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## Study Report

### On Financial Capacity Building Package for Industrial Energy Efficiency in Thailand : **Harmonizing the Evaluation Criteria**

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# **Study Report**

## **on**

### **Financial Capacity Building Package**

### **for Industrial Energy Efficiency in Thailand :**

### **Harmonizing the Evaluation Criteria**

The United Nations Industrial Development Organization (UNIDO) in partnership with the Department of Alternative Energy Development and Efficiency of the Ministry of Energy, the Department of Industrial Promotion and Thai Industrial Standard Institute under the Ministry of Industry, have jointly implemented the Industrial Energy Efficiency (IEE) Project with the financial support from the Global Environment Facility (GEF). The objective of the project is to promote and boost energy efficiency, cost-effective, competitiveness, performance and reliability among industries.

The main components of the project are to prepare “Project Financial Evaluation Criteria” regarded as a guideline for the Industrial Energy Efficiency Project in Thailand and to develop related training courses for financial institutions and industries. BRIGHT Management Consulting Co., Ltd. (BMC) has been appointed to study on the project.

The Project Financial Evaluation Criteria has been studied through interviewing process. The target groups are financial institutions meeting the loan approval criteria of the proposed projects. A total of 13 commercial banks and specialized financial institutions have so far been actively participating into the interviewing process.

The result and recommendations of the study can be summarized as follows:

**Part 1**  
**The Study on the Existing Criteria of Financial Evaluation for Industrial Energy  
Efficiency Project**

## 1.1 The Financial Products for Energy Efficiency Projects in Thailand and Methods of Submission

At present, industrial owners utilize several funding sources in a bid to develop Energy Efficiency Projects (IEE Projects) such as self-funding, partial government funding and bank loan. Of these financial sources, self-funding and bank loan are mostly used. The Financial Products for Energy Efficiency Projects in Thailand and Methods of Submission has been reviewed through secondary data available in the market and interviews with bank officers. A total of 13 related commercial banks and specialized financial institutions have actively participated in the interviewing process. Table 1.1 below shows sources of information from the bank officers.

**Table 1-1: Source of Information from bank officers**

Financial Institutions	Source of Information (Banks' Officer)				
	Relationship Officer	Credit Analyst	Credit Evaluation Officer	Product Development Officer	Public Relation Officer
Siam Commercial Bank (SCB)	✓				
Government Saving Bank (GSB)	✓				
Kasikorn Bank (KBank)	✓			✓	
Bank of Ayudhya (BAY)	✓	✓			
Small and Medium Enterprise Development Bank of Thailand (SMEs)	✓	✓	✓		
Export-Import Bank of Thailand (EXIM)	✓			✓	
United Overseas Bank (Thai) (UOB)	✓				
Thanachat Bank (TBank)			✓		
Thai Military Bank (TMB)				✓	✓
Thai Investment and Securities Company Limited (TISCO)	✓				
Islamic Bank of Thailand (IBank)	✓				
CIMB Thai (CIMB)	✓				
Krung Thai Bank (KTB)	✓				



### 1.1.1 The Financial Products for Energy Efficiency Projects in Thailand

The results from the secondary data and a series of interviews indicate that there are only a few financial institutions that provide the credit specifically for the IEE projects or project related to GREEN development initiatives. The Financial Products for Energy Efficiency Projects or related projects can be summarized as follows;

#### 1. Kasikorn Bank

Kasikorn Bank (K-Bank) is the commercial bank that has recently introduced new financial products for crediting energy efficiency projects for both industrial and commercial sectors. The initiated energy efficiency credit programs, among others, are K-Energy Saving Guarantee Program and K-Top Up Credit for Energy Saving: Lighting Solution. Details of these programs are as follows:

**Table 1-2: K-Energy Saving Guarantee Program**

Name of Product	สินเชื่อรับประกันการประหยัดพลังงานกสิกรไทย (K-Energy Saving Guarantee Program)
Objectives	To assist the owners save energy in their industries and, hence, reduce energy cost and production cost accordingly. This will be one of the approaches that can enhance long-term market competitiveness to the industries. Energy Efficiency Projects can also be integrated into one of the Corporate Social Responsibility (CSR) activities of the companies.
Key Features	The project will get energy-saving performance guaranteed by Energy Service Company (ESCO) to ensure credit repayment ability without affecting customers' business cash flow.
Started Year	2013
Target Group	Medium size entrepreneur with more than 50 million THB of the annual sale turnover
Credit Type	Commercial Credit and K-Equipment Leasing
Credit Limit	100 percent of project investment (inclusive of ESCO service and consultation fees). No credit limitation.
Repayment	Subject to the Bank's rules and regulations
Interest Rate	Subject to the Bank's rules and regulations
Fee	Subject to the Bank's rules and regulations
Collateral	Subject to the Bank's rules and regulations
Current status	Existing
Conditions	The summary of the energy savings appraisal prepared by qualified ESCO. An ESCO must pass the bank's selection criteria
Credit Target	5,000 million THB
Credit Criteria	Business Credit Criteria
ESCO	ESCO must be qualified according to the K-Bank criteria. There are, at present, 10 out of 50 ESCOs that are qualified.

**Table 1-3: K-Top Up Credit for Energy Saving : Lighting Solution**

Name of Product	โปรแกรมสินเชื่อประหยัดไฟกสิกรไทย (K-Top Up Credit for Energy Saving : Lighting Solution)
Objective	To assist customers save energy through long term credit. This is also able to be integrated into one of the Corporate Social Responsibility (CSR) activities.
Advantage	The credit can be approved easily and quickly within 2 business days
Started Year	2013
Target Group	The project with the energy use of 12 hours/day or more
Credit Type	Commercial Credit
Credit Conditions	The credit will be considered by giving the maximum of 100 percent of project investment (inclusive of related service fees and consultation fees but not more than 3 million THB)
Payback Term	3 years
Interest Rate	Subject to the Bank's rules and regulations
Fee	Subject to the Bank's rules and regulations
Collateral Credit	No additional collateral for existing customers
Current Status	Existing
Conditions	The project needs to be provided with a product warrantee from a supplier and/or a performance guarantee from the qualified ESCO
Target Credit Line	500 million THB
Credit Criteria	Report of Saving Estimated by ESCO or supplier
ESCO & Supplier	An ESCO or a supplier must pass the selection criteria established by the Bank.

## 2. Bangkok Bank

Bualuang Green is the energy financial product introduced by Bangkok Bank. Details of this credit can be summarized below:

**Table 1-4: "Bualuang Green"**

Name of Product	สินเชื่อบัวหลวงกรีน (Bualuang Green)
Objective	To improve energy efficiency and/or environmental-friendly products in the business lines.
Key Features	Based mainly on large credit line, special low interest rate which may be as low as MLR or lower and waived management fee.
Started Year	2008
Target Group	All type of the projects
Credit Type	The product is designed for the long -term credit
Credit Line	More than 1 million THB
Payback Term	Depend on the feasibility study of the project
Interest Rate	Special interest rate at MLR or lower

Bank Fee	0.25% of the approved credit line. Other fees are subject to the bank regulations
Collateral	Subject to the Bank's rules and regulations
Current Status	Existing
Conditions	Subject to the Bank's conditions
Credit Line	1 million THB
Credit Criteria	Subject to the Bank's rules and regulations

### 3. Krung Thai Bank

KTB Green Credit is the energy-saving-oriented financial product of Krung Thai Bank. The details of this credit can be summarized in the following table:

**Table 1-5: "KTB Green Credit"**

Name of Product	สินเชื่อกรุงเทพประหยัดพลังงาน (KTB Green Credit)
Objective	KTB Green Credit is designed for the investment and/or projects using renewable and clean energy for their own consumption and/or sale to grid. The credit includes consideration of energy efficiency projects that require pollution elimination, expenses for improving or renovating their businesses, site establishment as well as machinery and equipment replacement.
Advantage	The repayment period is more flexible
Started Year	2010
Target Group	Medium size entrepreneurs with potential of sale more than 100 million THB per annum
Credit Type	Term credit (T/L) and working capital (W/C)
Credit Line	20 million THB onward per application
Credit Period	Term credit (T/L) with the period of not exceeding 10 years Grace period is deemed necessary based on borrower's cash flow estimation
Interest rate	MLR up to MLR + 0.5 depending on the sale volume
Bank Fee	Front End Fee from 0.75% - 1.5% depending on the sale volume
Collateral	Under the Bank's procedures & regulations
Current Status	Existing
Conditions	Having acceptable financial record
Target Credit Line	15,000 million THB
Credit Criteria	Subject to the Bank's rules and regulations

### 4. CIMB Thai Bank

Clean Energy Loan is the product of CIMB Thai Bank. Details of the product are summarized as follows:

**Table 1-6: Clean Energy Loan**

Name of Product	สินเชื่อพลังงานสะอาด (Clean Energy Loan)
Objective	To improve energy efficiency in both industrial and commercial sectors by means of the energy lost protection, utilization of waste heat and renewable energy, improving electricity systems by using power factor, peak demand reduction, load adjustment, high efficiency equipment as well as control instrument and energy saving materials
Key Features	Qualified expenses relating to the projects covering equipment and installation expense, project consulting fee or ESCO fee, infrastructure such as foundation, natural gas piping, and transportation, removal, import tax, VAT
Started Year	2014
Target group	Industrial and commercial buildings
Credit Type	Long Term Loan (LTL)
Credit Line	It is designed for the project with minimum investment of 50 million THB covering such expenses as equipment, installation, consultation cost of design, fabrication control and saving guarantee (ESCO) as well as transportation, demolished cost, import tax and VAT.
Credit Term	7 years
Interest Rate	Subject to the Bank's rules and regulations
Bank Fee	Subject to the Bank's rules and regulations
Collateral	Subject to the Bank's rules and regulations
Current Status	Existing
Conditions	Saving estimated by ESCO or technical provider
Target Credit Line	N.A.
Credit Criteria	Subject to the Bank's rules and regulations

These financial products have different characteristics and criteria based on bank's policy and initiatives. However, considerations from these energy financial products are mentioned as follows:

- 1) The Energy Efficiency Product is aimed at supporting different sectors of industrial energy efficiency projects. The bank has so far given funding to both commercial and industrial sectors.
- 2) There is no other bank giving such product to industries and other sectors trying to renovate their existing buildings to be more energy efficient.
- 3) Most of the banks, offering an energy credit, always give more importance to their customers' operational record in terms of an annual turnover or the amount of credit requested than the types of industries.
- 4) The Credit Underwriting Criteria, a wide range of key features of the products depending on policies of individual banking companies for example the credit line, credit term, interest rate, bank fee and collateral.

- 5) With regard to business credit underwriting set by the banks. Currently, there is no single standard criteria specially designed for the energy efficiency projects. However banks have used ESCO as one of the criteria for considering credit approval under the IEE project. Kasikorn Bank is a good example
- 6) All banks express their readiness to support the industries showing interest in investment in energy efficiency projects. Some of specialized financial institutions owned by the government, such as Small and Medium Enterprise Development Bank of Thailand (SME Bank), under the Ministry of Industry, provides credit for product improvement.

### 1.1.2 Credit Underwriting Process

Credit Underwriting Process is among other factors that affect the industry's opportunity to get a credit approval. The process differs between commercial banks and specialized financial institutions process and can be categorized as follows:

#### 1.1.2.1 Pre-Credit Underwriting Process

The pre-credit underwriting process consists of two sub-categories: Credit Support and Product Development.

##### 1) Credit Support

The credit support is usually under the Credit Support Section in the risk management group. The section name, however, varies among individual banking companies. The main responsibility of the section includes

- Business Research

To evaluate business trend as information for credit consideration. The business research can be performed by setting the INDEX to measure opportunities and threats of the business in different factors;

- Credit Portfolio Management

To make an analysis on the current banks credit portfolio in terms of business area, business type, income size, financial amount, bad debt, etc.;

- Credit Policy

One of the responsibilities of this section is to prepare credit policy by formulating framework and prioritizing credits that banks would like to promote. The policy is based on information analyzed by business research and the result of portfolio analysis through the principle of risk distribution and growth opportunity; And

- Credit Standardization

One of the factors for project consideration. Customers' data and information will be analyzed for benchmarking.

## 2) Product Development

This section is responsible for studying market potential and proposing new competitive products. This section will work closely with such relevant sections such as relationship management, credit policy, credit standard and risk management.

### 1.1.2.2 Credit Underwriting Process

The process of credit underwriting starts from credit marketing to the final step of a credit approval described as follows:

#### 1) Credit Marketing

Customer Relationship Management Unit is usually responsible for this activity. The name of this unit varies, depending on individual banking companies. Some bank may call this unit as Business Relationship Center. However, this unit has vital roles in the credit process and activities and providing optimum services for the customers.

Major activities to be mentioned here are; encouraging customers to apply for the bank's product, coordinating with other relevant agencies to ensure the most sufficient information for consideration, credit pre-consideration, proceeding the project to credit committee for final consideration, negotiating the credit terms and conditions with customers, looking over bank guarantee and legal procedure, following up payment and repayment. Some customer relationship unit is also responsible for preparing financial projection. Thus, customer relationship management unit plays a crucial role in credit consideration process.

Based on assets, credit line and/or annual income, customers are categorized in three groups— Wholesale, SMEs and Retail Group. The Wholesale group is also further sub-categorized based on business types.

Several banks have so far introduced business centers or offices of SMEs business at their branches to support this particular group. Normally, this center will serve as a point of contact with customers. Some banks enable their business offices to directly submit the proposed projects to the credit committee for consideration. Others may still pin such duties to the customer relationship unit.

#### 2) Analyst or Underwriter

Most of the banks separate the financial analysis function from the customers relationship units in order to effectively perform "Check and Balance" of the credit consideration. Here are ways to communication between the two units:

- a) Working together i.e. they work closely together during the credit evaluation process.

- b) Working separately i.e. the customer relations officer work on preliminary credit evaluation and forward to finance analyst for further evaluation.

### 3) Credit Underwriting

Apart from cross checking between the relationship officer and the credit analyst working on the credit approval, the Credit Evaluation Section is also set for the third check in order to conform with the bank's policy, credit approval criteria and other related conditions before finalizing credit approval.

### 4) Credit Consideration

The process has been decentralized to bank outlets or business centers to handle. However, the credit committee at the Head Office still maintains approval authorities. The sub-committee, the credit committee, the management committee and the bank committee will have to consider suitability of the proposed project before making the final approval.

## 1.2 The Existing Financial Evaluation Criteria of Key Financial Institutions in Thailand

Most of the financial institutions depend on such criteria for credit approval as follows:

### 1.2.1 Credit Underwriting Concept

The so-called "The 5 C's of Credit" criteria has been used for considering credit approval for industrial energy efficiency (IEE) projects for more than 50 years worldwide. The criteria is set on the client's repayment ability based on five factors: character, capital, capacity, collateral and condition. Character refers to the money borrower's character, business experiences, capacity and financial reputation. Capital reflects a balance of potential investment and debt proportion. A suitable debt service ratio will reflect the borrower's repayment capacity and its contribution to the project. Capacity measures the money borrower's repayment capability by comparing income to recurring debts. This may consider from production capacity, income, cost and expenses and management. Collateral such as property and assets helps secure the creditor's compensation to the bank in case of repayment failure. Condition of the surrounding may influence product efficiency, income, production cost, operational expenses and other related economic, social and political factors.

### 1.2.2 Credit Underwriting Tools

Banking companies use both qualitative and quantitative tools for analyzing and evaluating the 5C's put in practice by individual clients. See the summary of credit analysis tools and credit underwriting factors in Table 1-7.

**Table 1-7: Tools for Credit Analysis**

Factor	Credit Rating	Expert System	Financial Projection	Assets Appraisal	Business Research
Character	✓	✓			
Capacity		✓	✓		
Capital		✓			
Collateral		✓		✓	
Condition		✓			✓

1. Credit Rating:

A quantitative tool to evaluate the borrower's potential. Factors taken for consideration include marketing, production, management, business trends and most importantly financial statement.

For Small and Medium Enterprises (SMEs), some banks may use credit rating result as a screening base due to an issue of credible financial record. Other banks also use a result of the credit rating to consider the rating and setting the interest rate.

2. Expert System:

An important qualitative evaluation tool for considering the SME credit. Hence relevant financial officers need to be equipped with expertise on credit consideration because of these following reasons:

- Credit evaluation is not directly related to financial statement but requires financial analyst expertise on financial statement evaluation.
- Some criteria may be a qualitative evaluation. Therefore skills and experiences of the financial analyst to evaluate the credit proposal are required.
- There is no tailor-made financial evaluation for the credit consideration due to numerous types of businesses undertaken by the money borrowers.
- The tool, which requires skill and expertise will be useful for evaluating credibility of financial statement among the SME.

3. Financial Projection:

An important tool for determining debt repayment capacity and financial ratio. The core of this method essentially depends on information and hypothesis to be put into the model. However, this model still has some



loopholes mainly due to insufficient information provided by the project owners.

Financial Projection Plans are usually prepared in accordance to judgment of the financial analyst. Some banks also use a commercial software but with less success. Financial projection may be performed on the analyst. In some cases, a cash flow estimation is just enough for the credit consideration. Moreover, the preparation of cash flow estimation, balance sheet and profit and loss statement may be performed in some cases.

4. Asset Appraisal:

A process aimed at evaluating the value of assets such as land, building and machineries that have been used as credit guarantee. The assets may be appraised by internal units or third party, depending on the value.

5. Business Research

Used for identifying the current situation or condition of the business.

### **1.2.3. Credit Underwriting Perspective of the Banks**

Many banks consider debt repayment capacity as a crucial corporate finance factor prior to crediting IEE projects. However debt repayment capacity is not regarded as “stand alone” factor due to the following reasons:

- 1) Inability to separate cash flow of energy-saving cost from IEE project and the core business.
- 2) The corporate has already received approval of credit line from a banking company and that it may be difficult to apply for additional credit approval from another bank.

However, the Thai Credit Guarantee Corporation (TCG) enables some banks to consider approving the IEE Project such as “Project Finance” with a credit limit of 5 million THB. Debt repayment record and credit proportion are other related conditions that the banks may take into consideration.

### **1.2.4. Credit Underwriting Criteria**

Commercial banks consider the Ability-to-Repay (ATR) as the first criteria for credit approval based on free cash flow during the projected period. The Ability-to-Repay depends on business operation management, resource efficiency, profits, liquidity and debt level as illustrated below:

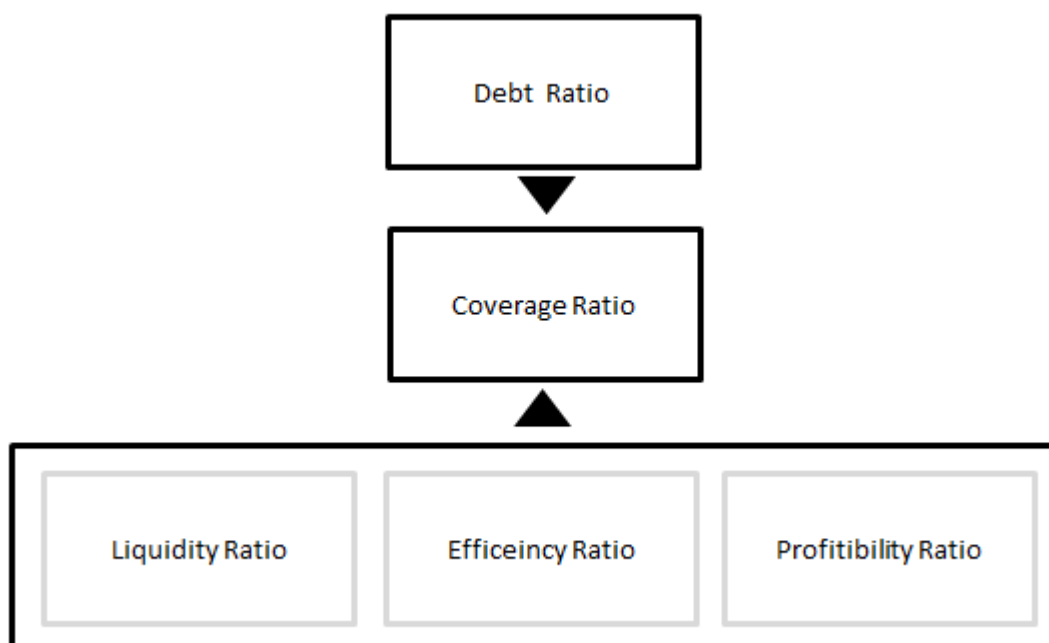


Figure 1-1: Factors Affecting the Ability to Repay (ATR)

Consideration of the ratio that indicates ATR is based on 1) Debt Service Coverage Ratio (DSCR), defined as capacity to pay for both installment and interests when looking at cash flow, and 2) Simple Payback Period.

The banks also consider the debt ratio which indirectly indicates debt repayment capacity based on: 1) Debt to Equity Ratio and 2) Loan to Value. These ratios could not be specified. Consideration is on case by case basis.

Other ratios such as the profitability ratio, efficiency ratio and liquidity ratio, normally defined as the basic financial ratio, are considered as less significant factor. By the same approach, Net Present Value (NPV) and Internal Rate of Return (IRR) have not been used as direct consideration of repayment capacity.

**Table 1-8: Criteria and Financial Ratio**

Criteria	Financial Ratio	1	2	3	range
Ability to Repay	Debt Service Coverage Ratio	✓			1.2-1.5
	Interest Coverage Ratio		✓		
	Payback Period	✓			3-10
Debt	Debt to Equity	✓			1.5:1 - 2:1
	Loan to Value	✓			80-100%
	Debt to Income		✓		
Business Growth and	Growth rate		✓		

Criteria	Financial Ratio	1	2	3	range
Profitability	Gross Profit Margin		(		
	EBITDA		(		
	Net Profit Margin		(		
Liquidity	Current Ratio		(		
	Quick Ratio		(		
Efficiency	Assets Turnover		✓		
	Stock Turnover		✓		
	A/R & A/P Turnover		✓		
Net Worth	Internal Rate of Return			✓	
	Net Present Value			(	
	Modified Internal rate of Return			(	

Additional credit underwriting criteria that should be noted are:

1. Some banks work progressively with 100% of Loan to Value for IEE Projects. This means a borrower can get a full coverage of the investment. Some banks consider the Loan to Value to be less than 100%. The borrowers would have to be responsible for their own investment.
2. Most of the banks require collateral for IEE Projects as a normal credit. However, there is a bank that provides IEE Projects without further collateral. This special credit provides existing customers with low credit line.
3. Normally, when the banks take the credit underwriting consideration for IEE projects, they would allow flexibility of debt repayment duration according to the cash flow. However, there is an exception in some banks that have short-term policy on account management but will set the fixed payment term for less than 7 years instead. Meanwhile, special designed products will have to define the fixed-term debt repayment.
4. Some banks use a technical ratio in the project screening prior to considering debt repayment capacity e.g. energy saving rate exceeding 20%.
5. For regular customers with the good record of repayment, most of the banks are ready to provide IEE loan with a low refusal rate.
6. Regarding the Credit Underwriting consideration, banks will always closely evaluate most of the risks that may affect the payment. In a market and financial risk assessment, the bank staff can perform these tasks without any problems. However, for the technical risk assessment, banks would rather outsource the third parties to perform the task than do the job by themselves.
7. Figures and assumption used in the financial projection are mostly concerned by the banks. Such concerned items include the electric unit of saving, energy price forecast, cost change in a unit production due to the project cost and maintenance, and change of management cost e.g. wage for technician.

8. Most of the financial institutions contain some levels of technical knowledge in IEE projects. Even then there is still lack of information about the IEE Projects for example the project subsidy and measures directed by the government and international organizations.

### 1.3 The Financial Support Mechanism of the Thai Government on the Industrial Energy Efficiency Project

Since 2003, the Thai government agencies especially the Department of Alternative Energy Development and Efficiency (DEDE) provides numerous financial measures to support energy efficiency projects including IEE Projects in industrial, commercial and household sectors. The concept can be implemented under supervision of involving energy regulated organizations or a network and financial institutions. The summary of the financial support is listed in the following table (Table 1-9).

**Table 1-9: Financial Support through Various Mechanisms**

Items	Energy Revolving Fund	Household Energy Loan	Memorandum of Understanding	ESCO Program	ESCO Revolving Fund	DEDE Subsidy
Project Duration	2003-2013	2008	2008	2008	2008-2014	2012
Status	terminate	terminate	terminate	exist	exist	terminate
Budget (million THB)	7,000	1,000	-	32	1,500	115
Support Channels	11 banks joined	5 banks joined	13 banks joined	5 banks joined		
BBL	✓	✓	✓			
KBank	✓		✓	✓		
KTB	✓	✓	✓	✓		
SCB	✓		✓			
TCAP	✓		✓	✓		
BAY	✓	✓	✓			
TMB	✓		✓	✓		
CIMB	✓		✓	✓		
ICBC	✓		✓			
GSB		✓				
EXIM	✓		✓			
ABANK		✓	✓			
SMEs	✓					

## 1.3.1 Energy Efficiency Revolving Fund (RF)

The most successful financial scheme offering soft loan through commercial banks.

**Table 1-10: Energy Efficiency Revolving Fund (RF)**

<b>Objective</b>	Financial support to industries, buildings and ESCOs to invest in Energy Efficiency Projects. This financial scheme entrusts the banks/financial institutions that the energy efficiency projects are reliable to be implemented.
<b>Project Duration</b>	2003 – 2013 (terminated)
<b>Implementing Agency</b>	Department of Alternative Energy Development and Efficiency (DEDE)
<b>Source of Fund</b>	ENCON Fund
<b>Target Group</b>	Factories, Buildings
<b>Interest Rate</b>	4%
<b>Credit Line</b>	Maximum of 50 million THB per project, beyond that can be negotiated with the banks
<b>Total amount from the Government</b>	7,000 million THB
<b>Approximate Credit from Banks</b>	7,700 million THB
<b>Credit Term</b>	7 years with maximum of 1 year grace period
<b>Co-partner Banks</b>	<ol style="list-style-type: none"> <li>1. Bangkok Bank</li> <li>2. Krung Thai Bank</li> <li>3. Bank of Ayudhya</li> <li>4. Kasikorn Bank</li> <li>5. Thai Military Bank</li> <li>6. CIMB Thai Bank</li> <li>7. Siam Commercial Bank</li> <li>8. Siam City Bank (Thanachat Bank at present)</li> <li>9. Small and Medium Enterprise Development Bank of Thailand</li> <li>10. ACL Bank (Industrial and Commercial Bank of China (Thai) or ICBC at present)</li> <li>11. Export-Import Bank of Thailand (EXIM Thailand)</li> </ol>

## 1.3.2. Household Energy Efficiency Loan

This loan aims to encourage most households to purchase high efficiency electric appliances, especially the air conditioner. The merit of this financial scheme is that there is no loan interest.

**Table 1-11: Household Energy Efficiency Loan**

<b>Objective</b>	Encourage households to use high efficiency appliances especially those that are certified under the label no. 5.
<b>Project Period</b>	1 year (in 2008, now terminated)
<b>Implementing Agency</b>	Department of Alternative Energy Development and Efficiency

<b>Source of Fund</b>	ENCON Fund
<b>Target Group</b>	Households
<b>Interest Rate</b>	0%
<b>Credit Line</b>	Maximum of 10,000 THB in general except for the air condition which is eligible for purchasing at the maximum of 30,000 THB
<b>Financial Support from Government</b>	1,000 million THB
<b>Credit Term</b>	1 year
<b>Co-partner Banks</b>	Bangkok Bank Krung Thai Bank Bank of Ayudhya Bank for Agriculture and Agricultural Cooperatives (BAAC) Government Saving Bank

### 1.3.3. Voluntary Energy Loan

Initiated by the Department of Alternative Energy Development and Efficiency (DEDE), this type of loan program is designed to promote the EE projects through the concept of voluntary support. Memorandum of Understanding is signed between the two parties. The banks participating in the program agreed to provide the whole amount of loan for crediting EE projects, while the Ministry of Energy would provide support on project dissemination and campaign.

**Table 1-12: Voluntary Energy Loan (MoU)**

<b>Background</b>	This financial scheme developed under the concept of reducing the Government Offices' role in financial scheme and turning to academic support.
<b>Objective</b>	To support EE projects through 100% of bank loan with the assistance of project dissemination and campaign from the Ministry of Energy. This is based on the voluntary principle and agreement between DEDE and the banks.
<b>Project Period</b>	Started in 2008, now phase out
<b>Implementing Agency</b>	Department of Alternative Energy Development and Efficiency
<b>Source of Fund</b>	Financial Institutions
<b>Target Group</b>	All entrepreneurs
<b>Interest Rate</b>	Depend on individual bank
<b>Credit Line</b>	Depend on individual bank
<b>Target Credit Line</b>	60,000 million THB
<b>Total Credit Approved</b>	Up to March, 2012, accumulated credit of 242,164 million THB
<b>Credit Term</b>	Depend on individual bank
<b>Co-partner banks</b>	1. Bangkok Bank 2. Krung Thai Bank 3. Bank of Ayudhya 4. KasikornBank 5. Thai Military Bank 6. Bank Thai (CIMB Thai at present)

	7. Siam Commercial Bank 8. Thanachat Bank 9. Siam City Bank (Thanachat Bank at present) 10. Small and Medium Enterprise Development Bank of Thailand 11. ACL Bank (Industrial and Commercial Bank of China (Thai) or ICBC at present) 12. Export-Import Bank of Thailand (EXIM Thailand) 13. MFC Asset Management plc.
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#### 1.3.4. ESCO PROGRAM

The ESCO program is a supplement activity created by the government to help administrative expenses for the ESCO network to promote activities relating to energy efficiency projects.

**Table 1-13: ESCO Program**

<b>Objective</b>	<ul style="list-style-type: none"> <li>To increasingly encourage the continuous mechanism of ESCO in energy efficiency projects.</li> <li>To encourage industrial and business sectors as well as government agencies to employ the ESCO services in energy efficiency projects.</li> <li>To support the emergence of ESCO.</li> <li>To develop the ESCO service international standard to be more acceptable.</li> </ul>
<b>Activities between government agencies and banks</b>	<ul style="list-style-type: none"> <li>A network creation between a bank and ESCO (ESCO – Bank Networking) through the seminar for 3-4 times a year.</li> <li>Memorandum of Understanding (MoU) with banks on fund sources for the Guarantee Saving Service by ESCO</li> </ul>
<b>Project Period</b>	2008 to present
<b>Project Management</b>	The Institute of Industrial Energy under Federation of Thai Industries (FTI)
<b>Target Group</b>	Industrial Factories and/or Energy Service Company – ESCO
<b>Used Budget</b>	34.8 million THB (approximately)
<b>Source of Fund</b>	ENCON Fund through DEDE
<b>Co-partner banks</b>	1. Krung Thai Bank 2. Kasikorn Bank 3. Thai Military Bank 4. CIMB Thai Bank 5. Thanachat Bank
<b>Operation with banks</b>	By the year 2013, ESCO has made Guaranteed Savings Contracts (GSC) with entrepreneurs at the invested value of 7,591.74 million THB while the industrial sector and commercial building invested about 6,814.03 and 77.71 million THB respectively.

The Institute of Industrial Energy under the Federation of Thai Industries plays a major role in performing as the one-stop service for ESCO activities covering areas of energy saving, energy conservation and/or renewable energy. The services cover a wide

range of activities such as project analysis, installation, guarantee and energy saving verification. This type has its outstanding in the contract that guarantee the energy project to create more technical confidence to related stakeholders. At present, there are 57 ESCOs registered with the Institute of Industrial Energy. Of the total, 75% has been operating.

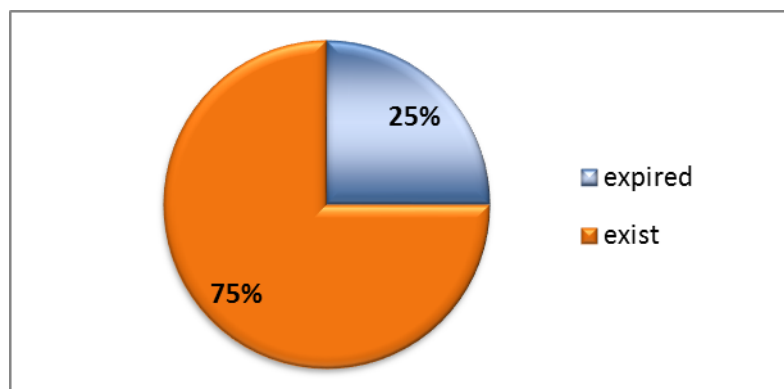


Figure 1-2: Current Situation of ESCO Service Factors Affecting to the Repayment Ability

The ESCO services are categorized into two themes: guaranteed saving and shared saving.

### 1 Guaranteed Saving

The ESCO provides the guaranteed saving while the entrepreneurs take care of their own investment. If the saving does not reach the specified guarantee, the company will then compensate for the deficiency.

### 2. Shared Saving

The ESCO makes an equity investment through the shared saving agreement between the company and individual energy efficiency or renewable energy project owners.

## ESCO Services and the Bank Requirements

At present, commercial banks have gradually been familiar with the roles of ESCO support on the EE project as technical assistance. Despite expressing uncertainty in the ESCO services, two banks are currently using it. The other two recognize and apply for the program. The rest have not yet recognized or been involved with the service.

## Banks' Perspective towards ESCO Services

To further understand relations between commercial banks and the ESCO services, here are some of the key views from the banks.

- 1) The selection of the ESCO services differs. Some banks use the ESCO program from time to time while others use their own qualified list of ESCO.



- 2) Most of the banks understand the concept of ESCO as the assistance to technical risk management rather than the collateral.
- 3) Banks regard ESCO as a source of technical reliability. Thus, it is a must for the ESCO to perform at its best to meet such requirement from the banks.
- 4) The government agencies, similar to the banks, understand the ESCO concept and consequently start strengthening its professional practice.
- 5) Some banks prepare a list of energy efficiency suppliers similar to those listed by ESCO. This can help create the reliability of entrepreneurs to get the credit approval.
- 6) Most banks prefer to stay out of the acknowledgement and negotiation process and contract signing between the investors and the ESCO. They would need only the reliable list from ESCO.

#### 1.3.5. ESCO REVOLVING FUND

With the financial support from the Energy Conservation Promotion Fund (ENCON Fund), the Department of Alternative Energy Development and Efficiency (DEDE) has established the ESCO Revolving Fund to stimulate private investment in renewable energy and energy efficiency projects which are considered viable, but still lack financing. The ESCO Revolving Fund also facilitates project owners or investors to get the benefits from selling carbon credit.

**Table 1-14: ESCO Revolving Fund**

<b>Objective</b>	To encourage the private sectors to invest in renewable energy and energy efficiency projects which are viable, but seek more financing.
<b>Time Duration</b>	2008 – present
<b>Implementing Agency</b>	Department of Alternative Development and Efficiency (DEDE)
<b>Project Management</b>	Energy for Environment Foundation (EforE) The Energy Conservation Foundation of Thailand (ECFT)
<b>Type of Services</b>	<ul style="list-style-type: none"> <li>- Equity Investment</li> <li>- ESCO Venture Capital</li> <li>- Carbon Credit Facility</li> <li>- Equipment Leasing</li> <li>- Credit Guarantee Facility</li> <li>- Technical Assistance</li> </ul>
<b>Source of Fund</b>	Energy Conservation Promotion Fund (ENCON Fund)
<b>Targets</b>	Energy Efficiency Projects directed under the Section 7 and Section 17 of Energy Conservation Promotion Act B.E. 2535 (1992) aiming to promote energy conservation in the country
<b>Credit Line</b>	500 million THB depending on yearly approval

Details of the ESCO Revolving Fund can be summarized in the following table (Table 1-15):

**Table 1-15: Types of Services under ESCO Revolving Fund**

Types of Co-Investment	Equity Investment	ESCO Venture Capital	Equipment Leasing	Credit Guarantee	Technical Assistance
Features	Share holder	Share holder	Equipment leasing	Credit guarantee to financial institution	Provide financial support for Energy Audit or Feasibility Study
Proportion of co-investment	10-50%	Less than 30%	100%		
Limitation	50 million THB	50 million THB	10 million THB	10 million THB	100,000 THB
Major share holder	no	no			
Duration	5-7 years	5-7 years	5-7 years		
Interest rate	4% Flat	4% Flat	4% Flat		
Management	Board	No specified			
Withdrawal method	Share sell back	Share sell back			
Withdrawal price	Share holder agreement	Share holder agreement			

### 1.3.6. Energy Efficiency Promotion through High Efficiency Equipment

It is a supporting measure promoted in the form of government subsidies. The table below illustrates the support details.

**Table 1-16: High Efficiency Equipment Promotion**

<b>Objective</b>	To promote and encourage the utilization of high efficiency equipment to reduce energy consumption and to boost expansion of technologies and equipment
<b>Year</b>	2011
<b>Implementing Agency</b>	Department of Alternative Energy Development and Efficiency
<b>Project Management</b>	Thammasat University
<b>Type of Service</b>	Direct Subsidy 20% of Investment Cost Maximum subsidy of 3 million THB/application Minimum credit of 50,000 THB/application Simple Payback Period within 7 years
<b>Source of Fund</b>	Energy Conservation Promotion Fund (ENCON Fund)
<b>Target</b>	Energy Efficiency Projects as directed under Section 7 and Section 17 of Conservation Promotion Act B.E. 2535 (1992) aiming to promote energy conservation in the country
<b>Total Grant</b>	2,000 million THB

Considering the overall financial scheme launched from the government sector especially the driving scheme through the financial institutions, there are some vital points to be taken into account as follows;

- The Revolving Fund could generate more investment. Response has been well received by both financial institutions and entrepreneurs. After the project termination in 2013, however, most banks do not have further sufficient energy credit products.
- Most banks are interested in joining the ESCO Program which creates the network between ESCO, commercial banks and ESCO Revolving Fund connected to the banks in the form of a credit guarantee and service fee. Although more information about this has been disseminated widely to relevant agencies, it is found that many staff therein have not yet learned about such information, making them unfamiliar and with details of the ESCO services.

## Summary

Availability of financial sources for energy efficiency and related projects depend on government support, self-funding and bank loan. The project owners mostly depend on self-funding and bank loan. Some banks provide loan program for energy project but not for the whole IEE projects. These products have different features and criteria based on each bank's policies and initiatives. Prior to providing the energy loan, most banks always consider the customers' annual turnover and the credit line rather than the detailed of proposed projects.

Regarding credit underwriting criteria, currently no standard criteria is available for energy efficiency projects. The process comprising pre-credit underwriting and credit underwriting process are more or less similar among the banks. However, the consideration may differ depending on individual commercial banks and special financial institutions.

Most banks use a similar concept of the 5 Cs' of Credit—character, capital, capacity, collateral and condition— and credit underwriting tools comprising credit rating, expert system, financial projection, assets appraisal and business research—for credit consideration. Most banks consider the IEE project as corporate finance, not single project finance, resulting in the difficulty of credit access. However, with the full credit guaranteed by Thai Credit Guarantee Corporation (TCG), some banks are able to consider the IEE project as project finance within the credit limit.

In terms of loan repayment, the banks consider the Ability-to-Repay (ATR) as a prime criterion for credit approval. The Ability-to-Repay depends on business operation management, resource efficiency, profitability, liquidity and the debt level.

With the concept of energy efficiency (EE) promotion, the Thai government agencies especially DEDE provide numerous financial measures to support energy efficiency projects to

overcome some barriers hindering the EE promotion. The financial schemes available are tax concessions, direct subsidy, in-kind subsidies, cross subsidies, credit subsidies and government guarantee, and market price support. These financial schemes provide both energy efficiency and renewable energy projects for industrial, commercial building and household sectors.

Government financial support via several schemes can reduce investment cost on EE Projects for the industries. However, if self-funding is not available, they have to seek support from the banks, discuss and follow banking regulations for credit approval will be required. Thus, industries' staff need to strengthen their financial background and credit process. If they gain more experiences in financial credit process, they could increase their opportunities in accessing credit from the banks.

**Part 2**  
**Recommendation on Financial Evaluation Criteria for Industrial Energy Efficiency Project**

## 2.1 Financial Evaluation Criteria for Industrial Energy Efficiency Project

### 2.1.1 Project Assumption and Projection

The income statement is a simple and straightforward report on the proposed business's cash-generating ability. It is a score card on the financial performance of the business that reflects when sales and expenses are incurred. It draws information from various financial models developed earlier such as revenue, expenses, capital (in the form of depreciation), and cost of goods. By combining these elements, the income statement illustrates just how much the company makes or loses during the year by subtracting cost of goods and expenses from the revenue to reach a net result, which is either a profit or a loss.

For a business plan, the income statement could be generated on a monthly basis during the first year, quarterly for the second, and annually for each year thereafter. It is formed by listing the financial projections in the following manner;

- **Income** - Includes all the income generated by the business and its sources.
- **Cost of goods** - Includes all the costs related to the sale of products in inventory.
- **Gross profit margin** - The difference between the revenue and the cost of goods. Gross profit margin can be expressed in dollars, or a percentage, or both. As a percentage, the gross profit margin is always stated as a percentage of revenue.
- **Operating expenses** - Includes all overhead and labor expenses associated with the operations of the business.
- **Total expenses** - The sum of all overhead and labor expenses required to operate the business.
- **Net profit** - The difference between gross profit margin and total expenses, the net income depicts the business's debt and capital capabilities.
- **Depreciation** - Reflects the decrease in value of capital assets used to generate income. Regarded as the basis for a tax deduction and an indicator of the flow of money into a new capital.
- **Net profit before interest** - The difference between net profit and depreciation.
- **Interest** - Includes all interests derived from debts, both short-term and long-term. Interest is determined by the amount of investment within the company.
- **Net profit before taxes** - The difference between a net profit before and after. **Taxes** - Includes all taxes from the business.
- **Profit after taxes** - The difference between a net profit before taxes and the taxes accrued. Profit after taxes is the bottom line for any company.

Following the income statement is a short note analyzing the statement. The analysis statement can be very short, emphasizing key points within the income statement.

### 1. **Cash-Flow Statement**

The cash-flow statement is one of the most critical information tools for the business, showing how much cash will be required and needed to meet obligations. It shows a schedule of the money coming into the business and expenses that need to be paid. The result is the profit or loss at the end of the month or year. In a cash-flow statement, both profits and losses are carried over to show the cumulative amount.

Like the income statement, the cash-flow statement takes advantage of previous financial tables developed during the course of the business plan. The cash-flow statement begins with cash on hand and the revenue sources. The next listed item is expenses, including those accumulated during the manufacture of a product. The capital requirements are then logged as a negative after expenses. The cash-flow statement ends with the net cash flow.

The cash-flow statement can be prepared on a monthly basis during the first year, on a quarterly basis during the second year, and on an annual basis thereafter. Items that business owner will need to include in the cash-flow statement and the order in which they appear are as follows:

- **Cash sales** - Income derived from sales paid for by cash.
- **Receivables** - Income derived from the collection of receivables.
- **Other income** - Income derived from investments, interest on loans that have been extended, and the liquidation of any assets.
- **Total income** - The sum of total cash, cash sales, receivables, and other income.
- **Material/Merchandise** - The raw material used in the manufacture of a product (for manufacturing operations only), the cash outlay for the merchandise inventory (for merchandisers such as wholesalers and retailers), or the supplies used in the performance of a service.
- **Production labor** - The labor required to manufacture a product (for manufacturing operations only) or to perform a service.
- **Overhead** - All fixed and variable expenses required for the production of the product and the operations of the business.
- **Marketing/Sales** - All salaries, commissions, and other direct costs associated with the marketing and sales departments.
- **R&D** - All the labor expenses required to support the research and development operations of the business.
- **G&A** - All the labor expenses required to support the administrative functions of the business.

- **Taxes** - All taxes, except payroll, paid to the appropriate government institutions.
- **Capital** - The capital required to obtain any equipment elements that are needed for the generation of income.
- **Loan payment** - The total of all payments made to reduce any long-term debts.
- **Total expenses** - The sum of the material, direct labor, overhead expenses, marketing, sales, G&A, taxes, capital, and loan payments.
- **Cash flow** - The difference between the total income and total expenses. This amount is carried over to the next period as beginning cash.
- **Cumulative cash flow** - The difference between current cash flow and cash flow from the previous period.

As with the income statement, the business owner will need to analyze the cash-flow statement in a short summary in the business plan. The analysis statement has to be short, clear and cover only key points derived from the cash-flow statement.

## 2. The Balance Sheet

The last financial statement the business owner needs to develop is the balance sheet. Like the income and cash-flow statements, the balance sheet uses information from all of the financial models developed in earlier sections of the business plan. Unlike the previous statements, the balance sheet however is generated solely on an annual basis for the business plan and is, more or less, a summary of all the preceding financial information broken down into three areas:

1. **Assets**
2. **Liabilities**
3. **Equity**

To obtain financing for a new business, the business owner may need to provide a projection of the balance sheet over the period of the business plan. More importantly, the business owner will need to include a personal financial statement or the balance sheet.

Divided into three sections, the top portion of the balance sheet lists the company's assets classified as current assets and long-term or fixed assets. Current assets will be converted into cash or will be used by the business within a year.

### 1) **Current assets include;**

- **Cash** - The cash on hand at the time books are closed at the end of the fiscal year. This refers to all cash in checking, savings, and short-term investment accounts.



- **Receivable accounts** - The income derived from credit accounts. For the balance sheet, it is the total amount of income to be received that is logged into the books at the close of the fiscal year.
- **Inventory** - This is derived from the cost of goods table. It is the inventory of material used to manufacture a product not yet sold.
- **Total current assets** - The sum of cash, accounts receivables, inventory, and supplies.

Other assets that appear in the balance sheet are called long-term or fixed assets because they are durable and will last more than a year. Examples of this type of asset include

- **Capital and plant** - The book value of all capital equipment and property (if you own the land and building), less depreciation.
- **Investment** - All investments by the company that cannot be converted to cash in less than one year. For the most part, companies just starting out have not accumulated long-term investments.
- **Miscellaneous assets** - All other long-term assets that are not "capital and plant" or "investments."
- **Total long-term assets** - The sum of capital and plant, investments, and miscellaneous assets.
- **Total assets** - The sum of total current assets and total long-term assets.

After the assets are listed, the business owner needs to account for liabilities of the business. Like assets, liabilities are classified into current and long-term. If the debts are due in a year or less, they are categorized as current liabilities. If the debts are due over a year, they will be categorized as long-term liabilities. Examples of current liabilities are as follows:

- **Payable accounts** - All expenses derived from purchasing items from regular creditors on an open account which is due and payable.
- **Accrued liabilities** - All expenses incurred by the business are required for operation but have not been paid at the time the books are closed. These expenses are usually the company's overhead and salaries.
- **Taxes** - Including those still due and payable at the time the books are closed.
- **Total current liabilities** - The sum of payable accounts, accrued liabilities, and taxes.

## 2) Long-term liabilities include:

- **Bonds payable** - The total of all bonds at the end of the year that are due and payable over a one-year period or more.
- **Mortgage payable** - Loans taken out for the purchase of real property that are repaid over a long-term period. The mortgage payable is that amount still due at the close of books for the year.
- **Notes payable** - The amount still owed on any long-term debts that will not be repaid during the current fiscal year.
- **Total long-term liabilities** - The sum of bonds payable, mortgage payable, and notes payable.
- **Total liabilities** - The sum of total current and long-term liabilities.

Once the liabilities have been listed, the final portion of the balance sheet of the owner's equity needs to be calculated. The amount attributed to the owner's equity is the difference between the total assets and the total liabilities. The amount of equity in the business is an important yardstick used by the investors when evaluating the company. Many times it determines the amount of capital invest in the business.

For the business plan, the owner will need to create an analysis statement for the balance sheet similar to the usual one for income and cash-flow statements. The analysis of the balance sheet will be short and cover key points about the company.

### 2.1.1.1 Project Cost Calculation

When potential business owners conduct a financial appraisal of an energy efficiency project, they will normally review the estimated cost of the project, proposed means of financing, financial and cash flow projections and feasible indicators provided by the banks or any feasibility study supplemented by the banks . They will also conduct a sensitivity analysis to check whether the project remains feasible under the adverse evolution of various parameters.

#### 1. Reviewing project costs

Realistic-based estimation should be applied to various components of the project cost to prevent cost over-runs and avoid over-estimated costs. The project cost, preliminary expenses, equipment, property, contingencies, design, engineering fees and interest during the construction period will have to be taken into account.

#### 2. Preliminary expenses

The preliminary expenses consist mainly of the cost of conducting energy audits and the cost of preparing project feasibility reports. These preliminary expenses will be capitalized and written off over the tenure of the loan.

### **3. Equipment cost**

Equipment cost estimations should be based on quotations/purchase contracts between the applicant and the suppliers. These contracts should be finalized after obtaining competitive quotations from a few suppliers. The selection criteria should not only focus on price, but also on appropriateness of the technology, reputation of suppliers, delivery periods, credit terms, etc. The estimated cost would be scrutinized to ensure that taxes and duties, insurance, freight charges, etc. are included and breakdown of the details has been included. Provision will be made for installation and spares.

### **4. Design and engineering fees**

A breakdown of design and engineering fees, and building construction and commissioning charges should be obtained from the banks and appended to the project feasibility report.

### **5. Interest during construction period**

An amount equivalent to the interest and other charges payable by a business owner to the Bank at an agreed rate during the construction period of the project. The interest during construction period should be capitalized and included in the cost of the energy efficiency project.

### **6. Contingencies**

Unforeseen expenses or losses such as increase in duties, taxes and foreign exchange fluctuations may increase the estimated cost of the project. Although a proper estimation of the costs of contingencies is difficult, generally it is prudent to keep 5 - 10% of the project cost for contingencies.

## **2.1.1.2 Energy Saving Calculation**

### **1. Baseline Issues**

To specify energy saving, an actual measure would be precisely calculated or estimated as much as possible to keep the cost at a reasonable level. Here are the main calculation methodologies.

#### **Calculation method(s)**

Three basic approaches are:

#### **(1) To calculate the actual savings achieved as a result of the measure:**

This is termed "ex post" and would entail before and after monitoring or billing analysis, as illustrated by this simplified schematic.

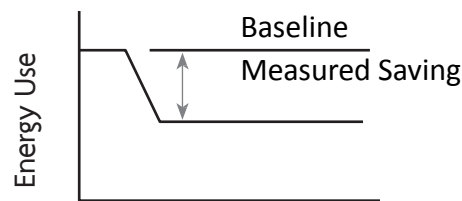


Figure 2-1: Energy Saving Calculation

A simple equation for quantifying the savings would be: **Savings = Baseline Period Energy - Reporting Period Energy ± Adjustments**

The adjustments are critical to ensure that a reasonable comparison is made before and after the period. Many things could change between the two periods e.g. the weather, occupancy, usage patterns, and production levels. Also, the duration of the monitoring period will have to be sufficient to provide a representative measurement. If the period is too short, the error risk is greater and there may be a “novelty” factor as users temporarily adjust their behavior in response to the installation. The main downside of the ex post methodology is the delay between the installation of measure and the validation of savings. For measures that save smaller amounts of energy, the savings may not show up in bill analysis unless sub-metering is presented, which is considered unlikely in residential or small business situations.

## (2) To specify savings from a particular measure in advance:

Defined as “ex ante” or “deemed savings”, such generic approach has the benefit of providing certainty in advance to market participants as much as to the target contribution. It does not suffer from the delay of the ex post methodology or from the need to trouble the end-user with the ongoing metering.

The downside is that the estimated ex ante savings may not reflect the true savings achieved in practice although, for a large number of installations, the average value will be representative.

In some cases, an intermediate approach between deemed savings and actual measured energy savings is appropriate. The method is known as engineering estimates of savings or deemed savings algorithms, in which existing robust measured data from similar applications are available but still difficult or disproportionately too expensive to directly monitor. Replacement of a compressor or electric motor with a different rating of kilowatt hour (kWh) rating to independent rating information on savings is an example. . This is similar for office HVAC equipment.

**(3) To undertake a survey:**

In case of difficulties in accurately measuring target qualifications, it may be appropriate to undertake a survey on the energy saving subsequently attained by scheme participants. It is a good practice to learn from the respondents who do not receive the behavioral and/or advice measures. A survey may also be appropriate for energy audit for determining the measures undertaken.

**New Building and Major Renovation**

Only the savings over and above the prevailing building regulations or codes for the property can be applied as a measure for a newly-built property. For particular categories of buildings e.g. social housing or public buildings constructed based on the higher standard regulations than the national or the regional buildings, the higher level will be used as the baseline. Similarly, if a major renovation to the building is undertaken under building regulations, then only energy savings will be awarded to those measures above the required building regulations.

**New Equipment (e.g. HVAC plant, lighting, appliances, motors and drives, compressors)**

Only the difference between the high-efficiency equipment and the market average would be counted.

**Early Replacement of Products or Equipment**

If the measures accelerated the replacement of equipment, products, or building components, due account would be taken from the duration of the energy savings compared to energy consumption of the original equipment during its remaining lifetime

**2. Gross Savings Adjustments****(1) Rebound Effect/Comfort Factor/ Increased Amenity**

Deemed energy savings would be counted from any changes in consumption. Insulation measures, for example, will make it easier and cheaper to cool a property. It is likely that a proportion of the benefit may be taken as increasing comfort. Equally, if energy bills are lower, there may be a tendency to increase consumption generally due to greater affordability.

**(2) Normalization Factors**

Deemed energy savings would be normalized as a value standard.

If there are significant weather variations in the country, the savings from cooling measures should be as a standard in the area. An alternative approach will be counted as the “true” savings in different parts of the country, but to adjust the target prior to the obligations. This alternative is appropriate for regionally-based companies but may be less effective among companies operating across the region.

### **(3) Conversion Factors**

Savings from different fuels need to be converted into a standard form. If carbon is the overall target, the conversion should be on the basis of carbon equivalence to the carbon content of the input fuel measured on a kilowatt hour (kWh) basis.

### **(4) Fuel Switching/Carbon Content of Fuels**

This is crucial where there is an increase in an energy source at the same time with a decrease in another. Fuel switching may occur when converting from coal-fired heating to gas or when installing a gas-fired combined heat and power (CHP) unit. Such switching increases gas consumption but may reduce primary electricity consumption, or heat recovery ventilation. For a program emphasizing on tackling climate change, due account would be taken off the carbon content of both the energy saved and the new type of energy that will be consumed.

### **(5) Measure Lifetime**

A realistic lifetime, ideally based on recognized market data (e.g., derived from recent annual replacement figures for the measure), would be applied to the measure.

#### **2.1.1.3 Other Financial Factors Identification**

The following paragraph describes financial appraisal in details including required documentation for financing an investment. It is very important that the responsible person of the company be the manager, the accountant or the chief engineer understands the financial appraisal process of the bank. .

#### **1. Key Stages in Economic Evaluation**

From the bank’s point of view, the most important part of an energy efficiency project appraisal is the financial appraisal. At this point, a brief outline of the approach for financially appraising energy efficiency & renewable energy projects would be presented. For existing enterprises, the credit assessment comprises not only the appraisal of the project but also the past performance in case the enterprise is already a client of the bank and the overall creditworthiness of the potential borrower, taking

into consideration. Market and competition, management and business concept, the previous and present profitability, stability of future cash-flows, and availability of the collateral will also be taken into consideration.

Cross cutting is the driving force for the industry to opt for energy efficiency investment. Decision making on load approval is based on credit worthiness of the entire company. A basic condition to secure financial support on energy efficiency and renewable energy investment is a well-prepared rational energy utilization plan (REUP) with the reliable data and detailed financial analysis. Economic evaluation is a rational method for decision making. Any good commercial organization must be able to identify viable investment opportunities and select appropriate projects to fund. Economic evaluation enables these choices to be made by calculating financial return and indication of each project valuable for the organization.

The objectives of economic evaluation are

- To decide which investments will make the best use of the organization's money,
- To ensure that the optimum benefits are available from each investment,
- To minimize any risk to the organization,
- To provide a basis for the later analysis of the performance of each investment,
- To produce measures of the financial improvement that each project could make to the business,
- To identify the risks and uncertainties in each project,
- To define the expected costs and benefits.

The decision maker can then use the result of the evaluation to consider approving the project. Economic evaluation helps organizations make the right decision. As projects to improve energy efficiency are likely to be competing for funds with other projects, what is really being evaluated is the project's position within a list of possibilities. To give energy projects the best chance of receiving funding support, an economic evaluation should be presented with the proposal. The decision maker will then be able to compare the benefits of the proposed energy efficiency project directly with other investment proposals.

Economic evaluation provides financial measures of each potential investment open to the organization. These measures can be used for making decision whether individual projects should be funded and given the priority. Economic evaluation cannot be considered as a technique for creating absolute values. It helps compare the merits of investing in

various projects rather than prioritizing one's idea to another. Economic evaluation tries to show the benefits of projects in relation to their capital costs. However it is often difficult to find any single parameter to measure this. There are many different measures used for economic evaluation. Each highlights different aspects of the project.

There is no measure better than any other. And each has its strengths and weaknesses. These are

- Simple methods,
- Discounting method.

### **1) Simple investment methods**

This approach is used for preliminary financial assessment of energy efficient projects. Assessment of investment efficiency is based on non-discounted cash flows. Rise in prices is not considered in cash flow. The parameters of the project's effectiveness are estimated without financing (from the point of view of all the project investors). The results show if it is reasonable to proceed with technical and economical calculations for the project.

The most frequently used simple methods are;

- The calculation of rate of return,
- The calculation of payback period.

The disadvantage of this approach is inaccurate calculation. The activity after the payback period is not taken into consideration. Simple investment methods cannot be used for comparing variants with different project durations.

### **2) Discounting method**

The essence of this method is in the preliminary discounting of the estimated cash flow based on the feasible discount rate. Usually, the real discount rate cleared from inflation rate is used when the energy efficiency projects are evaluated. Inflation expectations are not taken into consideration when the project cash flow is structured. When the rate of energy cost increase is defined, the total inflation index is not considered.

The following discounting methods are distinguished

- Net Present Value (NPV) method;
- Internal Rate of Return (IRR) method;
- Payback method.



Each has its own advantages and disadvantages.

- a) **Net Present Value (NPV)** considers value of money, not the risks. The fact that money is the absolute measure does not allow us to compare the projects with different levels of financing.
- b) **IRR** illuminates disadvantages mentioned above though the cost of capital is not counted or economical definition such as NPV is not defined. This indicator is relatively complicated.
- c) Finally, a **payback** period does not take into consideration the time value of funds. A period of project payback without income does not provide effectiveness to the optimum investment.

To systematically analyzing the investment, it is necessary to use all three indicators which complement each other. That is why most companies use the combination of these three methods.

## 2. The choice of method

The relative merits of using NPV, IRR, and Payback methods to evaluate a project are often discussed, because the results of the evaluation will sometimes vary depending on the method used. The following rules of thumb will give an idea how different methods should be used.

- Payback must be prioritized when the life duration of the project is known.
- Net Present Value (NPV) must be preferred to compare projects demanding similar investments and with similar useful lives. These two factors will be compared with each other and then the discount rate will be known.
- Internal Rate of Return must be preferred when the discount rate is unknown or questionable; on projects with different levels of investment and useful lives are compared with each other. The NPV must be determined complementarily.

## 2.1.2 Economic evaluation tools

### 2.1.2.1 Simple Payback Period and Discount Payback Period

#### 1. Simple Payback Period

##### *Introduction*

Simple payback (SPB) is a quick, simple way to compare alternative projects. Since SPB is easy to utilize, it has become a very popular financial tool. Simple payback is the number of years necessary to recover the project cost of an investment under consideration.

SPB is commonly used and recommended when risk is an issue i.e. significant uncertainties are present because it enables the banks to quickly assess whether any investor's capital is at risk. SPB is not recommended when evaluating alternatives involving financing and tax features because such inclusion makes the analysis complicated. . SPB is also not recommended for selecting among mutually exclusive alternatives due to different investment value. The investor will choose to invest more in an alternative having more favorable returns. This shortcoming may be corrected by applying SPB to incremental basis. SPB is not recommended for project ranking either. The thing is returns after the payback are not included.

##### *Discussion*

The SPB method however has its drawback. It ignores the time value of the money. The use of SPB can be implied that the investor has no opportunity costs of its discount rate is equal to zero. However, the simple payback method is easy to understand and calculate, and that can be useful when there are uncertainties for example tenure or life of the technology. When there is a high degree of uncertainty associated with future cash flows, SPB gives an indication of how long one's assumptions must hold to ensure that at least the principal is returned to the investor.

#### 2. Discounted Payback Period

##### *Introduction*

The discounted payback period (DPP) is the number of years necessary to recover the project cost of investment while accounting for the time value of the money.

DPB is recommended when risk is an issue. When uncertainties are significant, DPB will enable the bank to quickly assess whether the investor's capital is at risk. DPB is not recommended for evaluating alternatives, involving financing

and tax features. Such inclusion makes the analysis complicated and lose simplicity advantages. DPB is also not recommended when selecting mutually exclusive alternatives. The thing is differing investment sizes are not considered. The investor will choose to invest more in an alternative with more favorable returns. This shortcoming may be fixed by applying DPB to incremental basis. When ranking projects, DPB is not recommended returns after payback is not included.

### ***Discussion***

Excluding the time value of the money is not a limitation of the discounted payback. The difference between the DPB and the SPB is that the DPB analysis uses the present values of changes in investment and savings. Thus, when accounting for the time value of the money, the payback period is longer, as illustrated above. As in any present value analysis, the cash flows or net savings in DPB can occur at any time. Alternative assumptions such as mid-year, mid-month, or beginning-of-the-month cash flows will affect the result of the analysis.

## **2.1.2.2 Total Life-Cycle Cost and Levelized Cost of Energy**

### **1. Total Life-Cycle Cost**

#### ***Introduction***

Total life-cycle cost (TLCC) analysis is used for evaluating differences between costs and the timing among alternative projects. TLCCs are the costs incurred through the ownership of an asset throughout its life cycle or a period of interest. Only those costs relevant to the decision should be included in the analysis. TLCC analysis considers all significant money costs throughout the life cycle of the project. These costs are then discounted to a base year using present value analysis. Any revenue generated from the resale of the investment is also discounted to the base year and subtracted from the present value cost.

LCCA can also be used for prioritizing the allocation of funding to a number of independent capital investment projects within a facility or agency when insufficient funding is available to implement them all. This application involves the ranking of projects by their Savings-to-Investment Ratio (SIR) or by their Adjusted Internal Rate of Return (AIRR), supplementary measures of economic performance based on LCCA.

Since TLCC analysis is composed of many different costs similar to NPV analysis, the analyst therefore must know the form of the cash flow regardless of current or constant budget, so the correct discount rate can be applied.

### ***Discussion***

Analysis for the government, non-profit organizations, and the residential sectors does not require income taxes. State agencies and non-profit organizations do not pay income taxes whereas residential customers invest in the services which do not generate profits except home mortgage or home equity funding. Normally, analyses on these groups will include lifespan cost, whereas private industry will be more concerned with the NPV of a particular investment.

Unlike LCCA, the Payback method generally focuses on how soon the initial investment can be recovered. Hence the method is not a measure for long-term economic performance or profitability. The Payback typically ignores all costs and savings occurring after the payback is due. It does not differ among project alternatives having different lives, and that it often uses an arbitrary payback threshold. Moreover, the simple Payback method, which is commonly used, ignores the time-value of the money when comparing the future stream of savings to the initial investment cost.

LCCA is a powerful tool for economic analysis. Such method requires more information rather than analyzing the first-cost or short-term considerations. Understanding on the concepts from discounted cash flow, constant versus current dollars, and price escalation rates is required. The alternative, however, is to ignore the long-run cost consequences of investment decisions, to reject profitable investment opportunities, and to accept high utility costs.

## **2. Levelized Cost of Energy**

### ***Introduction***

The Levelized Cost of Energy (LCOE) allows alternative technologies to be compared when different scales of operation, different investment and operating time periods, or both exist. For example, the LCOE could be used to compare the cost of energy generated by renewable resource with standard fossil fueled generating unit.

### ***Discussion***

The LCOE is the cost that, if assigned to every unit of energy produced or saved by the system over the analysis period, will equalize to the TLCC when being discounted back to the base year. LCOE is recommended for use when ranking alternatives is given a limited budget. It is because the measure will provide a proper order to the alternatives, which may then be selected until the budget is expended. LCOE is not recommended when selecting among mutually exclusive alternatives because different investment sizes are not included for considered an investor will choose to invest more in an

alternative with more favorable returns). This shortcoming may be corrected by applying LCOE to the incremental cost of the alternatives.

### **2.1.2.3 Internal Rate of Return and Modified Internal Rate of Return**

#### **1. Internal Rate of Return**

##### ***Introduction***

The Internal Rate of Return (IRR) for an investment that has a series of future cash flows i.e.  $F_0, F_1, \dots, F_n$ , is the rate that sets the NPV of the cash flows to zero. The IRR analysis enables a wide variety of investment activities. However, IRR is not recommended when evaluating further investment after return is required. It is because downstream investments are improperly discounted and multiple positive IRR values can occur. IRR is commonly used for accepting or rejecting decisions, enabling a rapid comparison with a minimum acceptable rate of return or hurdle rate. IRR is not recommended when selecting among mutually exclusive alternatives. It is because the value of different investment sizes are not considered. The investor will prioritize investment in an alternative with more favorable returns. This shortcoming may be corrected by applying IRR on an incremental basis. IRR is also not recommended for ranking the projects because IRR implicitly assumes reinvestment of returns at the IRR.

The viability of a project is usually assessed by comparing the IRR of the project with a “hurdle rate” that represents the IRR of the second alternative or the opportunity cost of capital. IRR also has advantage that can be directly compared with the after-tax return available in financial products such as bonds. Hence the investor is entitled to rapid qualitative assessment of the project.

##### ***Discussion***

The equation for IRR is a polynomial of degree  $N$ . Hence the analyst must be aware that there are different roots, solutions, and equation. However, when the investment pattern is normal and the initial investment or cash outflow is followed by a stream of cash flow, all solutions are either negative or imaginary, except for positive solution. On the other hand, if the cash flow and large, outflows occur during or near the last phase of the investment, then the possibility of multiple positive roots will arise.

## 2. Modified Internal Rate of Return

### *Introduction*

For any project having different scales and lives, it is possible for different ranking criteria, such as NPV and IRR, to produce conflicted results because of differing reinvestment assumptions. The NPV method assumes reinvestment at the discount rate, whereas the IRR method assumes reinvestment at the IRR rate. The Modified Internal Rate of Return (MIRR) accounts for varying reinvestment rates and that it should be used in these circumstances. MIRR is calculated by assuming that all cash inflows received before the end of the analysis period are reinvested at the discount rate until the ending period of the analysis. The terminal or future value amount is then discounted back to the base year. MIRR is the discount rate that will equate the present value in the base year of the terminal amount to the present value of all investment costs.

MIRR is not recommended when selecting among mutually exclusive alternatives because the values of differing investment sizes are not considered. The business owner will choose to invest more in an alternative with more favorable returns. This short coming may be corrected by applying MIRR on an incremental basis. Because MIRR will provide the proper ranking of projects to be selected to maximize the total return given a limited budget, MIRR is recommended when ranking alternatives.

### 2.1.2.4 Net Present Value

#### *Introduction*

The NPV of a project is a way of examining costs or cash outflows and revenues or cash inflows. NPV analysis can be composed of many different costs and revenue streams. The analyst must know the form of the different streams, so the correct discount rate can be used for the present value analysis. Alternatively, the cash flows can be adjusted to reflect the form of the discount rate.

NPV analysis is recommended when evaluating investment features and decisions such mutually exclusive projects and social costs. With mutually exclusive projects, NPV does not fail to recognize the difference in the sizes of investment alternatives. For social costs, NPV is not only acceptable but also commonly used when evaluating investments from a societal perspective. It is also recommended that NPV be used in most other evaluations as specifically as a secondary measure to check the validity of any primary measure.

### ***Discussion***

The positive NPV shows that the investment is economical. The investor would have been indifferent as to whether to make the investment had the NPV been zero. Meanwhile a negative NPV would have indicated that the returns are worth less than the initial cash outflow and the investment is not a good one.

Although the positive NPV indicates that this is a good investment, the analyst must be careful. Good investments are not necessarily the best ones.

## **2.1.2.5 Savings to Investment Ratio**

### ***Introduction***

A variation of the benefit-cost ratio (B/C), also known as the savings-to-investment ratio (SIR), is used when benefits occur primarily as cost reductions. Although SIR is basically a B/C ratio, there is a computational difference. B/C ratio is typically calculated with all benefits in the numerator and all costs in the denominator. In the calculation of SIR, only the principle investment costs are included in the denominator. All other costs are subtracted from the benefits in the numerator. This essentially makes the numerator a measure of net savings.

### ***Discussion***

The SIR ratio is recommended in ranking analyses if costs predominate. It is simply because SIR can properly rank projects to be selected until the budget is exhausted. SIR is not recommended for use when project specific debt financing is present because of the issue that the investment is defined as either the only equity portion or the total investment. SIR is also not recommended when selecting among mutually exclusive alternatives because differing investment sizes are not considered. This shortcoming may be corrected by applying SIR on an incremental basis.

The higher the SIR ratio, the greater the average savings per money expended. For example, an SIR of two can be interpreted that the investment will save two money units on average for every unit of money invested, over and above the required rate of return reflected in the discount rate.

The constraints for B/C ratio outlined earlier can also be applied to the SIR. The SIR can be used in accepting or rejecting decisions for single projects. SIR cannot be used reliably to find optimal sizes or designs of investment alternatives unless the analysis is based upon the incremental rather, not total savings and costs.

### 2.1.3 Evaluation criteria guide

This section presents different measures of the economic value of investment. Whichever measure used for evaluating the investment is determined by several factors. These factors include the investor's perspective, regulation, risk, financing, cash flow in comparison to mutually exclusive alternatives, similarity of alternatives' benefits, whether the investment is fully defined in term of its size, use, and so forth. Most of the economic measures are valid for most investments, and it is usually a good idea to compute several of the measures to better evaluated the investment. However, certain measures are inappropriate for some investments. The use of the internal rate of return to compare two projects with significantly different return is available through reinvestment of the cash inflow.

The following table is a reference for identifying the appropriate economic measure for different investment features and decision criteria. Letters in the table indicate whether the measure is recommended(R), generally not recommended (N) or commonly used (C). A blank cell signifies that the measure is acceptable.

**Table 2-1: Overview of Economic Measures Applying to Specific Investment Features and Decisions**

	NPV	TLCC	IRR	MIRR	SPB	DPB	SIR
Investment after return			N				
Regulated investment							
Financing					N	N	N
Risk					C,R	R	
Social costs	C,R						
Taxes					N	N	
Combination of investments							



Type of Decisions	Evaluation Criteria					
	Payback SPB, DPB	TLCC and Supplements			NPV and Supplements	
		TLCC	NS	SIR	NPV	IRR, MIRR
1 Accept / Reject	Yes (for Screening)	Yes (minimum)	Yes (>0)	Yes (>1.0)	Yes (maximum)	Yes (>discount rate)
2 Level of Efficiency	No	Yes (minimum)	Yes (maximum)	No	No	No
3 System Selection	No	Yes (minimum)	Yes (maximum)	No	Yes (maximum)	No
4 Ranking Project Priority (Independent Projects)	No	No	No	Yes	Acceptable*	Yes

\* NPV is acceptable but requires evaluation of each combination of different investments the meets the budget constraints.

R – Recommended N – Not Recommended C – Commonly Used  A blank cell indicates that the measure is acceptable.	
<b>Economic Measures</b> NPV – Net present value TLCC – Total life-cycle cost IRR – Internal rate of return MIRR – Modified internal rate of return	SPB – Simple payback period DPB – Discounted payback period SIR – Saving-to-investment ratio

### 2.1.3.1 Explanations for the Economic Evaluation Measures Matrix

#### 1. Investment Features

*Investment after return:* A significant investment (net negative cash flow in the year) is required after the investor has received some cash inflow from the project.

Explanation of Entries: IRR is not recommended because a net negative investment after a positive return can result in multiple positive IRR values, and because downstream investment are improperly discounted at the IRR, not at the investor's discount rate. MIRR is acceptable because it avoids both of these problems with IRR.

*Regulated investment:* The recovery of costs of an investment is regulated by the government.

Explanation of Entries: Required revenues are recommended because this is normally the basis on which such investments are defined to the regulators.

*Financing:* This entry refers to the evaluation of investments requiring project-specific debt financing. The evaluation may be compared to those capitalized only through equity financing or corporate debt financing accounted by the discount rate, which reflects the cost of both equity and debt.

Explanation of Entries: Payback measure may be used to get a quick sense of a project ignoring the financing. However, the explicit consideration of financing significantly complicates the analysis, eliminates the simplicity advantages of these measures. Thus, payback measures are not recommended when financing is to be explicitly considered. The saving-to-investment ratio is not recommended because of the issue of whether the investment is defined as only the equity portion of the investment or the total investment.

*Risk:* All investments pose some risk that they will not provide the promised returns. For those investments with significant uncertainties, risks would be explicitly considered.

Explanation of Entries: Payback measures are recommended because they provide a quick assessment of the period the investor's capital is at risk. More formal evaluation of risk e.g. decision analysis is also recommended.

*Social costs:* The full cost of an alternative, including both direct costs such as capital costs and operation and management (O&M) costs as well as external costs such as environmental costs and all costs incurred by the society will be considered.

Explanation of Entries: Net present value and benefit/cost ratios are acceptable and are commonly used for the evaluation of investments from a social perspective, and therefore, are recommended measures.

*Taxes:* Taxes affect the value of most investments and, therefore, can be considered explicitly in all but the most rudimentary analyses.

Explanation of Entries: Inclusion of taxes in payback calculations complicates the analysis, eliminating the simplicity advantages of payback measures. Therefore, payback measures are not recommended.

*Combination of Investment:* Occasionally an investment in energy technology will have an impact on the cost, performance, or value of another energy investment. For example, the use of one item will decrease the value of a more efficient of the other item. In these cases, the investments should be evaluated as a combined system including single investment, with the cost, performance, and value reflecting the attributes to the combined system.

Explanation of Entries: All measures are acceptable subject to the other considerations, as given for the other investment features and types of decisions.

## **2. Investment Decisions**

*Accept/reject:* A single investment is under consideration. It can either be accepted or rejected.

Explanation of Entries: TLCC and IRR are not recommended because they provide no frame of reference as to what area acceptable costs and they do not consider benefits and returns. IRR is acceptable within the constraints mentioned in the Investment Features portion of the matrix and is commonly used for many accept/reject decisions because it allows a quick comparison with a minimum acceptable rate of return that represents the opportunity cost of capital to the investor.

*Ranking:* Ranking of investment alternatives is used to select one or more investments from a set of non-mutually exclusive investment alternatives. Usually the selections are constrained by the budget, cash flow, or other resources. The objective of the analysis is to select the set of investments that will maximize the value to the investor from the available funds.

Explanation of Entries: TLCC is not listed as “recommended” because it does not explicitly consider benefits and returns. IRR is not recommended because it implicitly assumes reinvestment of returns at the IRR. Payback methods are not recommended because they ignore returns after the payback. NPV is acceptable but requires the evaluation of each combination of different investment. MIRR and SIR are recommended because they provide the proper ranking of projects, which are then selected in the order of their rank until the resource budget is exhausted.

## **2.2. Special Consideration on Industrial Energy Efficiency Project Evaluation**

This section is included to identify special situations that might occur during an energy efficiency analysis and to provide guidance when these situations arise. This section will address some situations of the system boundaries, optimal sizing, externalities, government investments, O&M expense, major repairs and replacements, salvage value, unequal lifetimes, and retrofits.

### **1. System Boundaries**

Many times it is necessary to include the entire system in an analysis. For example, the analyst must compare a wind system with a conventional peak-load generating system. These alternatives offer potentially different services, and in order for the comparison to make sense when the entire utility system may have to be evaluated.

The need to extend a system's boundary beyond the direct boundary may occur in end-use markets as well as in utility investments. For example, a daylighting system will have different impacts on the space heating and cooling requirements of a building than those of a conventional lighting system. These different impacts can be addressed either by including the entire heating, ventilating, and air conditioning systems in the analysis. In turn, the building shell, or the value of the impacts determined may be included for analysis.

## **2. Sizing a System**

Equipment sizes for most systems would be individually designed to fit the particular situation. If the engineering analysis has been done correctly, then the economic analysis for determining optimum size is simply the same as the economic analysis used in making other mutually exclusive decisions. Once the range of acceptable alternatives has been established, the various sizes are compared to one another. It is important to include the cost of backup systems, should they be necessary for a particular technology. The standard measures used for analysis are the levelized cost of energy (LCOE) and the savings/investment ratio (SIR).

## **3. Externalities**

For non-utility investments, the approach is a little less clear. If the costs or benefits associated with the externality cannot be measured, the analyst may have no choice but to leave them out of a quantitative analysis and simply mention them in a qualitative analysis. If it is deemed necessary to quantify the externality, the analyst may go one step further and express the externality in units other than money, such as units of particulates per unit of output in the case of pollution. This method at least provides the decision maker with information about the size of the externality.

It is also a good idea to conduct a sensitivity analysis of the results with respect to the measured cost and benefits of the externalities. Many times the values assigned to specific externalities are provided as range, and sensitivity analysis on this range of values should be performed. In some cases, the inclusion of such costs and benefits will reinforce the results of the analysis in the absence of the costs and benefits. In these cases, they may be appropriate to exclude.

## **4. Government Investments**

For many government investments, the perspective can be broadened to include not only the costs and benefits to the government and any direct beneficiaries but also to indirect beneficiaries. For example, government research on light-emitting diode (LED) will benefit everyone, not just the LED industry and its customers, because an increase in LED use will help reduce overall demand and reduce prices of conventional fuels. However, some economic evaluations of government investments will require a private investor perspective. For example, once the government makes the decision to sponsor LED research, an economic evaluation from a private investor perspective would be

performed to determine if the new technology will have to be successful in the marketplace.

## **5. Operation and Maintenance**

There is no absolute standard to costs included in O&M. Frequently recurring labor and materials costs required to keep a system in operation are normally included. Infrequent major repair and replacement usually should be considered separately. However, these major replacement costs can be annualized and included with O&M. This occurs more frequently in the analyses of systems for which energy is a minor cost component.

Regardless of costs are included in O&M, they can be broken into the following categories: those costs that occur only when the system is operating, variable O&M costs, and those fixed costs that do not vary with the output of the system but rather are required to keep the system in an operable state. Energy costs are typically variable O&M, whereas labor costs are frequently fixed O&M.

Whatever the O&M costs are for the first year of operation of a system, they will most likely increase with inflationary pressures and as the system gets older and more maintenance is required. Here again, it is difficult to estimate how rapid the increase over time will be. The typical assumption that O&M costs will increase at the same rate as inflation is reasonable in the absence of any data to the contrary.

## **6. Major Repairs and Replacements**

Many renewable and conservation systems have components that will need to be repaired or replaced during the analysis period. If these are annual adjustments, such as an air filter, costs can then be included in the annual operating cost estimates. On the other hand, there may be the large, significant adjustments that need only be done once or twice during the analysis period. The costs of these larger repairs or replacements would be explicitly included in the analysis.

The common method of accounting for these significant repairs and replacements is to assume that the repair or replacement occurs at the end of the component's lifespan, discount the repair or replacement cost to its present value at the beginning of the analysis period, then add it to the initial investment cost. The present value of the repair or replacement cannot be added to the initial investment costs before the investment cost is multiplied by factors that compute properly taxes and insurance etc.

## **7. Salvage Value**

Salvage value is the value of an investment remaining at the end of the analysis period. If an investment can be resold or recycled, a positive salvage value will exist. On the other hand, if the investment must be dismantled or destroyed, a negative salvage value will exist. In most cases, salvage value is estimated as the resale value of the investment. Another method is replacing the cost of the investment with that of equal

characteristics and conditions. Still another method is to equate salvage value to the unamortized portion of the original or replacement costs.

For all economic measures, except payback, salvage value is treated as a revenue stream at the end of the evaluation period. Salvage value is not accounted for calculating depreciation for tax purposes using an accelerated depreciation method. However, an asset may not be depreciated below a reasonable salvage value.

## **8. Unequal Lifetimes**

Many of the measures introduced up to this point present useful, unbiased results only if the two compared investments have equal lifespan. Those measures affected the most by unequal lifespan required revenues, and internal rate of return. The inequity of comparing alternatives with different lifetimes using cost measures such as life-cycle cost arises because the costs of the long-period investment are summed. Benefits that occur over the long period are often ignored. With measures such as the internal rate of return, the inequities, which are less obvious, are a result of uncertainties including these questions: will it be possible to reinvest in a similar short-lived investment at that time? And will the same financing and tax depreciation be available then?

## **9. Retrofits**

In the economic analysis of retrofits, the analyst must not determine only if it is economical to retrofit, but also when it would be most economical to retrofit. If conventional fuel prices are predicted to rise substantially in a couple of years, then it may be more economical to wait and retrofit in two years.

Determining the appropriate time to retrofit is difficult because the useful life of the retrofit investment ends for each alternative at a different period. This complexity is minimized by comparing only two alternatives at a time, with the second alternative representing investment in the retrofit a year later than the first alternative.

For analyzing which the O&M costs are non-monotonic, the retrofit costs including operating, capital, and so forth vary, or both, the previous approach may yield only a local optima, and additional comparisons may be necessary between retrofits separated in time by more than a year. Even when all costs are expected to be unchanging over time, there is some risk that they will change, altering the optimal time to retrofit. The analyst may consider uncertainties in the analysis and its conclusions.

**PART 3**

**Recommendations to Strengthen the Financial Package for the Industrial Energy Efficiency (IEE) Project**

### 3.1 Financial Barriers of Industrial Energy Efficiency Project

#### 3.1.1 Credit Constraints Arising from Financial Process

For most of the Banks' point of view, the obstruction of the IEE credit growth in Thailand lies on the Demand Side, which the project owners has less interest in investment rather than the supply side, which is the bank part. Most of the banks usually show their readiness to provide the energy credit for the recent customers.

As seen from the previous section, the financial burden indirectly occurs during the Credit Underwriting Process, resulting in the slowdown of the IEE Projects investment. The burden of the supply side can be identified according to their significance levels as follows:

**Table 3-1: Credit Constraints from Financial Process**

Burden Points	Level of Significance		
	High	Medium	Low
IEE Credit Product	✓		
Credit Features		✓	
Customers Group	✓		
Credit Underwriting Process			✓
Service Channel			✓
Credit Consideration Concept			✓
Credit Perspective	✓		
Credit Approval Criteria		✓	
Knowledge of Staff	?		

#### 1. IEE Credit Product

As most of the banks do not develop special energy efficiency credit product, there are not any credit features, procedure, conditions and evaluation criteria that suite the IEE Projects. This does not encourage the investors to borrow the money for their investment, and becomes the most encumbrances for the investment.

#### 2. Credit Features

Credit features connect directly to the energy efficiency credit product development. If the special credit for the energy efficiency products cannot be provided by the banks, the credit features for general business will be then applied. Therefore, there will be no special key features for the incentives receiving from the interest rate, fees, credit period, collateral etc. for the project's offer.



### **3. Customers Group**

In the special credit product development, most of the banks set up the target group as a minimum annual income or minimum credit line that meet the profit making of the bank. This makes it difficult for small entrepreneurs to access that special credit. Consequently it becomes the major problem in promoting energy efficiency to all sizes of industries nationwide.

### **4. Credit Underwriting Process**

The credit underwriting process for the credit approval involves several sections. Many sections use more time to proceed the issue and may make lost in data transfer. This is not regarded as a major constraint to the process.

### **5. Service Channel**

Most of the banks established the channels for the investors to propose their projects. One of them is the Business Center and the other is through the Customer Relations Center at the head office. The process and the time for consideration of these two channels are similar. Generally, the customers who live in the rural area may have to spend more time than those who are in Bangkok where they can submit the project proposal directly at the head office. However, this is not a serious case.

### **6. Credit Approval Criteria**

The 5Cs—capital, character, capacity, collateral and conditions—of the Credit has been used for decades as the credit consideration criteria worldwide. This criteria then seems not to be the hindrance of the financial business.

### **7. Bank's Credit Perspective**

Most of the banks do not usually consider the IEE Projects as the Project Finance. This may, therefore, lead to a major obstruction to both investors and the banks as follows:

- 1) For the bank part, the credit consideration would be concentrated on a small size of IEE projects. But when the bank considers it as the Corporate Finance, it will increase the bank's transaction cost and consequently, affecting the ability to make a profit. As a result, the customers will not be able to bargain any special interest rate from the bank.
- 2) For the investor part, the credit consideration by the bank in the form of "corporate finance" would affect the investor. The reason is that the corporate finance process would spend more time and require more information, making it inconvenience for the investor interested in implementing the projects.

### **8. Credit Approval Criteria**

Most of the banks pay attention to the Ability to Repay Ratio especially DSCR. Practically, the criteria with high flexibility could be adjusted to suite the

risk from circumstance factor. This is due to the fact that the ratios have been calculated from a corporate cash flow via numerous data collection and analysis.

### **9. Knowledge**

During the process of the credit consideration, numerous fields of risk analysis would be conducted such as the market risk, financial risk and technical risk. Most of the financial staffs have high potential in assessing the market and financial risks but have limited technical risk assessment skill.

Many engineers who work as customer relations managers and credit analysts in most of the commercial banks still lack their knowledge about energy efficiency technologies. The banks consider the issue as best challenge for their financial staff to learn more about the technical know-how about financial perspective in a bid to gain the potential in technical risk analysis.

Some banks encourage their staff to learn more about financial risk rather than know every single issue. They usually leave any responsibility for the technical risk with energy consulting companies.

### 3.1.2 Opportunity to Tackle the Barriers

With the information mentioned above, there would be certain opportunities to tackle barriers from processing the credit consideration as illustrated in the following table:

**Table 3-2: Opportunity to Tackle the Barriers**

Burden Points	Significance			Opportunity in Mitigation		
	High	Medium	Low	High	Medium	Low
Credit Product	✓				✓	
Feature		✓			✓	
Target Group	✓				✓	
Credit Underwriting Process			✓			✓
Channel of Service			✓			✓
Credit Consideration Concept			✓			✓
Credit Perspective	✓					✓
Credit Criteria		✓				✓
Knowledge	✓			✓		

The table shows different level of opportunity to reduce the problems which would be explained as follows:

1) Low opportunity

Problems occurring from the credit underwriting process of the banks have low opportunity to be tackled. Because the process such as Channel of Service, Credit Consideration Concept, Credit Perspective and Credit Criteria has been set up by the banks and vary according to the banks. The process does not affect the investor access to the credit, yet it is difficult to be changed. The only important process which is affects the credit access is the Credit Perspectives of the banks.

2) Medium Opportunity

The medium opportunity to reduce barriers lies under the credit product development, credit types and target customers. They all are interconnected and important. Although they are the internal matters, the banks would keep them developed as it is the market issue which is dynamic and competitive. This is regarded then as the medium opportunity for the banks in order to reduce this hurdle.

3) High Opportunity

To help reduce the credit process constraints, banks recognize the importance of capacity building to be rendered to their staff. Sufficient knowledge of

relevant staff to get reliability of the process consideration of credit work to IEE projects have been left behind. Therefore, initiatives to build up knowledge, understanding and skills for their staff would be taken into account. Capacity building tools such as trainings and seminars in technical and financial issues should be available. It is believed that this is the high opportunity to help reduce any problems arising during the credit consideration process.

### **3.1.3 Key Recommendations**

There is a feasible opportunity to access the project's finance if all stakeholders and financial institutions cooperate and extensively work together to encourage the mindset change of the credit type consideration. This has yet to be defined since internal management remains the most difficult factor to be left out.

If the financial institutions change their mindset in IEE Project credit consideration from the Corporate Finance to the Project Finance, the energy credit product development can be promoted with key features of the credit. This product may in turn encourage the credit growth because it will intensify investors to invest in energy efficiency projects. Besides, this change may result in a short-cut process of credit consideration. It also reduces the administrative cost, time and tedious task and encourages a widespread of the customers. The banks' mindset changing can be made by boosting knowledge and understating to repayment risk of IEE projects differentiated from other business projects.

#### **Key recommendations for reducing the credit process constraints:**

##### **1. Capacity Building**

It would suggest that banks would increase their potential capacity to credit consideration by changing their perception from Corporate Finance to Project Finance. The following approaches may be useful for related banks' personnel.

- A training course designed on IEE characteristics for the bankers would be taken into consideration. The course content may include the risk management both technically and financially. The concept is to change banking perspective towards IEE projects from the corporate finance to the project finance. The followings are main points of the concept:
  - a) To decrease the technical risk in IEE projects and make it easy to manage.
  - b) To create common understanding towards evaluating and mitigating technical risk by using either ESCO or non-ESCO tools.
  - c) To create understanding towards the risk of the IEE Projects that either investment or new expansion is less than other business projects.
  - d) To create common understanding that IEE Projects have low financial risk due to many reasons including clearer benefit assessment when compared

to other general projects, short- term debt repayment, small amount of investment and low cash flow compared to the cash flow from operating activities.

- Banks would consider prioritizing capacity building among staff at all levels. There are sections where priority would be given. The most important one is the Credit Product Section as it deals mostly with all types of works starting from the very beginning of the process, and with most of the customers. Other capacity building approaches would also be applied to sections related to a credit underwriting ranging from the credit policy, customer relationships, finance analyst, finance screening and possibly to credit sub-committee secretariat. In addition, head of the section should participate in the technical training as well.

**Table 3-3: Example of Curriculum for Training**

Curriculum	Details	Days	Participant	
			Section	Level
IEE & RE Technologies	Advance and Common Energy Technologies and Cases Study	2	Credit Support, Product Development	All
Risk Management	Technical Risk Management	1	Credit Support	All
Energy Policy and Measures	Government Policy on Energy Projects	0.5 - 1	Executives, Product Development	All

## 2. Credit Product Development

- The development of IEE Credit Products and common credits would be considered as separated products because their credit size, benefit, security management and the important factor in risk management are different in nature.
- It is important for the IEE Credit to set up the key features of motivation for the entrepreneurs to invest more intensively in energy projects. The basic features of the IEE Credit can be listed as follows:

**Table 3-4: Proposed Energy Efficiency Financial Product**

Parameter	Description
<b>Target Group</b>	Entrepreneurs - All categories and sizes
<b>Credit Line</b>	No credit limit but cover investment cost, pre- and post-installation
<b>Credit Term</b>	Consider from Cash Flow generated from energy saving
<b>Grace Period</b>	Consider from Cash Flow generated from energy saving
<b>Collateral/Security</b>	Current Collateral/Security
<b>Interest Rate</b>	Lower rate than the common credit
<b>Fee</b>	Credit without Fee
<b>Other Conditions</b>	Current Customer

### 3. The Overall Credit Consideration

It would be reiterated here again that the consideration of credit approval for IEE projects of the banks is mostly based on the corporate finance which makes the investors difficult to get access to the credit. If the banks change their mindset and regard the IEE project as the project finance which takes less time and more compact, then there will be some crucial points to be considered as follows:

- Unlike the normal credit gained from banks, the IEE Project can normally be defined as a small credit line. Increment of debt from IEE Projects has affected neither the DE Ratio nor the Debt Service Coverage Ratio (DSCR). In consideration to the energy credit for current customers, there would be a 100% of credit investment cost or 100% of Credit to Value. If the current customers had good record of repayment, it is possible that the banks will consider only the financial ratios of the energy efficiency project, not the corporate statement.

**Table 3-5: Credit Consideration**

Criteria	Financial Ratio	Propose
Ability to Repay	Debt Service Coverage Ratio	Project
Debt Level	Debt to Equity	No consideration
	Loan to Value	100%

- Banks may consider that the development of templates for credit proposal and financial projection would make the credit consideration more convenient and accurate.
- Banks may consider the energy ratios in conjunction with the credit consideration. These ratios consist of Total Life Cycle Cost, Levelized Cost of Energy (LCOE) and Savings to Investment Ratio, etc.
- Banks may consider the decentralization of energy credit approval to local branches nationwide for easy access to the credit.

### 4. Support from Government Offices and Energy Network Agencies

For IEE projects, banks alone cannot promote them to the extent that they can fulfill the target of national energy efficiency development. Government and energy network agencies have to take their vital roles in supporting the banks and the private sector to achieve competitive market competition and socioeconomic sustainability. Several issues therefore need to be taken into consideration as follows:

- Capacity building for the financial staff needs to cooperate with numerous energy agencies such as the Institute of Industrial Energy, Energy for Environment Foundation, as well as companies with energy expertise. This is to ensure the achievement of conducting the training courses/seminars.

- A soft loan would be provided for financial institutions, and would be similar to Energy Revolving Fund. This aims to reduce a unit cost of the banks for the small IEE Project. Currently, the Energy Revolving Fund was terminated, and there is no single bank to further develop the credit products especially for the energy efficiency projects. The credit line of the soft loan for the suitable IEE project size is set at less than 50 million THB.
- With the cooperation between the Thai Bank Society and the Bank of Thailand (BOT) to seek an adjustment of the credit risk reserve measures for IEE projects, the amount for the banks to be reserved will be at 8.5% following BIS Ratio (Basel II). Any adjustment of the credit risk reserve will reduce the bank's cost indirectly, and eventually increase the capability of interest rate reduction to the IEE Projects.
- The government sectors responsible for promoting energy efficiency would take into account the further study on alternative financial options to promote energy efficiency projects such as:
  - a) Green Bank or Clean Energy Finance Corporation.
  - b) Loan Loss Reserve Fund to compensate a loss occurring from the credit. The Fund may be compensated in 2 forms 1) full compensation with limited time and 2) proportion compensation of the Credit.
- The utilization of ESCO confidence would be suggested through a verification process of ESCO's results. Meanwhile, energy efficiency products available in the market, the registration and arrangement of the technical provider would be performed as well.
- Certain stakeholders such as the Provincial Electricity Authority (PEA) and the Metropolitan Electricity Authority (MEA) would be encouraged to apply the right transfer of cash back generated from electricity saving.

As banks are classified as the large organizations with several sections, there is a need for those government sectors or network agencies, which seek cooperation with the banks, to comprehensively understand the banks' structure. Many sections of banks such as the SMEs credit would comprise more than 10 units which are SMEs Business Relationship Manager, SMEs Business Financial Analyst, SMEs Business Credit Production, Government Relationship, Governmental Financial Analyst, Government Production Development, Credit Analyst, Credit Verification, Credit Standard, etc.

#### **3.1.4 Obstruction in Accessing to Credit from the Business Owners**

According to the banks' perspective, the obstructions of IEE Project credit growth are derived from the demand side, i.e. from factories or building owners. These obstructions can be summarized as follow:

**Table 3-6: Obstruction in Accessing to Credit from the Business Owners Perspective**

Obstruction Type	Importance		
	High	Medium	Low
Project Features	✓		
Financial Proposal and Financial Projection	✓		
Financial Statement	✓		
Direct Cost and Indirect Opportunity Cost		✓	
Capital Status		✓	

### 1. Project Features

Some of business owners may not be interested in Industrial Energy Efficiency (IEE) project investment due to:

- The benefit from IEE Project is much lower than the Core Business
- Most of business owners pay their attention to the market activities rather than production activities
- Even though the IEE Projects have low investment cost and low return in a long period of time, lots of information has still been prepared as similarly treated as other types of credit.
- An asset value of the IEE Project used for a bank collateral is quite low due to the following reasons:
  - 1) The equipment which is the major asset in IEE Project is appraised with lower value than other asset types, and
  - 2) The investment cost of IEE Projects includes not only equipment cost but also the cost that cannot be used as collateral such as demolition the expense of the old equipment, installation cost of the new equipment, technical consulting fee etc.

### 2. Financial Proposal and Projection

Financial proposal and projection are very important in convincing the banks to approve the projects. The preparation of complete and precise financial information and documents of the projects are essentially needed. At present, the financial proposal and projection submitted by the business owners can be grouped in 4 different presentation forms. The details of these groups are illustrated in the following table:



**Table 3-7: Financial Proposal and Projection**

Presentation Form	Accuracy of Information	Reliability of Information	Completion of information	Necessity
Financial Plan	High	Medium	High	High
Business Plan	High	Medium	High	Low
Feasibility Study	High	Medium	High	Medium
Personal Interview	Low	Low	Low	High

- Although, the banks do not require the business owners to submit the project proposals in the form of a documentary report, the information proposed to the banks in the forms of documents, e.g. Financial Plan, Business Plan or Feasibility Study will help them quickly and accurately prepare the complete report on financial projection. This would help the entrepreneurs gain advantages.
- There are some banks which do not necessarily require the business plan or feasibility study. However, the banks would rather need the financial plan with clear and reliable assumption. Several materials are then needed as evidence to confirm the assumption which includes details of investment including cost and equipment, energy saving per unit and forecast of energy cost both before and after the project.
- There are many entrepreneurs who do not have potential, time or skills to prepare the financial projection and that they hire financial advisors to work for them. However the banks seem not to have confidence in accountability and caliber of the advisors.
- Prepared by the financial advisor, a strategic business plan is written for using as the attached document with the credit request. The banks sometimes need this document as part of the information for strategic planning and preparation for supporting their clients in the long run.

In the case where the business owners could not provide the banks with the project proposal, the banks will take care of financial analysis for their clients. However, it will take longer time than having documents readily prepared from the business owners' end. Sometimes the result may be considered as "infeasible" wasting the time of both the banks and business owners.

- Some banks, which are especially the state owned enterprises, have provided training for business owners on the capability to continuously prepare the business plan for many years.
- Some banks would suggest the business owners to provide the Financial Projection by a Scenario Analysis that uses three cases of assumptions namely; Base Case, Worst Case and Best Case.

### 3. Financial Statement

Most of Business Owners' Financial Statement is not certified by a qualified auditor. The statement does not reflect the actual business because of tax issue and lacking complete financial system, and could increase time and cost on clarification of figure accuracy appeared on the financial statement. In many cases, bank found it incomplete and inaccurate.

### 4. Cost and Indirect Opportunities Cost

Some business owners do not invest in the IEE projects. The following are the project costs which occur during the project operation :

- Old demolished equipment and mobilization costs
- Loss occurring from the temporary shut down or production decrease due to inconvenience in production line. The business owners spend time on the ESCO report or the financial adviser's document. The paperwork is time-consuming and inconvenient.

### 5. Capital

Some business owners have to reserve their accumulated profits for their business activities, such as working capital, business expansion or reserve for unfavorable cases. Therefore, such profits could not be used in energy efficiency projects.

#### 3.1.5 Opportunities to Mitigate Obstruction for Business Owners

**Table 3-8: Opportunities to Reduce Barriers for Business Owners**

Obstruction	Level of Obstruction			Opportunity		
	High	Medium	Low	High	Medium	Low
Project Features	✓					✓
Financial Proposal and Financial Projection	✓			✓		
Financial Statement	✓					✓
Direct Cost and Indirect Opportunities Cost		✓				✓
Capital Status		✓				✓

The opportunity to reduce barriers of processing the credit of the business owners is summarized as follows:

## 1. Low Opportunity

- When proceeding the project proposals, the business owners face the constraints from internal management and operation for example, cost and indirect opportunity cost including capital status. Since internal management is not easily changed by external mechanisms, these barriers are difficult to be reduce and therefore become low opportunity for business owners.
- A financial statement seems to be a major obstacle for credit consideration. Related agencies have tried to tackle this problem for a long period time but to no avail. The problem is in fact business ethics. To solve this issue, expertise among staff in evaluating accuracy of financial statement is required.

## 2. Obstruction with High Opportunity in Mitigation

- The project proposal document may be prepared by either a business owner or a hired financial advisor. In some cases, financial projection excludes the project proposal due to lacking budget skill. Having been operating for 10 years, the Office of Small and Medium Enterprises Promotion (OSMEP) has realized the importance of a project writing for credit approval and that the training through several business societies on financial proposal writing as well as the financial projection template for related stakeholders are provided. In addition, some banks support the entrepreneurs on preparing documents related to credit consideration such as report writing training, hiring consultant as a report writing mentor and a consultant for preparing documents for the project. However, the activities focusing on the standard and reliable report are unsuccessful activities with the following reasons:
  - 1) Most of SME business owner spend their time with current operational management rather than a future business planning. This makes the business plan appearing in the financial projection not based on real data and suitable concept.
  - 2) The SME business owners lack report writing skills even though they have been trained to do so. They also do not have time for writing or preparing a report.
  - 3) Developed financial templates in the past are not updated to meet different characteristics of individual businesses.
  - 4) It is difficult to understand structure of the report and that the business owners do not use it in reality. Financial consultant usually prepare the contents such as vision, mission, value, corporate strategies and tactics, etc. instead.
  - 5) A Financial Projection, either prepared by business owner or financial advisor, usually has no problem with the calculation method, formula used or credit criteria if precise and correct assumption and reliable references are included in the financial project.

These issues may be solved through clear concept and precise supporting data. It is important to note that writing and calculation skills of the business owner may possibly not be taken into consideration.

### **3.1.6 Recommendation for Business Owners**

Recommendations on strengthening the potential to access the credit by the business owners and relevant agencies would be proposed as follows:

#### **1. Proposal Preparation**

Business owners would give some consideration of changing the outline of a report on Strategic Business Plan encouraged by the government, to the Feasibility Study of the project. The Feasibility Study would be preferable to the banks in terms of short and precise content. The topic outline of a Proposal for the IEE Project would contain:

1. Executive Summary
2. Purpose and Requested Credit Line
3. Energy consumption situation covering characteristic of energy use, type of energy, cost of energy, problem related to energy, etc.
4. Need, alternative and expecting output from equipment change.
5. Financial Statement estimation
6. Appendices

#### **2. Financial Projection Preparation**

The preparation of Financial Projection proposed to the banks could be short but concise and pertinent. The topic outline of the Financial Projection is similar to the Project Proposal and usually contains the followings:

##### **2.1 Financial Projection Overview**

The Financial Projection with information and assumption plays a major role in calculating financial ratio for credit approval. It is also an important tool for a business owner to calculate the Return on Investment (ROI). At present, most of the Financial Projections are prepared by using such flexible commercial software as Microsoft Excel.

However, the Financial Projection will be in the standard complete form comprising three parts: Cash Flow Estimation, Balance Sheet Estimation and Profit and Loss Statement Estimation. These parts will fulfill the financial ratio evaluation. Topics covered in the Financial Projection are:

1. Details of Investment
2. Change of Cash Flow Estimation
  - 2.1 Energy Cost
    - Amount of energy used

- Unit Cost of Energy
- 2.2 Maintenance Expenses
- 2.3 Other Expenses
- 2.4 Cost of Damage from Production
- 2.5 Operating Expense
- 3. Cash Flow Available for Debt Service (CFADS)
- 4. Interest & Repayment
- 5. Net Cash Flow

Financial Projection prepared by the business owners is similar to the one prepared by the banks. There are numbers being generated from activities connected to the calculation of Cash Flow Estimation, Balance Sheet Estimation and Profit and Loss Statement Estimation.

**Table 3-9: Financial Projection**

Activities	Balance Sheet	Profit and Loss Statement	Cash Flow Statement
Investment	Accumulated Depreciation	Depreciation	Cash for Investment
Change in Energy Cost and Other Expenses	Account Payable Stock	Cost of Sales	Cash for Production
Change in Administrative Expense	Prepaid Expense Accrued Expense	Administrative Expense	Cash for Management
Source of Fund	Outstanding Debt	Interest	Cash for Interest Repayment

## 2.2 Data and Assumption Used in Financial Projection

During implementing financial projection, it is crucial to remember that information used as the calculation base will be originated from the real business performance plus the figure hypothesis expected in the future and the need for business experiences as well as overall information.

The following table shows the data sources of information used in financial projection.

**Table 3-10: Data and Sources Used in Financial Projection**

Items	Details	Source of Information	Information	Assumption
Investment in IEE Projects	1. Cost in Demolition	ESCO & Supplier	✓	
	2. Cost in New Installment		✓	
	3. Cost of New Machine		✓	
	4. Income from selling old Machine			
	5. Administrative Expense		✓	
	6. Technical Consultation Fee		✓	
	7. Cost of Report Prepared by ESCO		✓	
	8. Useful Life			✓
	9. % Salvage Value			✓
Saved Energy	1. Annual Saved Energy	ESCO		✓
	2. Unit Cost of Energy	Research Unit		✓
Change in other production cost	1. Change in man power	Production Unit and Research Unit		✓
	2. Labor cost rate per head			✓
	3. Change in raw material			✓
	4. Unit cost of raw material			✓
	5. Change in maintenance cost			✓
	6. Change in expenses			✓
	7. Change in stock of raw material and finished goods			✓
Change in Operation Expense	1. Increase/Decrease of technical staffs	Technical Consultant		✓
	2. Wage of staff	Human Resources Unit		✓

### 3. Cost Benefit Evaluation of the Project

When banks consider approving IEE projects, they will not give much emphasis on their value investment. However, the feasibility study of the IEE projects will be beneficial for the project owners in terms of the effective cost and reliability to the banks. This would help the banks consider prioritizing the credit. Detailed evaluation of value investment would be taken into consideration as follows:

#### 3.1 Concept and factors used in an evaluation

The evaluation of value investment of IEE projects would be undertaken by comparing the project cost of investment and the cost benefit which will be derived in the future and transformed it into the present. The cost benefit will be used as an indicator with two following forms:

- 1) Return to the Project
- 2) Return to the Business owners

However, the return of the project depends on operation capacity in the resource efficiency management, profitability and liquidity except the debt ratio. And the return of the business owner depends on the debt ratio.

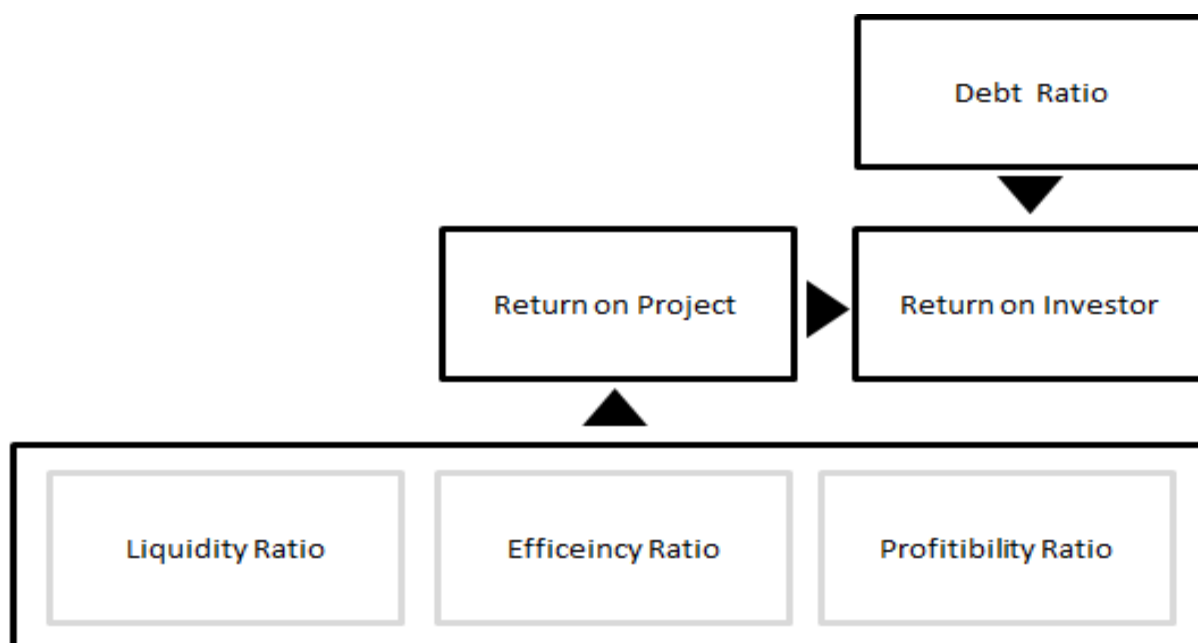


Figure 3-1: Concept and Factors Used in Evaluation

#### 3.2 Criteria for Project Evaluation

Business owners may use the financial projection template - the same approach to the bank as previously explained in Section 2 - as a calculation base for cost benefit ratio which can be subdivided into 3 groups as follows:

### 1) Economic Viability Ratio Group

Economic viability ratio is the most important for financial evaluation since it is evaluated according to the present value reflecting feasibility of investment value investment, cost effectiveness, and efficient resource utilization. The initial criteria would be proposed as the following Table;

**Table 3-11: Criteria for the Project Evaluation**

Criteria	Financial Ratios	1	2	3	Range
Economic Viability Ratio	Internal Rate of Return : Project	✓			>10%
	Net Present Value : Project	✓			>0
	Internal Rate of Return : Business owner		✓		
	Net Present Value : Business owner		✓		
	Simple Pay Back Period	✓			5 years
	Modified Internal rate of Return			✓	

### 2) Financial Ratio Group

Financial Ratio is calculated on an annual basis and it does not deal with the present or future value. The Financial Ratio does not indicate benefit of the project but can be used for additionally explaining the project's worthiness. This ratio will indicate profitability, operation management, liquidity management, debt management as well as efficiency of asset utilization of the project.

**Table 3-12: Financial Ratio Group**

Groups	Current Ratios	Significance		
		1	2	3
Profitability Ratio	Growth rate		✓	
	Gross Profit Margin		✓	
	EBITDA		✓	
	Net Profit margin		✓	
Liquidity Ratio	Current Ratio		✓	
	Quick Ratio		✓	



Groups	Current Ratios	Significance		
		1	2	3
Efficiency Ratio	Assets Turnover		✓	
	Stock Turnover		✓	
	A/R & A/P Turnover		✓	
Liabilities Ratio	Debt to Equity	✓		
	Loan to Value		✓	
	Debt to Income			✓
Ability to Repay	Debt Service Coverage Ratio		✓	
	Interest Coverage Ratio			✓

### 3) IEE Project Ratio Group

An IEE project ratio group is suitable for any energy efficiency project. The ratios in this group cannot be used in a cost-benefit evaluation in the final stage but in a wider view or screening of the alternative energy efficiency equipment. This consists of:

**Table 3-13: IEE Project Ratio Group**

Ratios	Explanation
Life Cycle Cost	The number indicates the total cost of investment of equipment and installation plus the operating cost converted back to present year such as the energy cost, maintenance cost and repair cost. The number suggests the total cost for a cost effective option among different competing alternatives to invest.
Levelized cost of energy (LCOE)	The calculation of the unit energy cost of the equipment for the whole useful life then back calculated to the present value. These include the energy cost, maintenance and repair cost, insurance, tax, interest, etc. plus cost in the purchasing and installation of equipment then divided by power capacity of those equipment. These ratios can be then used comparatively among different competing alternatives.
Saving to Investment Ratio	This ratio reveals the proportion of the saving from equipment replacing the whole life to the investment cost. It is a simple calculation suggesting the overall figure of benefit and cost as well as well screening of the project.

**Table 3-14: Significance of IEE Project Ratio**

Criteria	Ratios	Significance			Suitable Range
		1	2	3	
	Life Cycle Cost Analysis		✓		
	Levelized cost of energy (LCOE)		✓		
	Saving to Investment		✓		

The business owners may gain benefit from financial preparation with both cost-benefit evaluation used for making decision and the banks' credit consideration. They can adapt his vision into the credit criteria as follows:

- Apart from consideration of using payback period of IRR and NPV in evaluating the cost-benefit of the project , the business owner would be recommended to consider the ratios used by the banks in evaluating repayment ability to repay especially the service coverage ratio (DSCR) and debt equity ratio (DE ratio)
- The number used in evaluating repayment ability must be slightly higher than that used by the banks. This number has been brought for financial projection, sensitivity analysis and that it will automatically be made on the basis of decreased financial feasibility adjusted by the banks.
- The business owner will take into consideration his/her own cost-margin ratio from the IRR and NPV ratios reflecting real benefits.

**Table 3-15: Ranges of Financial Ratios**

Criteria	Financial Ratios	Ranges
Cost Margin Ratio	Internal Rate of Return : Project	>10%
	Net Present Value : Project	>0
	Internal Rate of Return : Business owner	>10%
	Net Present Value : Business owner	>0
	Pay Back Period	5 years
Liabilities Ratio	Debt to Equity	1.5:1
Ability to Repay	Debt Service Coverage Ratio	1.5

In case the business owner is interested in implementing more than one energy efficiency project, an initial comparability for making a decision on a suitable project can be performed by the IEE Project Ratio Group. However, the business owner needs to create understanding towards the meaning and the limitation of each ratio. If the ratios calculated from the IEE Project Ratio Group cannot used

for making decision, the business owner may find other possible financial and economic viability ratios to support their decision.

The following financial ratios are for the business owner to use for supporting his decision on implementing multi-projects, energy efficiency and other investments:

- A financial Projection preparation for an individual project.
- The calculation of NPV of each project under suitable discount rate of each business owner.
- The use of an optimization tool in combination of the projects with the highest NPV for business owner using the same amount of the approved budget. It is possible to apply more than one project.
- The capital rate, regardless of high or low, depends on both internal business and credit condition of the bank. In the case that the bank directs the ratio of Loan to Value to be 100%, a business owner can keep his internal business ability suggested to invest in all projects.
- However, when multi-projects are operated at the same time, it is crucial to ensure that technical problems effecting loss in the production would not occur.

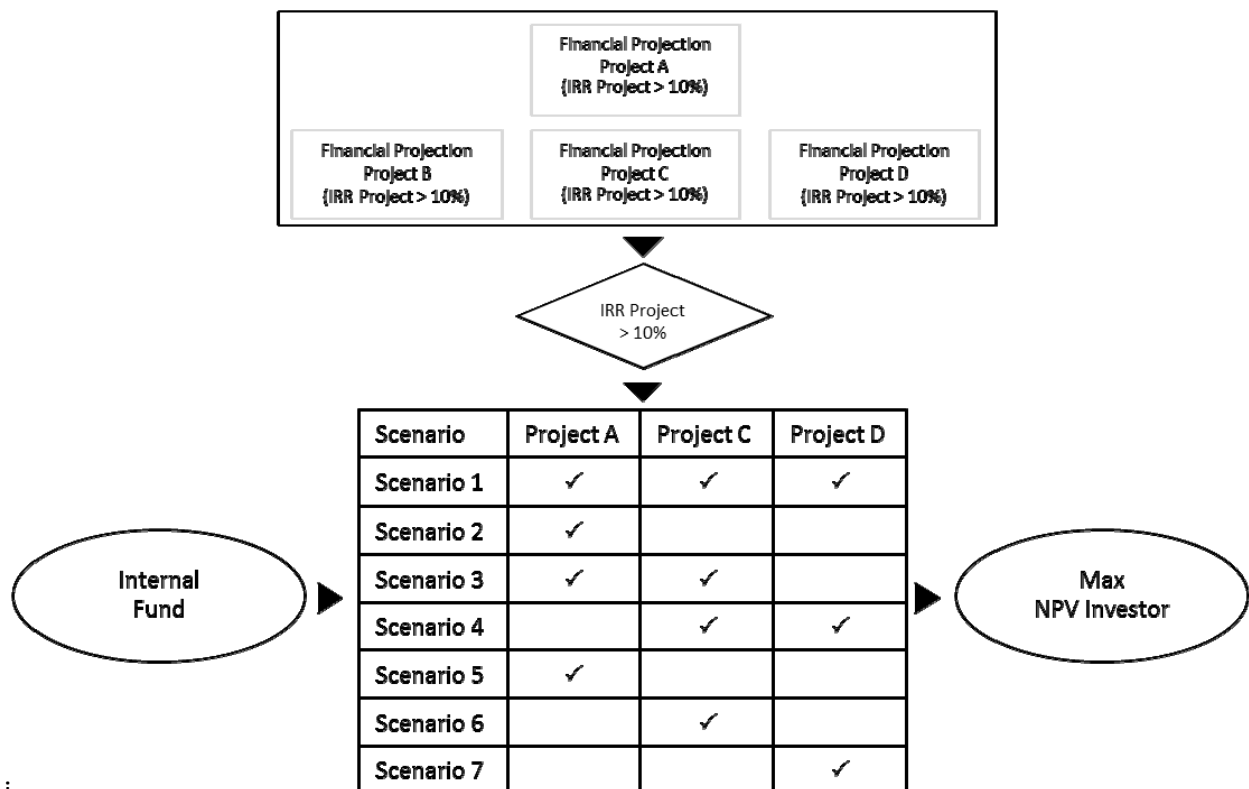


Figure 3-2: Multi-Projects Selection Criteria

#### 4. Support from Government Organization and Network

- Provide technical training for decision maker aware of the importance of IEE Project for the benefits of the industries and the country.
- Provide budget in template development both in proposal preparation, Financial Projection and decision making in equipment selection. Training activities should be accompanied for better understanding and capability to put in practice template usage and modification. These templates should be developed individually to suite the equipment. This may start with the most common equipment and long standing such as boiler and air compressor.

In comparative analysis for alternative investment in financially-feasible project by using optimization tool is quite complicated with low requirement from the business owner. The training for this application can be postponed to the next step.

- Promote standard creation for Financial Advisor to level up financial evaluation, technical knowledge as well as career morality. These may be done by cooperation with the bank group.

#### Summary

Most of the banks usually declare their willingness in providing energy loan for customers. Business owner may be ready to borrow money for energy efficiency investment. Constraints may occur in credit access during the time of banks' consideration. In general, financial burden indirectly occurs during the Credit Underwriting Process, resulting in the slowdown of the energy projects investment. Some burdens, which identified as medium to low opportunities to be mitigated, are difficult to be solved because it is the bank internal processes. However, recommendations to improve or reduce the barriers would be introduced such as a capacity building among the bank staff involving in the credit process. Banks' mindset toward the concept of IEE project consideration as the Cooperate Finance is the most difficult way to be changed. It should be noted that changes will help create more energy efficiency products and more investment in the IEE projects.

Suggestions on strengthening feasibility to access the credit for the business owners and relevant agencies already discussed in details for the preparation of proposal and financial projection which includes the data and assumption being used in document preparation. The financial document preparation may benefit the business owner in business decision making as well as helping the credit consideration. Therefore, the capacity building on these issues will, to the great extent, support the business owners to access the loan and eventually increase energy efficiency investment in the industries.

