

# Energy Efficiency Finance Support in Thailand: Lessons Learned from the Energy Efficiency Revolving Fund

Verena Streitferdt<sup>1,\*</sup> and Surapong Chirarattananon<sup>2,3</sup>

<sup>1</sup>Institute for Sustainable Futures, University of Technology, Sydney, Australia

<sup>2</sup>The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand

<sup>3</sup>Center on Energy Technology and Environment, Ministry of Education, Thailand

\*Corresponding author: [verena.streitferdt@uts.edu.au](mailto:verena.streitferdt@uts.edu.au), Tel.: + +61-2-95144966, Fax: +61-2-95144941

**Abstract:** This paper provides a critical perspective on the internationally acclaimed Thai Energy Efficiency Revolving Fund. The International Energy Agency predicted that by 2035 savings from energy efficiency measures could reduce global energy demand by 20% from 2010 levels. Most notably in Asian developing and fast emerging economies, demand-side energy efficiency initiatives in the industry and building sector seem promising. However, so far the potential has not been realized, with upfront finance being one main barrier. Therefore the question of how the public sector could mobilize private sector investment becomes an important one. Literature reveals that public supported funds or credit lines could be one of the options to overcome this barrier. The Energy Efficiency Revolving Fund of Thailand has been chosen as a case study as it has been considered as an international best practice example. By taking sustainability rather than a programme perspective interesting lessons can be learned: That energy efficiency finance will lose out once renewable energy and energy efficiency finance are combined in one mechanism, that the mechanism actually leads to changes in lending patterns and that the Thai government needs to focus to provide legislation that will drive the demand for energy efficiency finance in the future.

**Keywords:** Revolving Fund, energy efficiency, emerging economies, energy efficiency finance, Thailand, public policies.

## 1. Introduction

Threats to existing energy systems in Asian developing economies, as well as expected growth of energy demand in these countries, have opened up the discussion of transitioning to low fossil fuel energy systems [1]. Internationally demand-side energy efficiency (EE) is promoted as the most cost-effective option to secure energy supply [2]. Energy efficiency herein refers to the consumption of less energy for the same output, including improvements to existing infrastructure stock of industry and buildings and providing energy efficient solutions for new projects in the industry and building sector [3]. South East Asia has a very high EE potential due to the fact that countries have a much higher energy intensity compared with energy efficient countries such as Japan or Germany [4-5]. Further, the EE industry provides new business opportunities and ensures the commercial sector's global competitiveness [5-6].

South East Asia is not realising its EE potential and EE Finance (EEF) has been reported to be one of the main barriers. The Asian Development Bank (ADB) found in a recent study that even though \$211 billion (\$59 billion in Asia and the Pacific) were invested in 2011 in clean energy, only \$23.9 billion were invested in 'energy-smart' (EE systems and devices, etc.) technologies [4]. At the same time, there is a gap between the energy efficiency finance needed for the EE plans of developing countries and the energy efficiency finance provided [7-8]. Analysis focused on developing countries identified access to capital through suitable finance mechanisms as one of the main barriers [8-9]. Financial institutions are challenged by the particular characteristics of EE projects. *Energy efficiency finance* herein is defined as external finance for EE projects in industrial and commercial operations that leads to energy savings [10]. It is widely agreed that EE projects need relatively small investments, which limit possible profits to financing institutions. Also the finance stream comes from 'invisible' resource savings rather than selling of products. This necessitates special contract arrangements that, based on technical analysis provide long-term energy saving payments and a revolution in investment strategies [11]. Also, besides the customer and the financial institution there can be a multitude of

support players, such as project developers, technology experts, insurance companies, etc., all with a different objective and language [12]. In addition, in emerging markets weak legal enforcements, policy uncertainty, for example in regards to EE performance standards or EE subsidies, as well as the immaturity of technology and supporting mechanisms hinder confidence of the financial sector in those investments [13-14]. For example international energy service companies (ESCOs) lost the incentive to invest in India after they recognised the amount of capacity building necessary to convince potential customers of the contract arrangements [15]. Research on how *public policy related initiatives* mobilise the development of private sector finance mechanisms for EE is limited and focused on climate finance and the developed world [14, 16]. In theory the public finance mechanisms that reduce the risks of investment can range from funds via grants and concessional loans to Public-Private cooperations via guarantee mechanisms [3]. Especially revolving funds have been praised to mobilise private sector investment. These funds, usually financed and administered by the government provide lending to EE projects and the loan repayments recapitalise the fund [17]. This provides the opportunity to use operational funds for capital investment. However, revolving funds have limits to mobilise private finance and revolve quite slowly [17]. Also, a revolving fund could lead to a distortion of the financial market and actually hinder commercial and sustainable development [11]. So far, experiences of EE revolving funds are quite limited.

## 2. Material and methods

*Thailand is an interesting case study*, due to experiences with innovative public finance mechanisms for EE investments under its Energy Conservation Fund (ENCON Fund) since the early 2000s. The most prominent programme has been the Energy Efficiency Revolving Fund (EERF) [18]. The analysis is structured around three levels which have been derived from the discussion within transition and system innovation studies. Multi Level Perspective (MLP) of Geels (2005) [19] has been used in broad definition terms. Simply put, MLP provides the opportunity to analyse the co-dynamics within a socio-technical

system by focusing on three levels, namely the protected space of an innovation (*niche*), existing prevailing practices (*regime*) and external factors that might open up practices towards accepting new innovations (*landscape*) [20].

The niche that this research will look at is the Energy Efficiency Revolving Fund in Thailand. The regime herein is mainly defined by three sectors: energy, the finance and the building and industry sector and the landscape has been defined as 'the whole set of impacts outside the level of niches and regimes, which have influence' [21].

The data that contribute to this paper were collected in 2013. Twenty one semi-structured interviews were conducted which included government, private sector (banks, ESCOs), customers of EEF programmes and international consultants.

### 3. Results

#### 3.1. Establishment/objective

The EERF was established through the disruption of the institutional landscape, combined with transnational influence and relationships between two champions in the private and the public sector. The East Asian financial crisis which started off in the beginning of the period in 1997 transformed the financial sector completely as a consequence. International banks left Thailand and The Central Bank of Thailand annexed several banks and merged the Thai Development Bank and the Industrial Finance Commission of Thailand (IFCT) into the Thai Military Bank (TMB). IFCT had already implemented some support lending for EE in the end of the 90s so the staff looked for new opportunities to continue those programmes. In general the financial crisis opened up opportunities to support the very fragile banking sector. Several interviewees mentioned that at the same time the German Development Cooperation, the World Bank and the Danish International Development Agency (DANIDA) have supported the National Energy Policy office via study trips and studies to analyse the problems of energy efficiency finance in Thailand. Some of the findings indicated a lack of interest from the banking sector as well very high risks perceived by the banks that hindered EE lending to attractive conditions [18]. Finally the idea was born due to the great cooperation and relationship between two champions, one former IFCT employee and the director of the respective department at NEPO at that time. Besides options of sub finance from the GEF, facilitated by the World Bank, in the end they developed a national programme that could be financed via the Energy Conservation Fund of Thailand (ENCON Fund). The EERF was established in January 2003 with an initial budget of THB two billion [22].

#### 3.2. Operation and evolvement

The EERF had the objectives to support the investment into energy efficiency and also to build capacities at banks to provide EE finance mechanisms. It provided a maximum loan of fifty million THB per project that had to be paid back over a period of seven years maximum. As the money originated from the ENCON Fund it provided the loan at zero interest rate under the condition that the bank will on-lend the loan with a maximum interest rate of 4%. Further, the implementing agency, NEPO and after the Ministry of Energy was established, Department of Alternative Energy Development and Efficiency DEDE provided project development and technical support to the banks and customers to create a 'One-stop one shop offer' [11]. The Fund was targeted at participants of the designated building and industry programme but later also extended to any factory and building interested in EE lending and also to ESCO companies [22-23]. Money was mainly given to projects that installed EE equipment, but also for maintenance and operation [23].

#### 3.3. Outcome

From a *programme point of view* the EERF can be declared a success. The Programme ran over five implementing phases from 2003 until 2013 and provided overall 7 billion THB in loans with co-lending from the banks to reach up to 9 billion THB [23]. Also the interest rate was raised from 0% to 0.5% in the 4<sup>th</sup> and 5<sup>th</sup> phase. According to the interviewees the complete fund was returned to the ENCON Fund without any default. Initially four banks participated and in 2013 there were eleven participating commercial banks. A total of 292 projects were implemented until the end of 2013, with 40% in Renewable Energy (RE) and 60% in EE. Besides the projects implementation the capacity building among the banks and ESCOs was also praised [23]. The projects achieved overall 5 billion THB in energy savings [23]. Also international publications praised the fund to have caused leverage ratios from the government to the private sector of about 1: 3 up to 1:4 [18]. Even though this number was contested by the numbers from the ministry and local experts, it was still found that the EERF had mobilised finance from the customer and the banks. Many reasons for stopping the fund were brought forward and factors such as objective achieved, international praise for a successful programme, political focus towards ESCOs and MOF not being involved, were some of the named possibilities. However, from a *sustainability perspective* it can be argued that the EERF has failed its long-term goal to sustainably establish EE finance as business-as-usual in banks portfolios and merely became another EE subsidy for large companies that would like to implement EE measures. Out of the interviewee discussions it became clear that at present only one bank actively pursues EE lending. However, it seems that still several banks continue their RE lending portfolio. Also 292 projects seems a rather small amount for a 10 year public programme and THB 16 billions (500 millions USD) also not enough in regards to the necessary finance to achieve the EE targets, described in the Energy Efficiency Development Plan, which were estimated to be around 2 billion USD [4]. Further according to the interviewees the lending behaviour of banks has not changed, meaning they still require collateral or trusted customers for credit provision making such loans unreachable for small and medium enterprises such as ESCOs.

### 4. Discussions

#### 4.1 External financial mechanism can spoil the market

The long duration of the EERF, combined with the low interest rate seemed to have caused a lack of investment of banks to really develop innovative lending portfolios. In circumstances where the financial sector is under stress external revolving funds can be very successful but that when administered outside the commercial banking sector, it can also hinder the development of commercial sustainable solutions [11]. Also such credit-lines favour large and medium-size enterprises, due to their collateral. Also care needs to be taken for capacity buildings at financial institutions and that the banks are not just used as an implementation framework (NESDB, 2011)[10, 24]. The interviewees confirmed that the EERF did not really induce banks to think and experiment with different credit provision models. One interviewee noted: 'the financial support kind of spoils the market; it warns the market that the market has a characteristic of being immature'. Over the five phases only the interest rate criteria was changed from 0% in the first 3 phases to 0.5% in the last two. Also it was noted that DEDE actually provided most technical knowledge and even though trainings took place, there was insufficient transfer of the very important technical and credit lending advice to the banks [10]. As a consequence the EERF did not achieve that banks

changed their underwriting criteria - moving away from collateral and proven customers towards energy savings calculations to enable small and medium sized companies or ESCOs to access finance. For example in China the energy conservation project developed a guarantee fund to combat SME credit risks [25]. The ESCO fund which was established in 2008 might provide assistance in that regard, but so far it still needs to be seen whether it will generate other sustainable bodies in the Thai financial landscape.

#### 4.2 Lack of demand

Another reason for the banks to discontinue providing EE lending portfolios seems to be the lack of demand from customers for external finance. The designated building and factories programme incentivises large industries and buildings (that consume more than 1MW electricity per year) to report on their energy consumption and institutionalise an energy manager. However, so far no implementation of energy efficiency is required. Even though a mandatory building code exists, currently due to coordination problems between the Department of Public works under the Ministry of Interior and the Ministry of Energy, there is no enforcement. One interviewee called the institutional set-up for EE 'a mess'. In a recent study in China the strong project demand was noted as one of the benefits for EEF development [10]. Mandatory EE reduction targets for utilities or BEC enforcement in the public building sector might provide opportunities to create the needed demand to develop the EEF and ESCO markets further.

#### 4.3 Energy Efficiency is financially less attractive than renewable energy financing

EE finance further seems to have been compromised by including RE financing in the EERF. Research agrees that EE projects are the most cost-effective and environmental benign way to respond to rising energy demand and might also provide income over time [10]. Compared to other investments but specifically to RE, the investment is small, benefits are less visible and even though RE also has a technological risk, in EEF it is more diverse, with each sector requiring their specific EE technologies [11]. An interviewee stated that government seems to be pressured by the RE industry to further develop RE incentives. That is why the EERF was opened to RE projects for the 3<sup>rd</sup> phase. Unfortunately The Ministry of Energy could not provide information on the project ratio between RE and EE for each phase. However, as the overall ratio of projects was 40% RE and 60% EE less EE projects in the second half of the EERF existence can be assumed. The international consultants confirmed that if a support structure combines EE and RE project for eligible finance RE projects will be preferred due to their size and 'attractiveness'. Minimum EE project targets or other incentive schemes could avoid such a bias [11].

### 5. Conclusions

This paper analyzed how the EERF mobilised EE investment in Thailand. It was demonstrated that from a public programme perspective the EERF of Thailand was a success. However, from a sustainability perspective it was unsuccessful. Only one of the eleven participating banks continued with an EE portfolio once the EERF was terminated. Thus a revolving fund might be suitable to mobilise EE investment, but care needs to be taken to adapt the criteria once the private sector starts to develop, to incentivise innovative lending practices. This could mean that at some point a revolving fund should rather become a guarantee fund that only provides finance in case of lending failure. Also it became clear that an enabling legislative framework, such as building codes or energy savings obligations

for utilities create a demand for EEF. Further, mechanisms that combine EE and RE incentives need to be monitored so that RE investments will not dominate. Finally, the overwhelming international praise for the EERF might have hindered more critical reflection. This study intends to provide criticism that hopefully results in constructive policy discussions in the future.

#### Acknowledgement

Several organisations and individuals have contributed to this research which should be acknowledged. The Hildegard-Dinter-Stiftung, facilitated by the Wuppertal institute for Climate, Environment and Energy, provided financial support for the six week long field trip to Thailand. Also the Joint Graduate School of Energy and Environment of King Mongkut's University of Technology Thonburi hosted the researcher for the six weeks at their premises. Further the continued support for the research by the field supervisor Prof. Surapong and editing assistance from Prof. Exell were greatly appreciated. Lastly the researcher would like to thank the Australian Government for providing her overall PHD scholarship and the continuous support of her PhD supervisors, Pierre Mukheibir, Michael Paddon, Timon Wehnert and David Crossley.

#### References

- [1] UNESCAP, *Low Carbon Green Growth Roadmap for Asia and the Pacific* (2012) Available online: <http://www.greengrowth-elearning.org/pdf/MrChung-GreenGrowth.pdf>.
- [2] ADB, *Review of Energy Efficiency Interventions* (2011) Available online: <http://www.adb.org/documents/review-energy-efficiency-interventions>.
- [3] Selmet N, *Plugging the Energy Efficiency Gap with Climate Finance* (2012) Paris, France: OECD/IEA. Available online: [http://www.indiaenvironmentportal.org.in/files/file/Plugging the energy efficiency gap with climate finance.pdf](http://www.indiaenvironmentportal.org.in/files/file/Plugging%20the%20energy%20efficiency%20gap%20with%20climate%20finance.pdf)
- [4] ADB, *SAME ENERGY, More Power: Accelerating Energy Efficiency in Asia* (2013) Manila.
- [5] Eurocham, *Market potential in energy efficiency in Southeast Asia* (2011) Available online: [http://www.rolandberger.com/media/pdf/Roland\\_Berger\\_Market\\_Potential\\_in\\_Energy\\_Efficiency\\_in\\_Southeast\\_Asia\\_20111104.pdf](http://www.rolandberger.com/media/pdf/Roland_Berger_Market_Potential_in_Energy_Efficiency_in_Southeast_Asia_20111104.pdf).
- [6] Goldman CA, Hopper NC, Osborn JG, Review of US ESCO industry market trends: an empirical analysis of project data, *Energy Policy* 33/3 (2005) 387-405, doi:10.1016/j.enpol.2003.08.008.
- [7] Farrell D, Remes J, Bressand F, Laabs M, Sundaram A, *The Case for Investing in Energy Productivity* (2008) San Francisco, United States of America: Mc Kinsey Global Institute.
- [8] IEA, *World Energy Outlook 2012* (2012) Paris, France: OECD/IEA.
- [9] Sorrell S, Mallett A, Nye S, *Barriers to industrial energy efficiency: a literature review* (2011) Available online: [http://www.unido.org/fileadmin/user\\_media/Services/Research\\_and\\_Statistics/WP102011\\_Ebook.pdf](http://www.unido.org/fileadmin/user_media/Services/Research_and_Statistics/WP102011_Ebook.pdf).
- [10] Taylor RP, *Next Steps for financing Energy Efficiency in China* (2012).
- [11] Taylor RP, Govindarajulu C, Levin J, Meyer AS, Ward WA, *Financing Energy Efficiency: Lessons from Brazil, China, India and Beyond* (2008) Washington DC USA: The World Bank.
- [12] Ward M, *Engaging Private sector capital at scale in financing low carbon infrastructure in developing countries*

- (2010) The main report of the private sector investment project. Available online:  
<http://mitigationpartnership.net/gtriplec-2010-engaging-private-sector-capital-scale-financing-low-carbon-infrastructure-developing-c>
- [13] Painuly JP, Financing energy efficiency: lessons from experiences in India and China, *International Journal of Energy Sector Management* 3/3 (2009) 293-307, doi:10.1108/17506220910986815.
- [14] Venugopal S, Moving the Fulcrum: A primer on public climate financing instruments used to leverage private capital, *WRI Working Paper* (2012) 1-36.
- [15] Sarkar A, Sing J, Financing energy efficiency in developing countries – lessons learned and remaining challenges, *Energy Policy* 38 (2010) 5560-5571, doi:10.1016/j.enpol.2010.05.001.
- [16] UNEP, *Energy Efficiency and the finance sector: A survey on lending activities and policies*, (January) (2009) Available online:  
[http://www.unepfi.org/fileadmin/documents/Energy\\_Efficiency.pdf](http://www.unepfi.org/fileadmin/documents/Energy_Efficiency.pdf).
- [17] Kats BG, Author P, Menkin A, Domm J, Debold M, *Energy Efficiency Financing* (2012) Available online:  
[http://cap-e.com/Capital-E/Energy\\_Efficiency\\_Financing\\_files/Energy\\_Efficiency\\_Financing-Models\\_and Strategies.pdf](http://cap-e.com/Capital-E/Energy_Efficiency_Financing_files/Energy_Efficiency_Financing-Models_and Strategies.pdf)
- [18] Gruening C, Menzel C, Panofen T, Shuford S, *Case Study: The Thai Energy Efficiency Revolving Fund* (2012) Frankfurt School of Finance and Management GmbH.
- [19] Geels FW, Processes and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective, *Technological Forecasting and Social Change* 72/6 (2005) 681-696, doi:10.1016/j.techfore.2004.08.014.
- [20] Van den Bergh JCJM, Truffer B, Kallis G, Environmental innovation and societal transitions: Introduction and overview, *Environmental Innovation and Societal Transitions* 1/1 (2011) 1-23, doi:10.1016/j.eist.2011.04.010.
- [21] Lachman DA, A survey and review of approaches to study transitions, *Energy Policy* 58 (2013) 269-276, doi:10.1016/j.enpol.2013.03.013
- [22] APEC, *Thailand 's Energy Efficiency Revolving Fund : A Case Study* (2005).
- [23] DEDE, *Summary data of the EERF* (2014).
- [24] NESDB, *Thailand: Clean Energy for Green Low-Carbon Growth* (2011) (September).
- [25] Geels FW, Processes and patterns in transitions and system innovations: Refining the co-evolutionary multi-level perspective, *Technological Forecasting and Social Change* 72/6 (2005) 681-696, doi:10.1016/j.techfore.2004.08.014.