key barriers included a general **lack of interest and experience in EE financing among banks**, as well as corresponding **high perceived risks**. The stated objective of the EERF is to **“support clients for investment in machinery and equipment in relation to Energy Efficiency and Renewable Energy projects”**<sup>21</sup> through providing low-interest loans to banks, which then finance EE projects through loans with favourable interest rates.

**Table 2: Key parameters of the EERF**

KEY PARAMETERS	
Foundation	January 2003
Agency	Department of Alternative Energy Development and Efficiency (DEDE)
Objective	Mobilise commercial investments to improve EE lending market opportunities
Financing mechanism	EERF provide low-interest loans to banks, which then finance EE projects through loans with favourable interest rates
Loan channel	11 Commercial banks
Eligible borrowers	Buildings, factories, energy service companies (ESCOs) and project developers
Eligible projects	Energy conservation or energy saving projects
Loan period	Maximum 7 years
Loan size	Up to 100% of project costs per measure but not more than THB 50 million (approx. USD 1.4 million) per project
Interest rate	Maximum 4% p.a., on a negotiable basis
Projects financed (February 2012)	294

Source: USAID Asia (2009) and Sinsukprasert, Prasert (2011a).

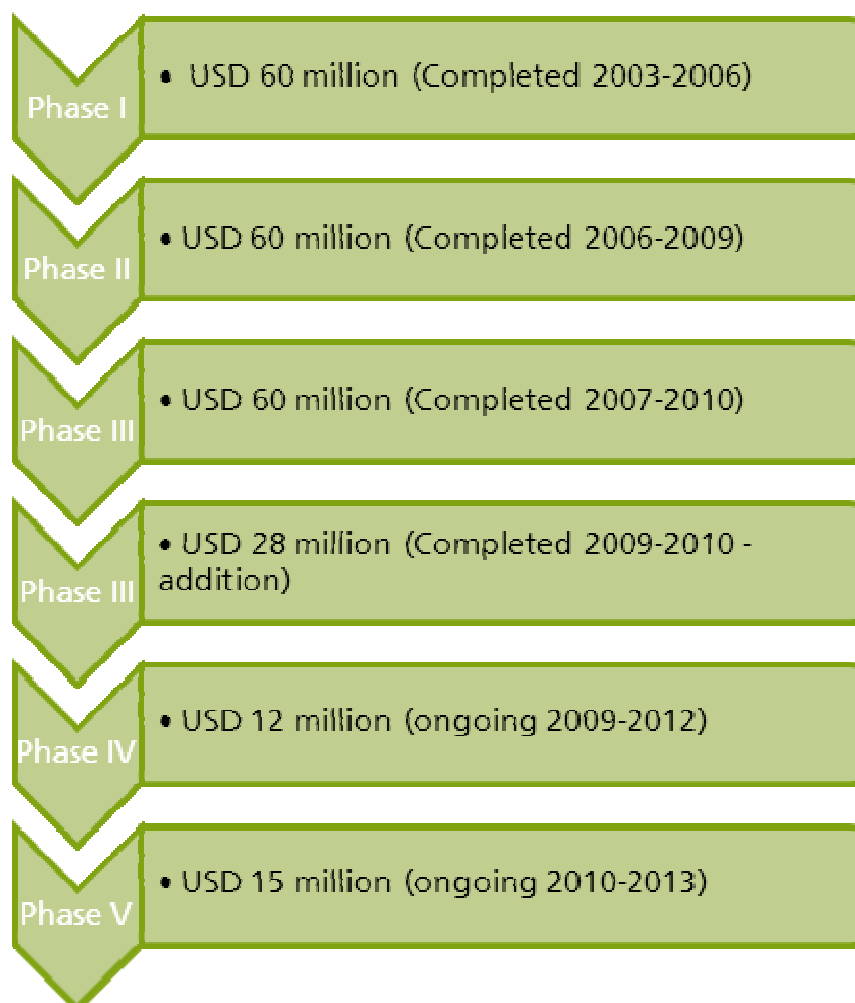
<sup>20</sup> Energy Futures Australia/ DMG Thailand (2005), p.1.

<sup>21</sup> Sinsukprasert, Prasert (2011b).

### 3.1 SOURCES OF FUNDING

To kick-start the EERF, the **Fund's** initial **capital** was solely derived from Thailand's **government budget** via the revenues from a petroleum tax that were channelled via the ENCON Fund. Originally, the EERF was launched for a pilot period of three years, from 2003 – 2005, as a partnership of Government and originally six participating banks (PBs).<sup>22</sup> The initial pilot phase has been replicated in additional phases via lines of credit allocated for a period of ten years (see Figure 3). Because the PBs are now investing their own capital, the EERF will not get a further government budget to on-lend to new projects after phase V.<sup>23</sup>

**Figure 3: Funding Phases of the EERF**



Source: Chaiyawat, Chirawut (2011) and Sarun Panyatham (2012).

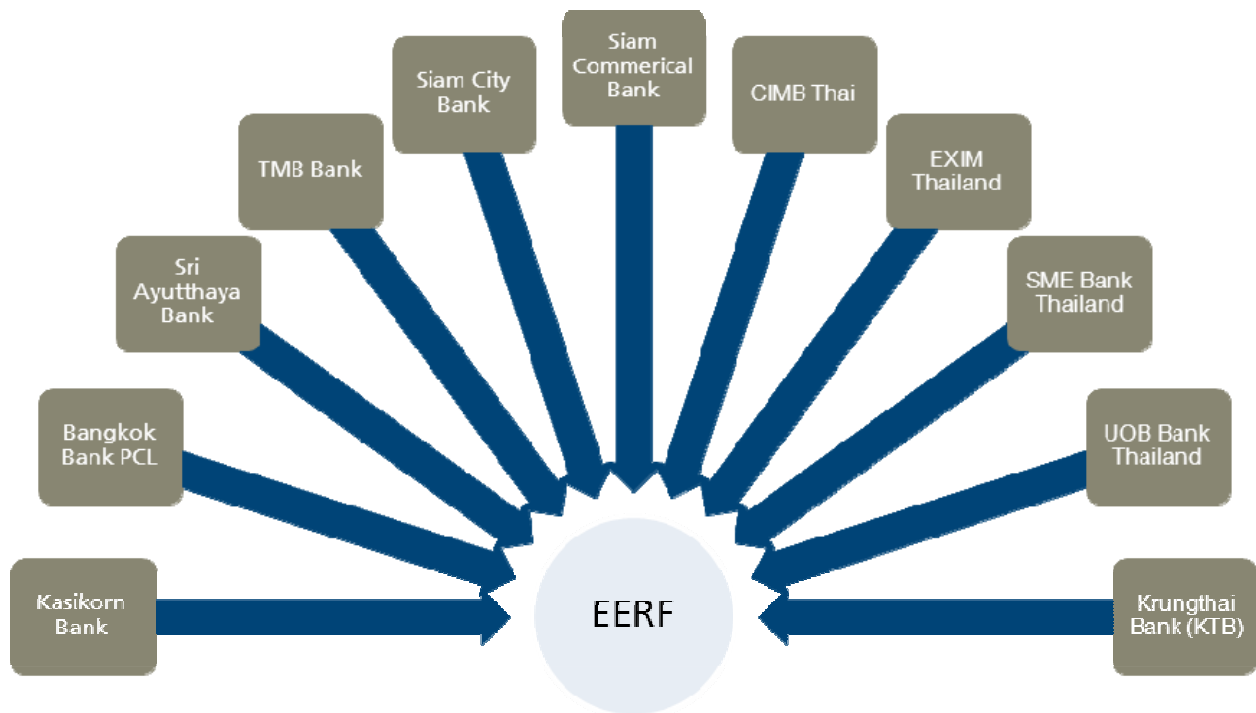
This Funds' upfront government funding was managed by the Planning Division within the DEDE, which then made funding available to PBs. Initially, the EERF cooperated with six PBs. Over time, the EERF signed agreements with 11 commercial banks (Figure 4).<sup>24</sup>

<sup>22</sup> Energy Futures Australia/ DMG Thailand (2005), p. 9.

<sup>23</sup> Sinsukprasert, Prasert (2012). Right now EERF is focusing in providing technical assistance to commercial banks.

<sup>24</sup> TMB Bank was formerly Thai Military Bank and Industry Finance Corporation of Thailand).

**Figure 4: Participating Banks**



Source: Frankfurt School of Finance & Management and Sarun Panyatham (2012).

### 3.2 PLANNING AND DESIGN OF THE EERF

The guiding principle of the EERF is to stimulate and leverage commercial lending by providing initial capital. Government involvement is kept to a minimum and procedures are simplified to further engage the banking community.<sup>25</sup> To this end an Energy Efficiency Market Assessment study was conducted in cooperation with commercial banks and served as the basis for the planning and design of the EERF. The study analysed the estimated technical and economic potential for EE projects in industries and buildings in Thailand and suggested an initial fund of THB 1 to 2 billion. Furthermore, DEDE consulted banks as well to estimate the total loans they expected to disburse through the EERF.<sup>26</sup>

The design of the EERF was also influenced by the Industrial Finance Corporation of Thailand (IFCT).<sup>27</sup> IFCT, who specialises in providing banking services to industrial customers. The IFCT suggested that the DEDE develop a simplified loan programme to operate under the ENCON Act for promoting EE in the industrial sector.<sup>28</sup>

The general principle of the EE Revolving Fund (and revolving funds generally) is that the revenue generated via repaid loans is made available for issuing new loans – hence the term revolving (see Figure 5). This fund structure is sustainable in that it ensures a consistent inflow and outflow of monies for funding EE measures.

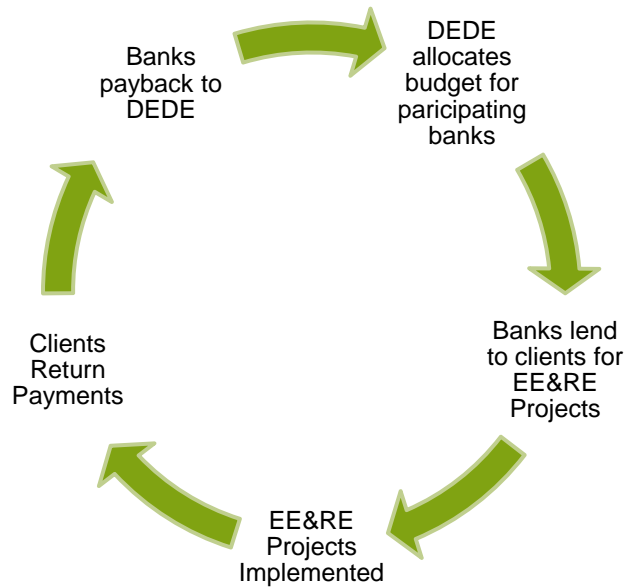
<sup>25</sup> Sajjakulnukit, Boonrod PhD (2008).

<sup>26</sup> Energy Futures Australia/ DMG Thailand (2005), p. 3.

<sup>27</sup> IFCT is a commercial bank that later merged with the Thai Military Bank to form the TMB Bank.

<sup>28</sup> International Energy Agency (2011), p. 55ff.

**Figure 5: General Design of the EE Revolving Fund**

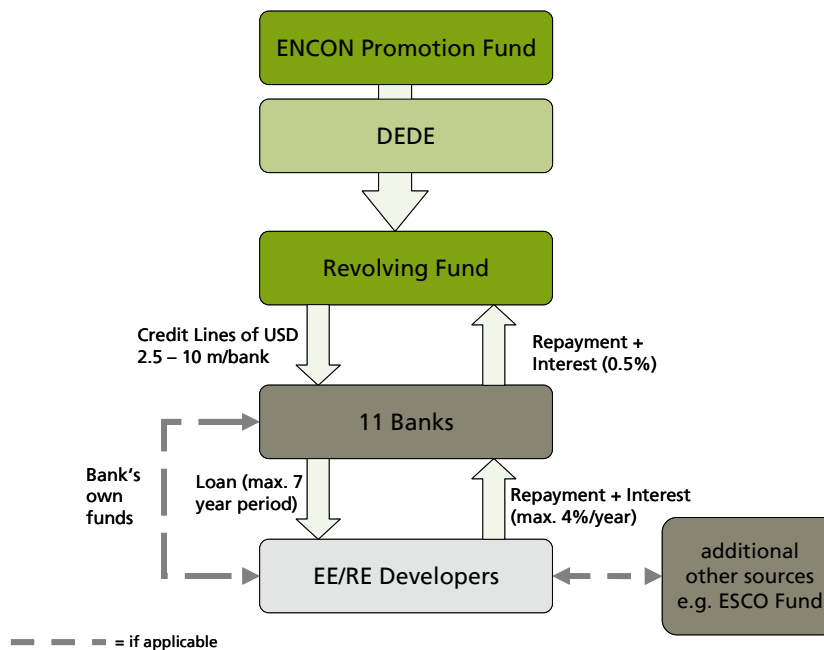


Source: Chaiyawat, Chirawut (2011).

### 3.3 FUND IMPLEMENTATION

The general flow of the EE Revolving Fund consists of the DEDE allocating a budget to the PBs which the PBs use for on-lending to clients for implementing EE and RE projects. Once mature, the interest earned on these investments flows back to the PB which is used to pay back the DEDE for its original budget allocation. The interest amount for the EE and RE projects is calculated to be sufficient to cover potential defaults and administrative costs. In this way the fund is carefully designed and monitored to keep portfolio risk and write-offs at an acceptable level. The EERF provides credit lines in the range of USD 2.5 million to USD 10 million to each PB in order to finance EE projects. The structure of the EERF is illustrated in Figure 6.

**Figure 6: Structure of the Thai Efficiency Revolving Fund**



The basic process of the fund's implementation includes the **drafting of a standard contract** by the DEDE with each partner bank. The contract stipulates, among other directives, the following funding terms:

- The maximum loan amount per project to the PB;
- the total amount of all loans made to the PB;
- interest rate charged by DEDE to the PB;
- interest rates to be charged by the PB to the borrower; and
- terms of the loan, including repayment conditions, treatment of default by the borrower to the PB and treatment of default by the PB to the EERF.<sup>29</sup>

Initially, the EERF provided the PBs with **zero interest credit lines** to jump-start projects. When financing higher volume projects, PBs have to use their own funds and mix accordingly.<sup>30</sup> The interest was subsequently reset at **0.5%** to cover administrative costs. Interest for **on-lending to borrowers was set at a ceiling of 4% p.a.**<sup>31</sup> Although many of the final PB borrowers requested higher amounts, the maximum loan amount is THB 50 million (approx. USD 1.4 million) per project in order to distribute the money to as many medium-sized projects as possible.

DEDE is supposed to repay the **total fund volume to the ENCON Fund within ten years**. Loans from PBs to final borrowers, however, have a **maximum maturity of seven years**. **Grace periods are possible during the first year** if the maximum maturity from the first drawdown to complete repayment is not exceeded.<sup>32</sup>

### 3.3.1 FUND ORGANISATIONAL STRUCTURE

The EERF is designed to **keep administrative and staffing costs low**, making it as cost-efficient as possible. For example, PBs are solely responsible for assessing loan applications and risk management. However, the EERF recognises that a sound assessment of final borrowers' projects is essential. If the PBs' staff is not sufficiently skilled to technically assess the project, DEDE provides the necessary assistance. For this purpose, DEDE employs two engineers for assessing the technical aspects and another two engineers for monitoring and evaluation of the projects. Financial experts are provided by the Ministry of Energy on a part-time basis in order to administer the loans and promote the model. Furthermore, experts from different divisions (solar, biomass, energy conservation, etc.) are available on demand. In total, there are about 25 part-time experts available with an average total workload of ten man-days per month. For that reason, the DEDE carries no risk other than the initial provision of credit lines and the employment of four permanent staff members.<sup>33</sup>

### 3.3.2 LOAN ELIGIBILITY CRITERIA

Eligible for support are **medium-sized energy conservation or energy saving projects**, and consultancy services for such projects. Initially, the criteria from the ENCON Promotion Act of 1992<sup>34</sup> were applied, i.e. only EE measures for factories and buildings for **Designated Facilities** were considered as eligible for support. Designated Facilities *"are the ones with an installed electrical demand from 1,000 kW up or installed transformer capacity from 1,175 kVA up or a total consumption of commercial energy including electricity and steam from 20 million MJ/year up"*.<sup>35</sup>

Table 3 provides the measures of energy conservation for *factories* and *buildings* defined by the ENCON Act.

<sup>29</sup> OECD/International Energy Agency (2011), p. 56f.

<sup>30</sup> The information is gathered from an interview with Prasert Sinsukprasert on 15th November 2011.

<sup>31</sup> USAID Asia (2009) p. 9.

<sup>32</sup> Energy Futures Australia/ DMG Thailand (2005), p. 7f.

<sup>33</sup> The information in this paragraph are gathered from an interview with Prasert Sinsukprasert on 15th November 2011.

<sup>34</sup> The Energy Conservation (ENCON) Promotion Act of 1992 was amended in 2007. However, there were no changes made with regard to the definitions of factories and buildings. See: Kingdom of Thailand (2007): Energy Conservation Promotion Act (No.2), B.E. 2550, Section 7. Accessed via: [http://thailaws.com/law/t\\_laws/tlaw0072.pdf](http://thailaws.com/law/t_laws/tlaw0072.pdf) on January 16th 2012.

<sup>35</sup> Wangskarn, Prapat (1997). Accessed via: <http://www.eppo.go.th/inter/wec/int-WEC-TD01.html> on January 17th 2012.

**Table 3: Measures of energy conservation for factories and buildings defined by the ECON Act**

FACTORIES		BUILDINGS	
1.	Enhance fuel combustion efficiency	1.	Reduce heat from sun glare into buildings
2.	Prevent energy loss	2.	Enhance efficient air-conditioning and to maintain an appropriate temperature within buildings
3.	Reuse energy left from consumption	3.	Use construction materials which enable energy conservation and to demonstrate quality of that material
4.	Switch to use other kinds of energy	4.	Enhance efficient illumination in the building
5.	Improve electrical energy consumption by adjusting power factor, reducing maximum electrical energy demand at the peak time of use of system, using electrical utilities appropriately or by other measures	5.	Use and equip machine, equipment and material which enable energy conservation for the building
6.	Use highly efficient machines or equipment, control systems and energy conservation material	6.	Equip operating control system for machine and equipment
7.	Other energy conservation measures as prescribed by Ministerial Regulation	7.	Carry out other energy conservation measures as prescribed by Ministerial Regulation

Source: Kingdom of Thailand (2007): Energy Conservation Promotion Act (No.2), B.E. 2550, Section 17

In May 2004 (only about one year after its establishment), **the EERF was expanded to include any commercial or industrial facility**, whether or not they were previously considered as a Designated Facility by the ENCON Act, **as well as ESCOs** or other third parties. The general definition of energy conservation measures however, remained unchanged. In order to meet the financing needs of ESCOs, the ENCON fund was subsequently subdivided into the EERF and the ESCO Fund. The latter offers co-investment with the private sector.

This extension of eligible entities was deemed necessary by the DEDE because the uptake of loans was not satisfactory during the initial months of operation. *“The eligibility criterion was extended principally to broaden the target area for the Fund, and particularly to make loan funds available to small and medium enterprises.”*<sup>36</sup>

Eligible investments according to DEDE were expanded to include:

- Equipment and installation costs
- Consulting costs – design, control, supervision, guarantee fees

<sup>36</sup> Energy Futures Australia/ DMG Thailand (2005), p. 5.



- Civil works, piping, or necessary components specifically and necessary for the project
- Associated costs necessary – removal of existing equipment, transportation, taxes, VAT<sup>37</sup>

Accordingly, apart from the maximum loan size, the **eligibility criteria for support are kept broad**. As the above specifications on eligible conservation measures indicate, in practice some **RE applications may fall under these definitions** as well. However, investments generally not eligible for support include:

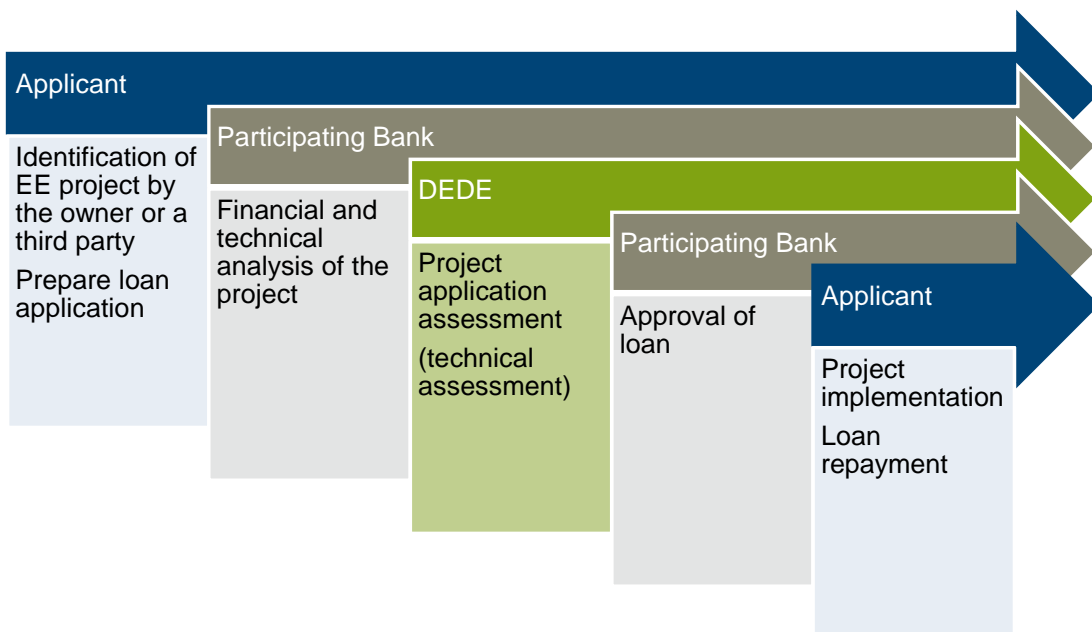
- Land costs and land improvement costs
- Building construction
- Costs not specifically needed for the project
- Main transformers and substation<sup>38</sup>

Furthermore, it is generally possible to obtain funding under the EERF for an individual project that includes several separate EE measures, which need not necessarily be interlinked, i.e. the project applying for funding is acting as an umbrella comprising several smaller and independent EE measures. Conversely, it is also possible to structure one larger EE project into several separate measures each applying for a loan in order to not exceed the THB 50 million ceiling. Though in the latter case, these measures have to be implemented independently.<sup>39</sup>

### 3.3.3 APPLICATION AND IMPLEMENTATION PROCEDURES

As shown in Figure 7 the application and implementation process for the EERF contains five stages.

**Figure 7: Application and implementation procedures**



Source: Adapted from Energy Futures Australia/ DMG Thailand (2005), p. 11.

<sup>37</sup> Sajjakulnukit, Boonrod (2008).

<sup>38</sup> Ibid.

<sup>39</sup> Energy Futures Australia/ DMG Thailand (2005), p. 7.

The promotion, education and publicity for EERF are split between DEDE and the PB. **Potential projects may be identified** by the owner of an industrial or commercial facility or through an energy audit of the facility conducted by an ESCO or other energy services provider.<sup>40</sup> The technical feasibility, estimation of the potential energy and cost savings are gained through a feasibility study. These determine the financing needs and loan repayment requirements using the EERF scheme. Facility owners submit their application to EERF via PBs. Third parties, such as ESCOs, are also eligible to apply for an EERF loan on their own account. The application is only 2 pages and includes information about the applicant, their energy consumption and a non-technical project description.

For the **financial assessment** PBs analyse applicants and base their loan decision on their regular lending criteria. They apply asset-based rather than project-based lending, e.g. cash flows and savings from the EE project under consideration are not taken into account. Thus, loan applications are assessed by the PB concentrating on their capacity to repay as well as offered collateral. Associated credit risks lie solely with the PBs, i.e. banks have to repay their line of credit (+ 0.5% interest) in any case to the Fund. However, banks are free to terminate any loan past due in default and restructure it at their own conditions to recover (including seizure of collateral).<sup>41</sup>

Therefore, some banks are reluctant to lend to new clients since they rely to a large extent on applicants' loan history and financial standing. Moreover, eligible collateral – mortgage, building or equipment – is usually linked to the project. However, third parties or small and medium enterprises (SMEs) which normally either own the facility or substantial land, buildings or equipment have difficulties to provide adequate collaterals. Since PBs are frequently unwilling to lend to clients without sufficient collateral, ESCOs and SMEs face difficulties in accessing the EERF.<sup>42</sup>

The **technical assessment** is done by the PB if they have required technical expertise or otherwise by DEDE. As the application already includes a feasibility study the technical assessment concentrates on eligibility for the project according to the ECON Act, controlling the feasibility of the proposed energy efficiency and plausibility of the estimated energy savings. If the financial and technical assessment is acceptable, the PB forwards the application to DEDE.

**EERF/DEDE assesses the project** and decides whether or not to approve the project. For final approval of projects, the requested two-page report by the Fund's working group indicates 1) a summary of the project including total costs, 2) how much energy they consume, and 3) how much energy the project will save. If the project is generally eligible in terms of the criteria, its performance will be assessed based on the ratio between energy consumption and potential savings. However, no minimum level of energy savings is applied.<sup>43</sup>

Based on the **disbursement and repayment** plan for approved loans from the PB to the EERF/DEDE the disbursement of funds from the ENCON Fund to the PB can be organised. Finally, as soon as the applicant and the PB agree on the loan, interest and repayment conditions (within 7 years) the loan will be disbursed. The borrowers implement their projects on their own risk.

### 3.4 MONITORING AND EVALUATION OF PROJECTS

The PBs are responsible for the **monitoring of loans** issued as they are the party on-lending to the client. Routine monitoring usually takes place every two to three months with the borrower. If the borrower does not submit the report the EERF sends a person to the facility on site to collect the relevant information.<sup>44</sup> DEDE, however, requests one single monitoring report six months after disbursement to analyse the performance of the project. The report is supposed to indicate energy savings compared to the baseline scenario and is forwarded to the Ministry. Furthermore, an engineer from the DEDE is supposed to inspect the project site and to give additional advice. However, DEDE's experts were only able to visit half of the projects up to now (October 2011).

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<sup>40</sup> OECD/International Energy Agency (2011), p. 57.

<sup>41</sup> UNEP (2006), p. 35.

<sup>42</sup> Energy Futures Australia/ DMG Thailand (2005), p. 11.

<sup>43</sup> OECD/IEA (2011), p. 57.

<sup>44</sup> The loan application includes a paragraph that the facility has to welcome staff of the EERF and to provide them access to the information. Sinsukprasert (2011a).

### 3.4.1 PERFORMANCE OF THE EERF

For **monitoring the performance of the EERF**, PBs are required to submit supplementary monthly reports to DEDE including total amount of each loan and corresponding repayment schedule. These reports are mainly used to secure that PBs do not hold back capital provided by the Fund for more than two months. Furthermore, each PB has individual disbursement targets negotiated under the EERF. Although DEDE does not impose any penalties in case of non-fulfilment, the reports are used to monitor PB's performance against these targets.<sup>45</sup>

DEDE uses several **key performance indicators (KPI)** to monitor the Fund. KPIs concentrate on the overall pipeline of projects, i.e. number of applications received and how applicants became aware of the EERF; time DEDE spent on approving applications; foreseen as well as actual energy savings per project; performance of each PB; and total number and value of loans approved.<sup>46</sup>

Recently, the Thai EERF could achieve a **leverage ratio of approximately three (PBs own funding) to one (Funding by EERF)**. According to Dr. Prasert Sinsukprasert, Director of Energy Regulation of the Department of Alternative Energy Development, PBs grow more interested in disbursing loans from their own resources and do not access the Fund as frequently as in the early phases. The CIMB Thai bank for example developed an own loan product similar to the EERF loans called the CIMB Thai Clean Energy Loan. The terms and conditions vary slightly compared to loans from the EERF (Table 4).<sup>47</sup> Nevertheless, the ratio of invested public money versus mobilised private capital is relatively low given the time of operation and ceiling in loan size.

**Table 4: Terms and Conditions of the CIMB Thai Clean Energy Loan**

CIMB Thai Clean Energy Loan	
Objective	To support clients for investment on machinery and equipments in relation to Energy Efficiency and Renewable Energy projects
Total Amount	THB 1,000 million
Loan Type	Long Term Loan
Facility Amount	THB 5 – 100 million
Loan Tenor	Not more than 5 years (including 1-year grace period), otherwise, to be considered on case by case basis
Interest Rate	Year 1 MLR-2% p.a. Year 2-3 MLR-1% p.a. Year 4 onward MLR-0.5% p.a.

Source: Chaipayat, Chirawut (2011).

### 3.4.2 ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

The **economic impact** of the EERF is calculated **by the reduction of oil imports based on energy savings of the projects**. Since there have been a relatively small number of projects funded, the overall economic impact is rather limited. However, when comparing Phase I total energy savings of 1620 in baht million/year<sup>48</sup> with current total energy savings of 5,423.48 million baht/year (as of February 2012), the EERF could accumulate savings by a factor of 3.4 (Table 5).

<sup>45</sup> Energy Futures Australia/ DMG Thailand (2005), p. 7.

<sup>46</sup> OECD/IEA (2011), p. 57.

<sup>47</sup> Chaipayat, Chirawut (2011).

<sup>48</sup> du Pont, Peter (2009).

**Table 5: EERF PROJECT - STATUS FACT SHEET**

EERF PROJECT - STATUS FACT SHEET by end of February 2012	
Implementation Period	2003 – 2011
Number of Projects	294
Total Investment	15,959.05 million baht
Loan from RF	7,231.94 million baht
Loan from Commercial Banks	8,727.10 million baht
Electricity Savings	1,170.66 million kWh/year
Oil Savings	234.35 million liter/year
Total Energy Savings	5,423.48 million baht/year
Reduction of Oil Imports	320.38 KTOE/year
GHG Emission Reduction	0.98 million TON CO <sub>2</sub> eq

Source: Status Fact Sheet provided by Sinsukprasert, Prasert, DEDE (2011a).


The **environmental impact** is reflected in the GHG Emission reductions. Factors provided by the Ministry of Environment of Thailand in “the greenhouse gas reduction estimate” are used to calculate the CO<sub>2</sub> emissions savings.

Up to now the EERF is not assessing the **social impact**. However, there has been job employment e.g. been employment in the rural areas for PBs providing RE products which are not measured.

### 3.4.3 FUNDED INTERVENTIONS: PROGRAMMES, PROJECTS AND MEASURES

In total, 294 projects – with approx. 80% implemented in factories – have been funded by the EERF (as of February 2012; see Table 6). Most frequent projects funded under the EERF are replacements of chillers or installations of biogas systems. In general, the fund offers TA (through a set of consultants) to possible borrowers, but there are not many requests for it. Subsequently, three project examples from different type of business and technology used with the saving result and payback period for the loan are presented (Table 6).

**Table 6: Project examples of the EERF**

EXAMPLE 1: BRITISH INTERNATIONAL SCHOOL PHUKET	
Type of Business	Academy
The technology used	Improve Energy Efficiency : Change Air Cooled Chiller by Water Cooled Chiller
Investment	9.25 Million Baht
Loan EERF	9.25 Million Baht
Financial Institution	The Siam Commercial Bank: SCB
	
SAVING RESULTS AND PAYBACK PERIOD of the BRITISH INTERNATIONAL SCHOOL	
Average Electrical Saving	0.68 MWh/year
Cost Saving	2.37 Million Baht/year
Payback Period	3.90 year

**EXAMPLE 2: TRANG PALM OIL Co. Ltd.**

Type of Business	Palm Oil Factory
The technology used	Biogas and Power Generator from Waste Water 2 MWp
Investment	115 Million Baht
Loan EERF	50 Million Baht
Financial Institution	Krung Thai Bank (KTB)

**SAVING RESULTS AND PAYBACK PERIOD of the TRANG PALM OIL Co. Ltd.**

Average Electrical Produce	5.58 MWh/year
Benefit	19.62 Million Baht/year
Payback Period	5.86 year

**EXAMPLE 3: TOWER PROSPECT COMPANY**

Type of Business	Biomass Cogeneration Power Plant
The technology used	Cogeneration Power Plant from Biomass (mostly Rice Husk)
Investment	648.11 Million Baht
Loan EERF	50 Million Baht
Financial Institution	Krung Thai Bank (KTB)

**SAVING RESULTS AND PAYBACK PERIOD of the TOWER PROSPECT COMPANY**

Average Electrical Produce	41.44 MWh/year
Average Steam Produce	55,425.33 TonSteam/year
Benefit	94.89 Million Baht/year
Payback Period	6.83 year

Source: Project Examples provided by Sinsukprasert (2011), DEDE 2012

## 4 KEY POINTS AND FEATURES

The principle goal of the EERF is to **stimulate the investment appetite of commercial banks in Thailand so that they will engage in financing EE projects**. When considering the fund's project results, one could say that the GoT (acting through the EERF) **has achieved this goal**. For example, among the funds' eleven PBs are most of the large Thai commercial banks, which are increasingly investing their own capital in EE projects. In fact, the fund has been designed so that most of them no longer need to use the EERF fund facility. Because of this the GoT has decided to not issue a new budget line to the EERF for on-lending. The EERF will, however, continue to carry out the accounting responsibilities for funded projects and to provide technical assistance to commercial banks.<sup>49</sup>

To Dr. Prasert Sinsukprasert (2011a), a key accomplishment of the Fund is, besides actual projects funded, the **creation of networks of private financiers and ESCOs**. By holding meetings and events, the EERF proactively brings together banks and ESCOs. ESCOs have developed **a showcase of about 40 projects** in order to teach banks the assessment of and return period for EE projects. Furthermore, they provide two sets of **trainings for banks**: one technical course for the bank's engineers and one **training course on the policy framework** focusing on tax incentives etc. These networks enhance mutual learning and a better understanding of funding requirements. Taking into account the initial goal of the EERF to stimulate financial sector involvement in EE projects, this intercommunication between key stakeholders is a crucial step.

When governments, banks and the private sector work together to stimulate investments in EE (and sustainable energy generally), there are several points to consider. According to Dr. Sinsukprasert, the following conditions were key to the EERF's success:

- **Making it as simple as possible:** The EERF tries to reduce the administrative process e.g. with short and easy application and reporting processes. Furthermore, as the bank has already made the needed adjustments to the application usually the project is ready for approval by the EERF.
- **Putting the project ownership where it belongs to ensure efficiency and commitment:** The private sector expects a rapid work process. They must make a decision within 7 days from project proponents submitting a project to the Fund, and the bank then has to commit that they will release the money for the project within 30 days. Since the project proponent is dedicated and willing to implement the project and must show this commitment in the project proposal the fund managers do not have to worry too much about the project's performance.
- **The conditions and interest rates must be attractive for potential applicants:** Furthermore, banks' risk in engaging in the sector is also manageable since they are free to restructure overdue loans at their own terms.
- **Active promotion of the EERF among the Thai banks:** When the Fund started out, Dr. Prasert Sinsukprasert visited all the banks in Thailand to promote clean energy lending, the EERF, and to explain the application process and the eligibility criteria. After approximately three or four years the application rate was high.
- **Communication between key stakeholders:** The creation of networks of private financiers and ESCOs through meetings, events and training courses brings together banks and ESCOs on a personal level. These networks enhance mutual learning and enable a better understanding of funding requirements.

Another key achievement is that the government was able to jumpstart the EERF with the initial capital with almost zero risk. This was possible because the fund primarily finances tested products and the capital was sourced from petroleum import tax revenues. This form of innovative financing lightens the

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<sup>49</sup> Sinsukprasert (2012).

strain on government budgets in providing this type of upfront financing, thus making it more sustainable.

In general it can be said that the EERF represents a public finance mechanism with **a learning process for all stakeholders** involved. The EERF required approximately three to four years before achieving a good application rate. In the first two years, many banks were not familiar with EE technologies, and the associated risks and costs. By offering awareness raising campaigns, clear and simple application guidelines and technical support, the EERF ensured that the PBs would invest in EE and in turn increase their competitiveness.

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