

# Financing Options for Energy Efficiency Improvements in Thailand's Iron & Steel Industry

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## Introduction

Energy generally forms a major cost component (about 20% to 40%) in the total manufacturing cost of steel.<sup>1</sup> Improving energy efficiency is an important factor in determining the competitiveness of a steel plant, yet some energy efficiency improvements may require a significant level of investment. How to fund such investments becomes a critical question. This is the role of financing: the provision of funds, often from third parties, for new business activities and investments such as energy efficiency projects.

Energy efficiency projects are often attractive from the perspective of steel plants and third party financiers because the energy savings provide a cash flow that can be used to provide returns and repay the financing. Energy efficiency projects may also provide additional revenue streams in the form of improved plant performance and monetisable carbon dioxide (CO<sub>2</sub>) emissions reductions (under a carbon trading scheme, for example).

Steel plants may already have the necessary capital to pay for energy efficiency improvements. This is called “self-financing,” or “internal funding.” The plant purchases and installs the energy efficiency improvement, and instantly begins benefiting from reduced energy costs.

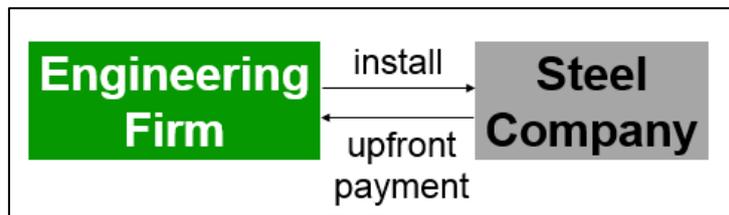


Figure 1: Basic Self-Financing Diagram

For some larger energy efficiency investments, steel plants may not have the necessary funds to self-finance, and may seek financing, usually in the form of a loan, from a third party such as a bank, government programme, or equipment manufacturer for the purchase and installation of the energy efficiency improvement. If a steel plant obtains financing (usually a loan) from a third party for an energy efficiency improvement, it will avoid paying the upfront cost of the energy efficiency improvement, it will benefit from reduced energy costs, and it will have to repay the financing to the third party.

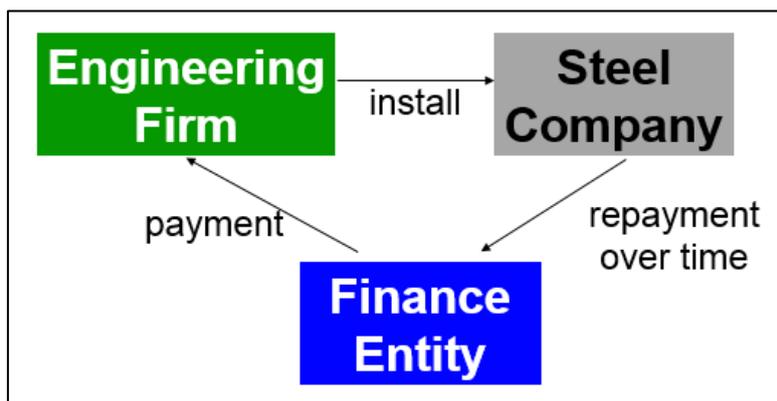


Figure 2: Basic Third Party Financing Diagram

There are many potential sources and forms of financing that a steel plant might use to fund energy efficiency improvements. The purpose of this **Financing Options Report** is to outline some of the potential sources of financing available for steel plant managers seeking to make energy improvements in their plants.

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<sup>1</sup> Worldsteel Association Fact Sheet: Energy use in the steel industry 2016

## 1 Scope

This **Financing Options Report** outlines some of the potential sources and forms of financing energy efficiency improvements in the Thailand iron and steel industry.

This report outlines the broad categories of financing, specific sources of financing, and examples of previous financing arrangements in similar fields and geographies. The purposes of this report are to:

- (1) Provide instructions for plant managers on using the financial model to determine if project is economically attractive, and whether there is a need for financing
- (2) Provide an initial framework for plant managers that may wish to seek third party financing for energy efficiency improvements
- (3) Provide attractive options for plant managers seeking third party financing for energy efficiency improvements in their plant
- (4) Demonstrate the viability of third party financing for energy efficiency improvement projects in the Thai iron and steel industry

It is important to note that the economic attractiveness of a specific energy efficiency improvement should be determined *before* the decision to finance it and search for a source of financing. This report provides guidance on options for financing *after* it has been decided that an energy efficiency project is desirable from an economic perspective. To help steel plant managers determine if an energy efficiency improvement is desirable from an economic perspective, a financial model was developed as a part of this project. Steel plant managers can use the financial model to determine the costs, benefits, and cash flows associated with a given project, and how financing might impact those cash flows. See the “Directions for Using the Financial Model” Chapter for instructions on using the financial model.

## 2 Target Users of the Financing Options Report

This **Financing Options Report** is intended for the use by individuals in Thailand’s iron and steel companies who are responsible for evaluating and securing funds for potential investments in the plant, as well as individuals responsible for finding and implementing cost-saving and energy-reducing opportunities in the plants. This report provides a framework and initial ideas for those individuals on how to finance energy efficiency improvements.

## 3 Directions for Using the Financial Model

The financial model created as a part of this project is tool that can help steel plant managers understand the costs and benefits of an energy efficiency improvement in their plant, as well as the cash flows associated with self-financing or finding third-party financing the improvement. Managers can use the model to estimate annual savings and other cash flows from efficiency upgrades, as well as the cash flows associated with financing the efficiency improvement. If the model suggests that a specific efficiency improvement makes economic sense, and the managers decide to move forward with the improvement, then managers can begin searching for financing options for the improvement.

A financial model was created to calculate the payback periods and perform a cash flow analysis of potential energy efficient technology upgrades in a hypothetical steel plant. This model was used to analyse the costs, savings, and cash flows of four potential equipment upgrades, each in a self-financed scenario and a loan-financed scenario. The results from that financial modelling analysis are available in the Energy Efficiency Manual.

The financial model can also be used by plant managers to estimate the potential value and attractiveness of additional equipment upgrades beyond the four technologies originally modelled. Additionally, plant managers could use the model to estimate changes in cash flows (including energy cost savings and operations and maintenance costs) from operational changes in their plants. The following instructions are intended to help plant managers in the iron & steel industry of Thailand make investment decisions about potential energy efficient technology upgrades.

To use the model, a plant manager should open the document in Microsoft Excel, and navigate to the sheet titled “Model for Plant Managers.” Then the plant manager should enter the name of the equipment upgrade they would like to model, and enter all relevant details about the steel plant, energy consumption, expected energy savings, price of energy, degradation rate, discount rate and expected terms of a loan in the cells highlighted in yellow in Column C. (Instructions for using the model are also included in the orange box at the top of the “Model for Plant Managers” sheet in the model).

The model will automatically calculate annual savings, costs, and cash flows for the technology, graph the cash flows, and perform a sensitivity analysis on the project NPV relative to terms of the loan.

## 4 Forms of Financing

Once it is determined that there is a desirable energy efficiency improvement that needs financing, plant managers should begin the process of finding an appropriate source of financing. But before exploring the potential sources of financing for energy efficiency improvement projects, it is helpful to understand the various forms financing can take. There are four general forms financing can take: debt, equity, grants, and de-risking.

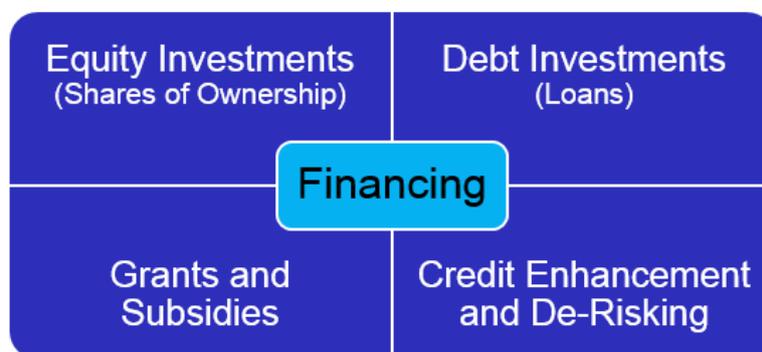


Figure 3: Forms of Financing

**Equity** can be thought of in simple terms as one’s share of ownership in a company or asset. Owning equity in an asset entitles the owner to a share of the future cash flows of that asset. A basic example of equity investments are publicly traded stocks. A stock represents a share of ownership in a company.

**Debt** is essentially money that is borrowed from one party and used by another party. Loans are a common form of debt in which the lender supplies money to the borrower in exchange for repayment with interest for the lender over an agreed upon period of time. Examples of common loans include loans for houses and loans for cars.

**Grants** (also known as subsidies, rebates, and incentives) are money that is provided to a recipient for a particular purpose with no expectation of repayment or ownership in return. Grants are usually provided by an entity that has a social or policy goal, such as government bodies and foundations. One example of a grant is the money used by governments to pay for a portion of the upfront cost of energy efficiency equipment.

**De-risking**, often in the form of credit enhancement, is means of reducing the risk of providing other forms of financing for a given business or project. By reducing the risks associated with a given endeavour, that endeavour becomes a more attractive investment for other forms of financing, thereby increasing their likelihood and reducing the associated costs of financing. De-risking can be accomplished in a variety of ways, but one common way is to provide a guarantee for a borrower that reduces or eliminates the credit risk for the lender. This form of de-risking is often called a credit enhancement.

Each of these four forms of financing has many versions and forms itself. For example, debt can take the form of senior debt or subordinated debt, secured or unsecured debt, bonds, credit lines, and

revolving debt, among other forms. There is some crossover among the forms of financing as well—grants can be used to de-risk a project, and some forms of debt, such as convertible bonds, can take the form of equity.

Different forms of financing can be combined in a single investment. A business may sell shares of ownership (equity) and take out loans from a bank (debt), while receiving subsidies (grants) and guarantees (de-risking) from the government.

Different financial institutions often specialise in providing different forms of financing. Some investment funds only make equity investments, while some banks only make debt investments, and some government programmes only provide grants. The following section outlines some of the sources of financing, and discusses the forms of financing provided by specific sources.

## 5 Sources of Financing

For the purpose of financing energy efficiency improvements in Thai iron and steel plants, there are four broad categories of financing sources:

- (1) Thai Commercial Banks and Energy Services Companies (ESCOs)
- (2) Government Programmes
- (3) Development Finance Institutions
- (4) International Organisations

Different sources of financing can be used together for the same project. For example, a government programme and a commercial bank may both provide financing for same business endeavour. There also may be some overlap among the categories. For example, an international organisation may also be classified as a development finance institution.

Institutions in each category may have specific preferences about the form of financing, amount, potential returns, and time horizon of the financing they provide. Individual sources of financing may have varying levels of experience and interest in energy efficiency investments.

For each of the four sources of financing identified here, the following sections describe the attributes of each source category, examples of institutions in the category, and examples of financings in which the institutions have participated.

### 5.1 Thai Commercial Banks and ESCOs

Thailand has well-developed capital markets. In addition to providing basic banking services for Thai citizens and businesses, Thai commercial banks are making investments in a range of business endeavours across Thailand. Commercial banks are private entities, and are themselves profit-seeking businesses, and accordingly they seek to make attractive returns with the investments they make. Commercial banks maintain diverse portfolios of financial activity, and many already have relationships or financing agreements with businesses in the steel industry.

Many Thai commercial banks are already familiar with the investment opportunities presented by improving energy efficiency in buildings.<sup>2</sup> The Thai commercial banks that have previous experience

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<sup>2</sup> “Financing Energy Efficiency and Renewable Energy: Thailand’s ENCON Fund”  
[https://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/Astana\\_EEForum\\_Sep2010/d1s4\\_3\\_Praser\\_t\\_e.pdf](https://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/Astana_EEForum_Sep2010/d1s4_3_Praser_t_e.pdf);  
“Publication Result of Revolving Fund for Energy Conservation  
Project”<http://dedeenergyfund.com/%E0%B8%94%E0%B8%B2%E0%B8%A7%E0%B8%99%E0%B9%8C%E0%B9%82%E0%B8%AB%E0%B8%A5%E0%B8%94/>

providing financing to businesses for energy efficiency improvements as a result of participation in the Thailand Energy Efficiency Revolving Fund<sup>3</sup> (EERF) include the following banking institutions:

- 1) CIMB Thai
- 2) EXIM Thailand
- 3) SME Bank
- 4) Kasikorn Bank
- 5) TMB
- 6) UOB
- 7) Krung Thai Bank
- 8) Bangkok Bank
- 9) Siam City Bank
- 10) Siam Commercial Bank
- 11) Krungsri
- 12) LH Bank

It is also worth noting that Thai commercial banks with no experience providing financing for the purpose of energy efficiency improvements (and thus not listed above) may still be interested and willing to finance steel plants seeking to make energy efficiency improvements.

The Thai commercial banks participating in the EERF programme provided loans for eligible energy efficiency improvements in industrial and commercial buildings. In the most recent iteration of the programme, the EERF provided loans for up to 3.5% interest for up to 7 years on the basis of the borrowers' assets (not the project cash flows) and covered 100% of the energy efficiency project costs. There was a maximum of one project per company, and 50 million THB per project.<sup>4</sup> Thai commercial banks provided financing for hundreds of energy efficiency projects through the EERF programme.

Projects financed under the EERF programme include a loan for 51.5 million THB for an upgrade to a high efficiency expander and meat dryer that saved 2,700,000 kWh/year and 8.7 million THB/year; a loan for 125 million THB for the installation of a waste heat boiler, heat exchanger, and other equipment in an industrial building that saves 31.5 million THB/year; and a loan for 9.25 million THB for an upgrade to a cooling system in a commercial building that saves 3.8 million THB/year.<sup>5</sup>

The Thai banks may offer different financing terms outside of the EERF programme, and are likely to make business loans to steel companies based on the strength of the steel companies' balance sheets and credit ratings. For a steel company to acquire a loan from a commercial bank, the bank will first examine the steel company's balance sheet, credit rating (if applicable) or credit history, the strength of the business, to determine if they are in good condition. Then the bank and the steel

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<sup>3</sup> The Energy Efficiency Revolving Fund (EERF) is the Thai government programme that helps the Thai commercial banks begin making loans to businesses for energy efficiency programmes is discussed in the subsection entitled Government Programmes. It is described in the Government Programmes section.

<sup>4</sup> Stakeholder interviews; "Investment strategy for energy efficiency projects in Thailand" <https://www.giz.de/fachexpertise/downloads/2012-en-nattapon-pep-informationsworkshop-thailand-eneff.pdf>; "DEDE Energy Fund" <http://dedeenergyfund.com/>

<sup>5</sup> "Publication Result of Revolving Fund for Energy Conservation Project" <http://dedeenergyfund.com/%E0%B8%94%E0%B8%B2%E0%B8%A7%E0%B8%99%E0%B9%8C%E0%B9%82%E0%B8%AB%E0%B8%A5%E0%B8%94/>

company will negotiate and agree on a rate and term for the loan. The loan can then be used to pay for energy efficiency upgrades, and the cost savings from the energy efficiency upgrades can be used to repay the loan.

In addition to commercial banks, Energy Services Companies, or ESCOs, are another potential source of financing within Thailand. ESCOs are businesses that specialise in developing, designing and implementing various energy improvements for commercial and industrial buildings. In addition to these services, some ESCOs offer financing for their clients as well.<sup>6</sup> The Thai ESCO Association lists 50 domestic ESCOs that have registered in Thailand,<sup>7</sup> and various international ESCOs have been active in Thailand as well. Due to the large capital requirements necessary for an ESCO to finance its clients' energy efficiency improvements, only larger (often international) ESCOs provide financing.

One example of an ESCO financing was a project to upgrade to an energy efficient centralised air compressor system in the Siam Fiberglass Company.<sup>8</sup> The project created savings of 768 MWh/year and more than 2.7 million THB per year, and has a payback period of 2.54 years. The ESCO company, Cofely Co., provided a 6.9 million THB investment to the Siam Fiber Glass company, and was paid back for this investment through an energy savings contract.

Another example of an ESCO financing is a project to upgrade to a high efficiency watercooler system in the Ubonrak Thonburi Hospital. The project created savings of 519 MWh/year and 1.8 million THB per year, and has a payback period of 3.10 years. The ESCO, Energy Conservation and Management Co., provided capital for the 5.7 million THB investment in the project, and was paid back through a guaranteed energy savings contract.

## 5.2 Government Programmes

There are various government programmes in Thailand and elsewhere that provide financial support for energy efficiency improvements in industrial buildings. Many of these programmes were designed specifically to support energy projects that reduce CO<sub>2</sub> emissions, such as energy efficient equipment upgrades. These programmes are a means by which governments achieve policy goals and desired social outcomes. Many government programmes also offer financial support either without expectation of repayment (for example, as a grant or subsidy) or for "below-market" or "concessional" rates (sometimes called "soft loans"). Sometimes government programmes are used to de-risk private financial activity.

There are three key government structures that run programmes that may be helpful for steel plant managers seeking to finance energy efficiency improvements. Each of the government structures provides more than one programme or service that could be useful for Thai steel plant managers. They are listed below.

- 1) The Thailand Ministry of Energy's Department of Alternative Energy Development and Efficiency (DEDE) currently has three operational programmes:
  - a. Energy Efficiency Revolving Fund (EERF)
  - b. Demand Side Management (DSM) Bidding System
  - c. Energy efficiency subsidy programme
- 2) The Japan Bank for International Cooperation (JBIC) has two relevant programmes:

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<sup>6</sup> ESCOs may offer unique forms of financing not previously discussed in this report, such as energy savings performance contracts or energy savings agreements. These are "off-balance sheet" financing structures allow building owners to repay the financing for the energy improvements out of the energy savings generated by the improvements.

<sup>7</sup> "Thai ESCO Registration List" [http://www.thaiesco.org/2016/english/info\\_member.aspx](http://www.thaiesco.org/2016/english/info_member.aspx)

<sup>8</sup> "ESCO Annual Report 2015" [http://www.thaiesco.org/2016/file/download/39/Annual\\_2015.pdf](http://www.thaiesco.org/2016/file/download/39/Annual_2015.pdf)

- a. Global action for Reconciling Economic growth and Environmental preservation (GREEN) Programme
  - b. Enhanced Facility for Global Cooperation in Low Carbon Infrastructure and Equity Investment (E-FACE)
- 3) Japan's Joint Crediting Mechanism (JCM), along with its implementing partners METI, NEDO, MOEJ, and the ADB Fund, has two means of support:
- a. Financial support for demonstration projects that achieve emissions reductions
  - b. Financial and technical support for project studies and measurement and verification

Each government programme is structured differently, and may require different documents, data, partnerships and activities from steel companies seeking their financial support. The government programmes discussed here exist to achieve various policy goals, so in addition to providing concessional financing for energy efficiency projects, they will require documentation proving that energy savings and emissions reductions were achieved as a result of the financed project.

The Thailand Ministry of Energy's Department of Alternative Energy Development and Efficiency (DEDE) ran several successful iterations of the Energy Efficiency Revolving Fund (EERF) that provided lines of credit to Thai commercial banks to on-lend to businesses for energy efficiency upgrades. Currently, the EERF is in its 7<sup>th</sup> phase and has a budget of 3 billion THB.<sup>9</sup> Approximately 300 loans financing energy efficiency projects have been made through this programme.<sup>10</sup>

DEDE also runs the Demand Side Management (DSM) Bidding System. The DSM Bidding Mechanism provides financial support in the form of a subsidy to encourage industrial and commercial businesses to invest in energy efficient equipment. The subsidy amount is determined based on actual units of energy savings achieved. The businesses seeking the DSM subsidy must enter a "bid" for a subsidy amount per unit of energy saved. For example a business could enter bids for 1 THB per kWh saved and 70 THB per MMBtu saved, and receive a payment up to 10 million THB based on the savings they are able to achieve. Lower bids are filled before higher bids, and the programme currently has a budget of 250 million baht.<sup>11</sup> Companies can enter bids in this programme for a maximum of 5 projects per year. The purpose of the bidding system is to achieve higher energy savings to subsidy ratio.

DEDE also runs another subsidy programme for industrial businesses investing in machinery or equipment that saves energy. DEDE provides funds for 20% of the upfront costs for efficiency upgrades with payback periods less than 7 years, up to a maximum of 1.5 million THB per company.<sup>12</sup> It is important to note that the subsidy from this programme and the subsidy payments from the DSM Bidding System can be combined with other forms of financing.

The Japan Bank for International Cooperation (JBIC) runs two investment programmes that facilitate more private investment activity in energy efficiency projects, and operates similar to development finance institutions. One programme is the Global action for Reconciling Economic growth and Environmental preservation (GREEN) Programme.<sup>13</sup> The purpose of the GREEN programme is to promote overseas business and private investment that helps preserves environment, including business activities that reduce the emissions that cause global warming. The basic structure of the GREEN programme involves JBIC providing guarantees to and co-investing with private investors

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<sup>9</sup> Stakeholder interviews.

<sup>10</sup> "Investment strategy for energy efficiency projects in Thailand"

<https://www.giz.de/fachexpertise/downloads/2012-en-nattapon-pep-informationsworkshop-thailand-eneff.pdf>;  
"Financing Energy Efficiency and Renewable Energy: Thailand's ENCON Fund"

[https://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/Astana\\_EEForum\\_Sep2010/d1s4\\_3\\_Prasert\\_e.pdf](https://www.unece.org/fileadmin/DAM/energy/se/pp/eneff/Astana_EEForum_Sep2010/d1s4_3_Prasert_e.pdf)

<sup>11</sup> Stakeholder interviews.

<sup>12</sup> Stakeholder interviews.

<sup>13</sup> "JBIC Activities for Global Environment 2013" <https://www.oecd.org/greengrowth/Sato-GGSD-13.pdf>

(equity and debt financing) in eligible entities for eligible projects. Eligible projects must reduce greenhouse gas emissions and follow the JBIC methodology for measurement, reporting and verification (MRV). Eligible projects include a wide array of energy efficiency, renewable energy, and waste capture technologies. To receive financing, a project must be affiliated with an eligible entity, such a foreign government body (such as DEDE), a foreign financial institution (such as a Thai commercial bank) or utility company operating closely with the government.

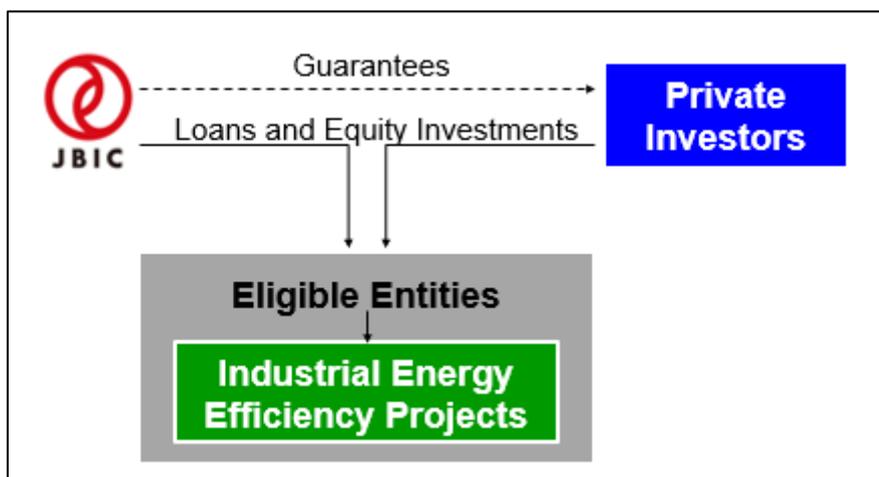


Figure 4: Basic Diagram of JBIC GREEN Programme

JBIC’s GREEN Programme has already financed energy efficiency projects in foreign countries. For example, JBIC provided a loan through the ICICI Bank for financing renewable energy and energy efficiency projects in India.

JBIC also runs the Enhanced Facility for Global Cooperation in Low Carbon Infrastructure and Equity Investment (E-FACE). In addition to financing other types of low-carbon projects, the E-FACE programme provides financing energy efficiency projects in Asia.<sup>14</sup> The purpose of the E-FACE programme is to promote private business and investment activity in low-carbon infrastructure in foreign countries. The basic structure of the E-FACE programme involves JBIC makes equity investments in energy efficiency projects in Asia and provides guarantees to private investors which co-invest with JBIC by making equity and debt investments in those projects.

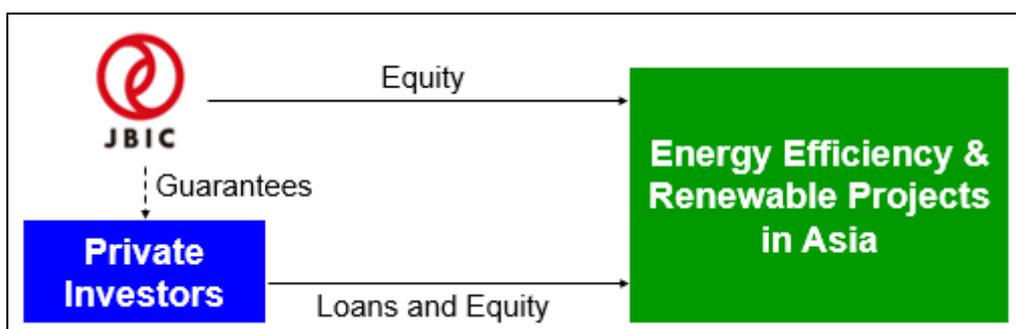


Figure 5: Basic Diagram of JBIC E-FACE Programme

Japan’s Joint Crediting Mechanism (JCM) is a project-based bilateral offset crediting mechanism aims to facilitate the diffusion of leading low-carbon technologies that also contributing to the sustainable development of developing countries and contribute to the objectives of the United Nations Framework Convention on Climate Change (UNFCCC). The JCM allows both Japan and the project’s host country to credit the resulting greenhouse gas emission reductions to both countries.<sup>15</sup>

<sup>14</sup> “Appendix : JBIC Enhanced Facility for Global Cooperation in Low Carbon Infrastructure and Equity Investment (E-FACE)” [https://www.jbic.go.jp/wp-content/uploads/press\\_en/2011/04/7312/Appendix.pdf](https://www.jbic.go.jp/wp-content/uploads/press_en/2011/04/7312/Appendix.pdf)

<sup>15</sup> “Joint Crediting Mechanism: An Emerging Bilateral Crediting Mechanism 2016” <https://www.adb.org/sites/default/files/institutional-document/217631/joint-crediting-mechanism.pdf>

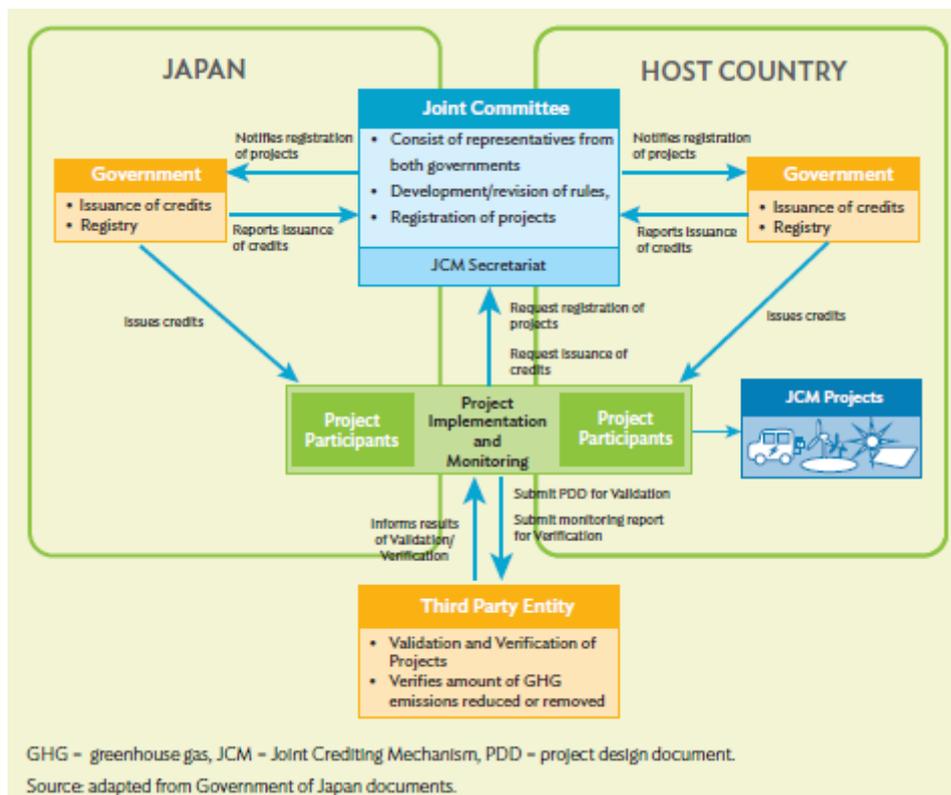


Figure 6: JCM Stakeholders and Roles

Through the JCM, Japan's implementing partners METI, NEDO, MOEJ, and the ADB Fund provide financial support for demonstration projects that achieve emissions reductions, technical support, project studies, and measurement and verification for projects in the host countries.

MOE provides technology, financing and partnership solutions for projects that may include facilities, equipment, vehicles, or other upgrades that reduce CO<sub>2</sub>. It will finance less than half of a project's cost, and has a budget of 6 billion JPY (\$60 million) for 2017-19. The ADB Trust Fund's goal is to acquire JCM credits by developing projects and providing financial incentives for the adoption of advanced emissions-reducing technologies that currently face high costs of deployment. The fund had a draft budget in FY 2017 for 1 billion JPY (\$10 million). METI, along with NEDO, promotes JCM projects through providing funds to cover the costs necessary for MRV. METI also performs feasibility studies. METI had a budget of 2.4 billion JPY (\$24 million) in 2016 for these activities.<sup>16</sup>

Typically, support from the JCM either comes through the MOEJ and the ADB in the form of collaborative financing, or through METI and NEDO in the form of pre-development project support and demonstration projects. However a single project cannot get support from both the MOEJ and METI at the same time.<sup>17</sup>

With MOEJ and ADB collaborative financing, MOEJ contributes to a JCM fund which is managed by the ADB.<sup>18</sup> The fund provides grants and interest rate buy downs (meaning they pay part of the interest expense for a loan on behalf of the borrower) for the ADB, which makes loans or grants to the project, and co-invests with other financial institutions and funds. The project must include eligible technologies that reduce emissions, and the project must adhere to the JCM methodology for

<sup>16</sup> "Recent Development of The Joint Crediting Mechanism 2017" [http://www.meti.go.jp/policy/energy\\_environment/global\\_warming/1701\\_JCM\\_EN.pdf](http://www.meti.go.jp/policy/energy_environment/global_warming/1701_JCM_EN.pdf)

<sup>17</sup> "Recent Development of The Joint Crediting Mechanism 2017" [http://www.meti.go.jp/policy/energy\\_environment/global\\_warming/1701\\_JCM\\_EN.pdf](http://www.meti.go.jp/policy/energy_environment/global_warming/1701_JCM_EN.pdf)

<sup>18</sup> "Japan Fund for the Joint Crediting Mechanism 2017" <https://www.adb.org/site/funds/funds/japan-fund-for-joint-crediting-mechanism>

measurement, reporting and verification (MRV). Credits for the emissions reductions that result from the project are applied to both Japan and the project's host country.

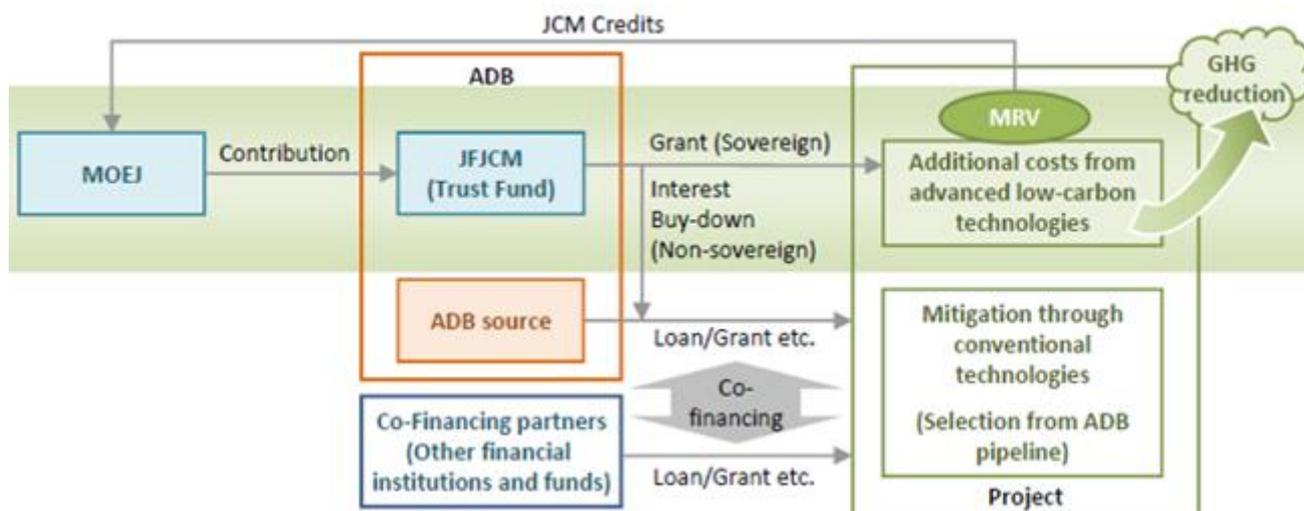


Figure 7: Diagram of MOEJ and ADB Collaborative JCM Financing

MOEJ has financed many projects in Thailand through the JCM using similar structures. JCM projects have included energy efficient equipment, such as high-efficiency air conditioners, chillers, and refrigerators, high-efficiency looms, boiler systems, waste heat recovery systems, and solar photovoltaic panels at commercial and industrial properties such as textile factories, semiconductor factories, cement plants, rubber belt plants, and convenience stores. Outside of Thailand across the rest of Southeast Asia many other similar energy efficiency projects have been financed in industrial and commercial buildings.<sup>19</sup>

METI and NEDO provide pre-development project support in the form of feasibility studies, MRV studies, and supporting demonstration projects. JCM projects supported by METI in this way include operational optimisation, high-efficiency heating and cooling equipment, and high-efficiency industrial equipment at industrial and commercial buildings in JCM partner countries throughout Southeast Asia.

### 5.3 Development Finance Institutions

Development Finance Institutions (DFIs)<sup>20</sup> are specialised development banks or subsidiaries set up to support private sector activity and development in developing countries, and are backed by states with developed economies. In other words DFIs were designed to provide capital and technical assistance for productive investment in countries like Thailand throughout Asia and the rest of the world, and have been doing so for decades. Globally, a large portion of DFI investment is made in the energy sector, and in projects that reduce emissions or are otherwise considered “sustainable development” projects. DFIs may require participation of in-country financial institutions as a condition of financing. DFIs that are capable of providing financing for energy projects in Thailand include the following institutions:

- 1) Asian Development Bank (ADB)
- 2) Conservation International Foundation (CI)
- 3) Crédit Agricole Corporate and Investment Bank (CIB)
- 4) Deutsche Bank AktienGesellschaft (AG)

<sup>19</sup> “Recent Development of The Joint Crediting Mechanism 2017”

[http://www.meti.go.jp/policy/energy\\_environment/global\\_warming/1701\\_JCM\\_EN.pdf](http://www.meti.go.jp/policy/energy_environment/global_warming/1701_JCM_EN.pdf)

<sup>20</sup> “Development finance institution” is a broad term that includes multilateral development banks and bilateral development banks.

- 5) European Bank for Reconstruction and Development (EBRD)
- 6) European Investment Bank (EIB)
- 7) HSBC Holdings
- 8) Inter-American Development Bank (IDB)
- 9) International Union for Conservation of Nature
- 10) Deutsche Investitions-und Entwicklungsgesellschaft (DEG) (subsidiary of Kreditanstalt für Wiederaufbau (KfW))

There are many DFIs beyond those listed here that may provide financing for energy projects in Thailand. The DFIs listed here are all certified as Accredited Entities for the Green Climate Fund, which is discussed in the International Organisations section.

Different DFIs have different application processes for financial assistance. However virtually all DFIs will require a detailed description of the energy efficiency improvements that are desired, in the form of a project proposal. The proposal will likely have to include information on the following:

- Technologies to be installed in the project
- The beneficial economic, social, and environmental impacts of the project (including the estimated energy savings and emissions reductions)
- Other forms of support that has been offered by government bodies and other financial institutions
- Feasibility study on the potential project (perhaps prepared by a third party)
- The owners of the projects and the ownership structures
- The business conditions of the steel company and the market conditions of the steel industry
- The plan for the project implementation and operation, including cost estimates and an analysis of all the risks of the project, and information on any relevant permits and licenses
- The proposed financing plan and financial model

Due to the large scale of many DFIs and the scale of investment necessary for the energy efficiency improvements in the Thai steel industry, it may be useful to propose financing structures that facilitate many projects across the Thai iron and steel industry. Financing structures like this are common. Creating a fund or a line of credit with the purpose of financing numerous energy efficient equipment upgrades in the Thai steel industry (or perhaps the Thai industrial sector in general) would provide a level of scale and impact that would be more attractive to DFIs.

One example of a DFI financing of an energy project in Thailand was the Asian Development Bank's participation in the financing of a 55 MW solar photovoltaic plant. The project was led by the Natural Energy Development company, a \$250 million joint venture between CLP Thailand Renewables, Diamond Generating Asia, and the Electricity Generating Public Company. The Asian Development Bank provided a loan of \$72 million and facilitated the registration and certification of the project and its emissions-reductions under the Clean Development Mechanism. ADB's assistance and

participation in the project attracted the participation of several Thai commercial banks, including Bangkok Bank, Kasikornbank, and Siam Commercial Bank.<sup>21</sup>

As another example, ADB made a \$30 million dollar equity investment in Asia Environmental Partners II, a regional fund with a total of \$300 million managed by Olympus Capital Asia focused. KfW-DEG, another DFI, also invested €20 million in the fund. AEP II focuses on investment opportunities in energy efficiency, renewable energy, waste management and recycling services, water management, among other related areas in Southeast Asia, China, and India.<sup>22</sup>

## 5.4 International Organisations

For the purposes of this report, “International Organisations” refers to any intergovernmental organisations and related or subsidiary institutions that include financial support in the scope of their activities. There are a group of international organisations provide financing specifically for sustainable development and emissions-reducing projects, and many have already contributed financing for energy-related projects Thailand and Asia.<sup>23</sup> Such international organisations include:

- 1) The World Bank
- 2) International Finance Corporation (IFC)
- 3) United Nations Development Programme (UNDP)
- 4) United Nations Environment Programme (UNEP)
- 5) United Nations Economic and Social Commission for Asia and the Pacific (ESCAP)
- 6) The Green Climate Fund (GCF)

Though international organisations may have a wider scope of activities than DFIs, international organisations operate similarly to DFIs when it comes to providing financial support for energy efficiency. International organisations may require the participation of in-country financial institutions or other partners as a condition of providing financing for a given project. International organisations vary widely in their objectives and the forms of support they may offer, and may require different documents, data, partnerships and activities from applicants seeking their financial support for energy efficiency projects. Like national government programmes, international organisations want to achieve specific outcomes, so in addition to requiring all the financial and legal documentation that would typically be required from a financial institution, they will require documentation proving that energy savings and emissions reductions were achieved as a result of the financed project.

There are numerous instances of international organisations supporting energy efficiency. The UNDP, for example, has provided funds for energy efficiency projects and programmes throughout the world. In Vietnam, the UNDP and its partners contributed funds and services worth about \$24.7 million to improve the energy performance of commercial buildings and high-rise residential buildings in cities by partnering with the Ministry of Construction to facilitate higher levels of efficiency technology uptake and strengthen the relevant building codes.<sup>24</sup>

As another example, the World Bank recently approved \$200 million in financial support for the Energy Efficiency Facility for Industrial Enterprises Project in Uzbekistan. The purpose of the project is to scale up the energy efficiency lending to industrial businesses in the country by designing and

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<sup>21</sup> “Sun, Partnerships Power Thailand Solar Project 2016” <https://www.adb.org/results/sun-partnerships-power-thailand-solar-project>

<sup>22</sup> “Sun, Partnerships Power Thailand Solar Project 2015” <https://www.adb.org/results/equity-investment-asia-environmental-partners-ii>; “Asia Environmental Partners II., L.P. 2015” [https://www.deginvest.de/DEG-Documents-in-English/About-us/Responsibility/Investment-related-information/201512\\_AEPII\\_EN.pdf](https://www.deginvest.de/DEG-Documents-in-English/About-us/Responsibility/Investment-related-information/201512_AEPII_EN.pdf)

<sup>23</sup> It is worth noting that many international organisations are connected to each other either formally or informally. The IFC, for example, is a sister organisation of the World Bank, and both are members of the World Bank Group. The World Bank, in turn, is an independent specialised agency of the UN system.

<sup>24</sup> “Energy Efficiency in Commercial Building 2016” <http://open.undp.org/#project/00084022>

establishing a financing mechanism for energy saving investments. The financial support will be used to provide a credit line and technical assistance to participating commercial banks to further strengthen and expand the dedicated efficiency financing business lending in the Uzbek banking sector.<sup>25</sup>

As a global fund set up under the United Nations Framework Convention on Climate Change (UNFCCC), the GCF has more than \$10 billion in resources to allocate as grants, loans, equity or guarantees to projects that address climate change, including building energy efficiency projects in the industrial sector.<sup>26</sup> The GCF works with public and private implementing partners and co-investors, and requires that all financing proposals be submitted by “accredited entities.” One example of a GCF-funded project is a Building Efficiency Loan Programme in Armenia, run by a local municipal government. The UNDP served as the accredited entity and the project was awarded a \$20 million grant from the GCF.<sup>27</sup> Another GCF-funded project was the “Business Loan Programmeme for GHG Emissions Reduction,” an energy efficiency and renewable energy loan programme for businesses run by XacBank, a commercial bank in Mongolia. XacBank, which is an accredited entity, proposed and received a loan for \$20 million from the GCF to be blended with capital from other financing partners (including the Global Climate Partnership Fund, European Bank for Reconstruction and Development, and DWM Securitizations) to scale up XacBank’s energy lending to small businesses in Mongolia.<sup>28</sup>

## 6 Potential Financing Structures

As mentioned earlier, combining different sources and forms of financing is an important and common means of securing all the necessary funds for energy efficiency improvements. A government grant programme may pay a business for 20% of the upfront costs of an energy improvement, but a bank may provide financing for the remaining 80%. Alternatively, two different banks may provide two different investments into a fund or a third bank, which would on-lend that money to businesses for energy efficiency improvements. Many of the sources and forms of financing mentioned above either require the participation of another financial institution as a condition of financing or work best when they are combined with another form of financing.

Below are three examples of a hypothetical financing structures that could provide financing to Thai steel plants seeking to finance energy efficient equipment upgrades.

### 6.1 Example 1

Currently in Thailand there are two attractive programmes that provide financial support that can be combined for the benefit of steel companies: the Energy Efficiency Subsidy Programme and the Energy Efficiency Revolving Fund (EERF). Steel companies can use the subsidy programme to pay for 20% of the upfront costs of an energy efficiency improvement, and use a loan from a Thai commercial bank participating in the EERF programme to finance the remaining 80% of the project costs.

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<sup>25</sup> “Energy Efficiency Facility for Industrial Enterprises, Phase 3 2018”

<http://projects.worldbank.org/P165054?lang=en>

<sup>26</sup> “GCF – About the Fund 2018” <https://www.greenclimate.fund/who-we-are/about-the-fund/>; “GCF – Funding Projects 2018” <https://www.greenclimate.fund/how-we-work/funding-projects>

<sup>27</sup> “De-risking and scaling-up investment in energy efficient building retrofits in Armenia 2016” <https://www.greenclimate.fund/-/de-risking-and-scaling-up-investment-in-energy-efficient-building-retrofits-in-armenia>

<sup>28</sup> “Business loan programmeme for GHG emissions reduction 2016” <https://www.greenclimate.fund/-/business-loan-programmeme-for-ghg-emissions-reduction>

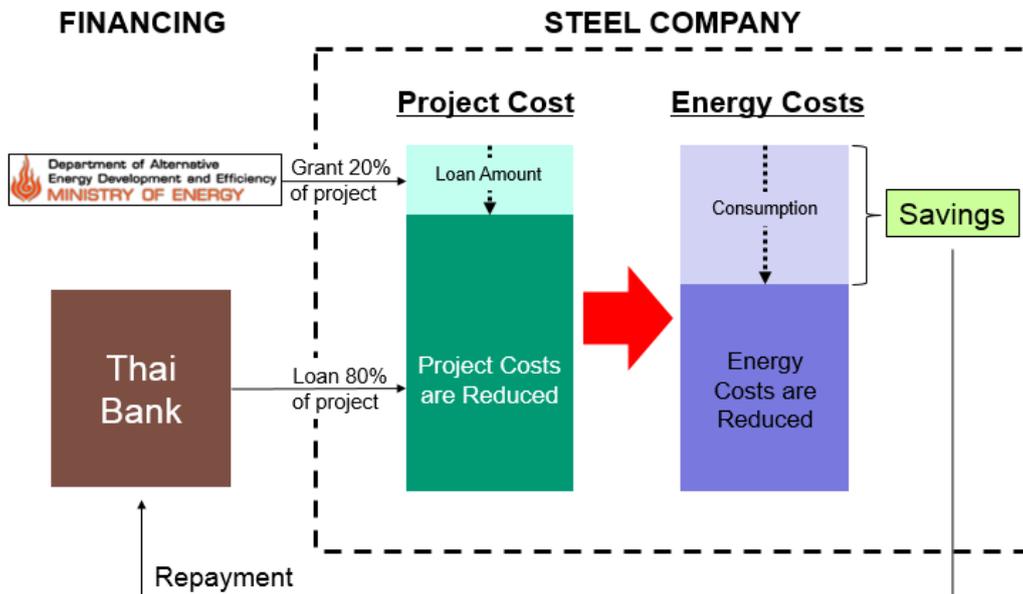


Figure 8: Financing Project with Subsidy & Loan

Alternatively, steel companies could bid into the DSM Bidding System with a proposed subsidy per unit of energy saved amount, and then use a loan from a Thai commercial bank participating in the EERF programme to finance 100% of the upfront project costs, and then once the project starts generating savings, receive the subsidy payment.

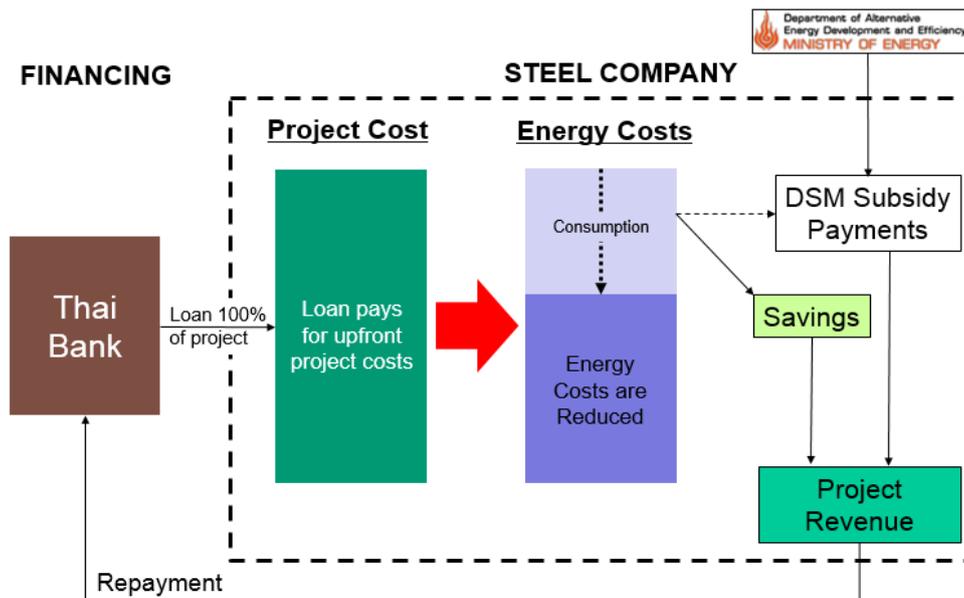


Figure 9: Financing Project with Loan & DSM Subsidy

## 6.2 Example 2

To access international sources of financing, a more ambitious proposal must be developed to achieve the desired scale and impact of international financial institutions. One attractive international source of financing for GHG-reducing projects (including energy efficiency projects) is the Green Climate Fund (GCF).

To access GCF financing, a project must be proposed by an appropriate Accredited Entity (AE), and supported by a country's Nationally Designated Authority (NDA) or Focal Point. Thailand's Focal Point is ONEP, and while there are no in-country AEs in Thailand, there are many international AEs that have previously financed projects in Thailand, such as the Asian Development Bank. By partnering with an international AE and devoting their own resources to a given project, government bodies and/or financial institutions in Thailand can apply for GCF financing.

One hypothetical financing structure to propose to the GCF could involve using funds from the GCF and Thailand's ENCON Fund to capitalise a \$60 million fund that would co-finance and de-risk energy efficiency investments in the industrial sector with Thai commercial banks. Such a proposal would require the partnership of an international AE, such as the Asian Development Bank, which could provide either financial support, technical assistance, or both.

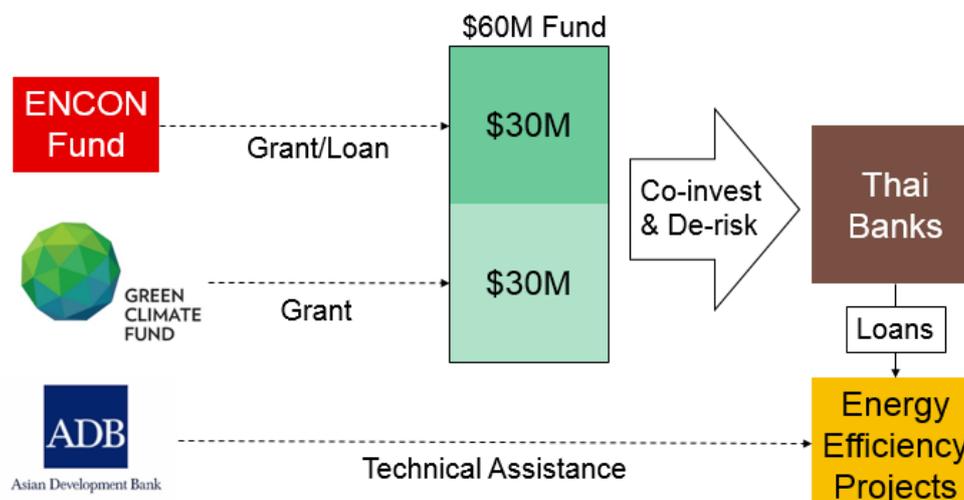


Figure 10: Proposal for GCF Financing

To achieve a level of scale that would be attractive to the GCF and the ADB, it may be necessary to create a fund that would invest in and de-risk energy efficiency improvements across the entire industrial sector of Thailand, rather than just the steel industry. If such a fund were established with grants, and developed a sufficient portfolio of loans that generated interest income, the fund could be operated as a “revolving fund” which would use the income from its portfolio to fund additional investments in energy efficiency improvements in the industrial sector.

## 7 Data Collection and Financing

Energy consumption data, as well as plant output and energy intensity data is an important component of many financing arrangements. Any steel plant manager in Thailand that may be interested in seeking financing for energy improvements in the future should prepare immediately by beginning to collect and record data on energy consumption. There are numerous applications of energy data related to financing:

- 1) Understanding baseline energy consumption
- 2) Calculating baseline greenhouse gas emissions
- 3) Identifying energy- and cost-saving opportunities
- 4) Calculating savings from energy improvements after they are implemented
- 5) Calculating emissions reductions from energy improvements after they are implemented

Primarily, energy data at the plant-level, and ideally at the process-level as well, is necessary to establish a “baseline” or “reference level” of energy consumption against which future energy improvements and the resulting energy savings can be measured. Similarly, energy data is necessary to calculate a baseline of greenhouse gas emissions against which the emissions reductions resulting from future energy improvements can be measured. Many government programmes and other mission-oriented financial institutions will not provide financing for projects if they cannot measure the energy savings and/or emissions reductions that result from the project. For this reason, collecting energy data can be an important requirement for securing some types of financing.

Energy data is also important for understanding where in the energy costs are located within the steel plant operations, and is necessary to perform an analysis on energy cost centers to identify potential energy efficiency improvements to reduce those costs. Identifying costs and trying to lower costs is a fundamental practice of operating a competitive profit-maximising business enterprise. Energy costs make up about 20% to 40% of the total manufacturing cost of steel.<sup>29</sup> Using energy consumption data to find ways to reduce energy costs is an important means of improving business performance and competing against other steel companies. The better a business performs, the easier it is for it to acquire financing.

Energy consumption data is also important for calculating energy and cost savings that result from an energy improvement. Energy consumption data from before and after the implementation of the improvement is necessary to understand and calculate the energy cost savings that result from the improvement. The same is true for calculating the emissions reductions that result from the energy improvement: energy consumption data from before and after the improvement is needed to determine the reduction in greenhouse gas emissions. Many sources of financing for energy improvements will require as a condition of the financing that plant managers collect and report data that demonstrates energy savings and emissions reductions resulting from the improvement.

Apart from being a fundamentally good business practice, collecting and recording energy data is an important way to increase the opportunities acquiring financing. It is highly recommended that steel plant managers collect and record the following data on a monthly basis using the monthly data input tabs on the Benchmarking Tool.

- (1) Units of energy consumed for each energy type
- (2) Cost of energy for each energy type
- (3) Quantity of output (crude steel for crude steel producers, final products for non-crude steel producers)

Recording this data on a monthly basis both at the plant-level and process-level allows steel plants to identify areas of improvement and take actions, and prepares the steel plants for any types of future reporting or due diligence requirements required by some financial institutions and government programmes. All the energy data collected is of course proprietary and confidential, and can be shared with partners, counter-parties, government bodies and other stakeholders as desired by the plant managers.

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<sup>29</sup> "Worldsteel Association Fact Sheet: Energy use in the steel industry 2016"  
[https://www.worldsteel.org/en/dam/jcr:f07b864c-908e-4229-9f92-669f1c3abf4c/fact\\_energy\\_2016.pdf](https://www.worldsteel.org/en/dam/jcr:f07b864c-908e-4229-9f92-669f1c3abf4c/fact_energy_2016.pdf)