Japan International Cooperation Agency

Special Assistance for the Project Implementation for Energy Efficiency and Renewable Energy Promoting Project in Vietnam

FINAL REPORT

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Japan Consulting Institute

Japan Economic Research Institute Inc.

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ABBREVIATIONS & ACRONYMS

APP	Asia Pacific Partnership
CDM	Clean Development Mechanism
CIF	Cost, Insurance, and Freight
CIC	Credit Information Center
DAF	Development Assistance Fund
DBJ	Development Bank of Japan
ECC	Energy Conservation Center
EE	Energy Efficiency
EECO	Energy Efficiency Conservation Office
EEREP	Energy Efficiency and Renewable Energy Promoting Project
EIA	Environmental Impact Assessment
FS	Feasibility Study
FSR	Feasibility Study Report
GHG	Greenhouse Gas
HCMC	Ho Chi Minh City
IE	Institute of Energy
JBIC	Japan Bank for International Cooperation
JCI	Japan Consulting Institute
JERI	Japan Economic Research Institute
JICA	Japan International Cooperation Agency
JODC	Japan Overseas Development Corporation
JSBs	Joint Stock Banks
METI	Ministry of Economic, Trade and Industry
MOD	Minutes of Discussions
MOIT	Ministry of Industry and Trade
MOF	Ministry of Finance
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
NEDO	New Energy and Industrial Technology Development Organization
ODA	Official Development Assistance
PMU	Project Management Unit of VDB
RE	Renewable Energy
SAPI	Special Assistance for the Project Implementation
SBV	State Bank of Vietnam
SOCBs	State-Owned Commercial Banks

TOR	Terms of Reference
TSL	Two-Step Loan
USD	United States Dollars
VND	Vietnamese Dong
VDB	Vietnam Development Bank

Executive Summary

Since Doi Moi policy in 1986, Vietnam has achieved an economic growth triggered by both the shift from centrally-planned to the market-oriented economies and the integration into the international economy. Owing to the industrialization, energy demand or energy consumption in Vietnam has increased rapidly, and the efficient use of energy has become an urgent challenge to accommodate its anticipated growth in the future energy demand.

Under the above situation, the Vietnamese government has enhanced policies related to energy conservation by issuing relevant laws and regulations including the Decree on Energy Conservation (2003) and National Energy Program (2006).

In this connection, "Special Assistance for the Project Implementation for Energy Efficiency and Renewable Energy Promoting Project in Vietnam" (hereinafter referred to as "SAPI" or "SAPI for EEREP") has been carried out in accordance with the Minutes of Discussions on the Scope of Work (S/W) for SAPI for EEREP signed between VDB and JICA in May 2009. The relevant cooperation from the Japanese government has been highly regarded in Vietnam.

The main objective of SAPI was to assist the Project Management Unit (hereinafter referred to as "PMU") of Vietnam Development Bank (hereinafter referred to as "VDB") for smoothly implementing the Energy Efficiency and Renewable Energy Promoting Project (hereinafter referred to as "the Project" or "EEREP"). As well, the objectives of the Project included the following; (i) awareness-raising on energy efficiency and renewable energy promotion among Vietnamese local enterprises, (ii) assistance in cost estimation and implementation of installation planning, and (iii) enhancement of local enterprises' investments related to energy efficiency and renewable energy promotion by demonstrating the effects of energy efficiency and renewable energy investments.

The final report of SAPI for EEREP consists of the following three chapters.

Chapter 1, upon reviewing the background and outline of SAPI, expresses the importance of implementing the policies to promote EE&RE investments in Vietnam, which is still on the early stage in terms of the level of energy efficiency awareness among business owners.

Chapter 2 explains the outcomes of individual terms of references (TORs) for SAPI as of end-January 2010, including the below.

- EEREP Project Operation Manual has been drafted both in Vietnamese and English to be

issued in early-March (TOR-1);

- PMU, which was officially established by the issuance of the VDB Decision No. 695/QD-NHPT on 26 November 2009, plans to organize the first EEREP Advisory Committee to be held in late-February 2010 (TOR-2);
- ODA Program Document for EEREP is scheduled to be approved by the General Director of VDB in mid-February 2010 (TOR-3);
- SAPI Team has compiled the list of candidate sub projects (in cement, cokes, ceramic, shipbuilding, textile, biomass power generation sectors) based on the information gathered from MOIT, IE, EEC-Hanoi and EEC-HCMC as well as conducted on-site survey of each candidate sub project (TOR-4);
- SAPI Team has conducted technical evaluation of five sub projects, (namely, Cement Thanh Cong Cement, Hoa Phat Coal Processing-Stage-II Waste Heat Recovery Power Generation, Duc Nhan Wooden -Refuse Power Generation, Bentre Suger -Refuse Power Generation and Thai Nguyen Cement) (TOR-5);
- SAPI Team has provided some important tips for PMU in deciding the targeted values of indicators to measure sub project effectiveness (TOR-6);
- SAPI Team has presented List of Eligible EE & RE Equipments and Technology and a format for Technical Appraisal Form in order to assist PMU in composing Technical Appraisal Manual (TOR-7); and
- SAPI Team has organized two seminars (8 January 2010 in Hanoi, 12 January 2010 in Ho Chi Minh City) in order to deepen the understanding towards the system and technology of energy conservation and renewable energy as well as towards JICA's Two Step Loan Scheme.

Chapter 3, the final chapter, comprises concluding remarks and recommendations. Upon pointing out three potential obstacles for the smooth operation of EEREP, SAPI Team has proposed seven essential recommendations and five countermeasure actions, namely, (i) examining the appropriateness of VDB's mid-to long-term working capital under EEREP, (ii) relaxing the requirement of energy conservation efficiency in EEREP; (iii) strengthening the marketing activities for EEREP; (iv) supporting SMEs under EEREP and (v) facilitating training programs for realizing a better monitoring practice under EEREP.

1 Background and outline of SAPI

1.1 Background

Since Doi Moi policy in 1986, Vietnam has achieved an economic growth triggered by the shift to the market-oriented economy and the integration into international economy. Owing to the industrialization, the demand of energy or energy consumption has increased rapidly. According to the Study on National Energy Master Plan in Vietnam, energy consumption has increased five times from 1990 to 2005. In addition, the energy demand is expected to continue increasing rapidly in Vietnam.

On the other hand, Vietnam's primary energy consumption per GDP in 2005 was 618 tons in oil equivalent, which was less effective than that of India. This could possibly imply that Vietnam has the potential to save much more energy. Furthermore, given the present situation that public awareness on energy-saving has been relatively weak among Vietnamese business leaders, if the public awareness is raised significantly, there will be room for much more energy-saving in Vietnam. With respect to the renewable energy, the renewable energy use is relatively lower than the expectation in Vietnam. The renewable power generation was 265.57 GWh in 2005, which was approximately 0.5 percent of the total power generation in 2005. As a result, efficient use of energy has been the urgent challenge in Vietnam.

Under the above-mentioned situation, the Vietnamese government has issued the following policies related to energy conservation: (i) the Decree on Energy Conservation in 2003, (ii) the Prime Minister's Decision No.79/2006/QD-TTg on approval of the National Program on Energy Efficiency and Conservation, (iii) the Prime Minister's Decision No.1855/2007/QD-TTg on approval of National Energy Development Strategy of Vietnam 2020, with a Vision to 2050, and (iv) the Prime Minister's Decision No.158/2008/QD-TTg on the approval of the National Target Program to Respond to Climate Change.

However, the implementation of policies improving the EE&RE has been still on the early stage, and the EE&RE diffusion has been slow in Vietnam. In this connection, the relevant cooperation from the Japanese government is highly expected in Vietnam.

1.2 Objective

The main objective of SAPI is to assist the Project Management Unit (hereinafter referred to as

"PMU") of Vietnam Development Bank (hereinafter referred to as "VDB") for smoothly implementing the Energy Efficiency and Renewable Energy Promoting Project (hereinafter referred to as "the Project" or "EEREP"). In addition, the objectives of the Project include the following; (i) awareness-raising on energy efficiency and renewable energy promotion among Vietnamese local enterprises, (ii) assistance in cost estimation and implementation of installation planning, and (iii) enhancement of local enterprises' investments related to energy efficiency and renewable energy promotion by demonstrating the positive effects of energy efficiency and renewable energy investments.

1.3 Terms of Reference

SAPI was carried out in accordance with the Minutes of Discussions on the Scope of Work (S/W) for SAPI for EEREP agreed between VDB and JICA in May 2009. The terms of reference (TOR) of SAPI include the following eight components which are divided into two categories:

Figure 1-1: TOR of SAPI

Financial matters	TOR-1: To assist in creating the Operation Manual for the Project
	TOR-2: To assist PMU for the smooth start up of the Project
	TOR-3：To support PMU to create the Program Document
Technical matters	TOR-4：To assist PMU in selecting candidate sub projects
	TOR-5: To submit cost estimation and basic design of candidate sub projects
	TOR-6: To assist PMU in establishing targeted values of indicators to measure the sub project effectiveness
	TOR-7: To assist PMU in composing the Manual for Technical Appraisal
	TOR-8: To implement awareness campaign on energy efficiency and renewable energy investments

1.4 Work schedule and main works in the field survey

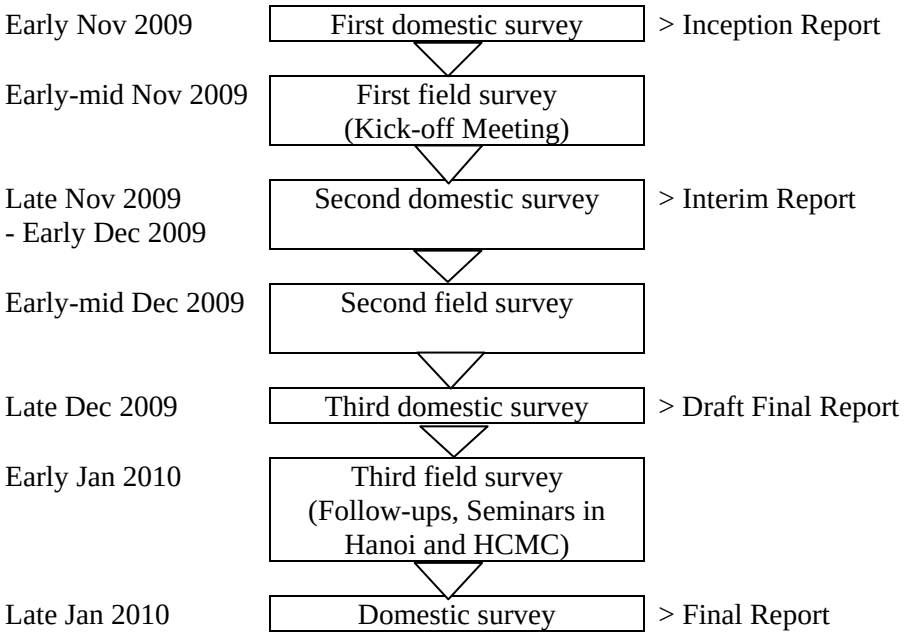
The Team started SAPI activities in November 2009 with preparatory work (the first domestic survey) in Japan to prepare the work plan and Inception Report (ICR). From early November to mid November, the Team conducted the first field survey in Vietnam, which included the kick-off meeting held on November 9, 2009. At the meeting, the Team made presentations on

ICR before the candidate members of PMU (namely, Deputy General Director of VDB[1], Foreign Capital Management Dept., Appraisal Dept., Investment Credit Dept. and other relevant departments) and explained the purpose of SAPI survey and its basic frameworks. Based on the discussions at this meeting, PMU was established officially on 26 November 2009. As well, SAPI finance team held several meetings with individual PMU member departments. Meanwhile, the technical team had meetings with candidate subcontractors, namely, Institute of Energy, Energy Conservation Center of Hanoi (ECC-Hanoi) and Ho Chi Minh City (ECC-HCMC); conducted interviews with IE, ECC-Hanoi and ECC-HCMC to get lists of candidate sub projects and their relevant information; and conducted site visits to four candidate sub projects (namely, cement, coal, wood processing and sugar projects).

From early to mid December, the Team conducted the second field survey in Vietnam, which included the follow-ups of the assistance for each TOR. During the third field survey in early January 2010, the Team continued the follow-ups for each TOR and organized seminars as awareness campaign both in Hanoi and Ho Chi Minh City.

According to the following schedule, SAPI Team has prepared and submitted the following reports in due course (see Figure 1-2).

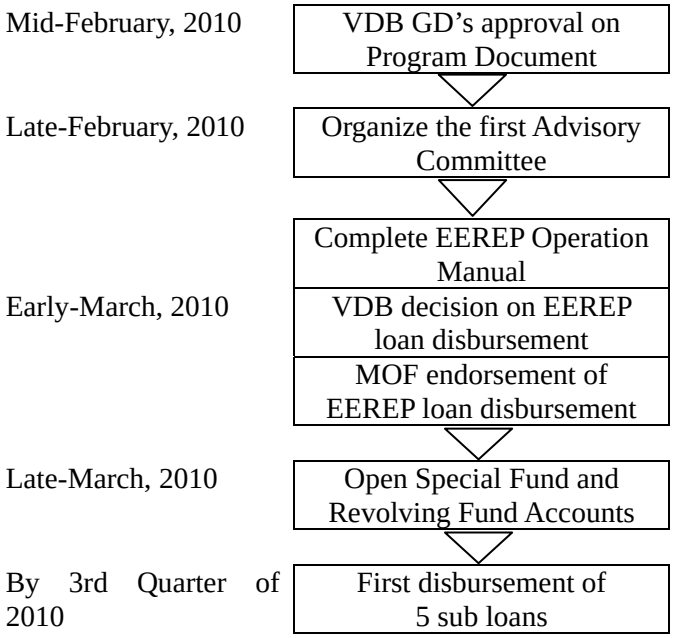
Figure 1-2: Overall schedule of SAPI



[1] Mr. Dao, Deputy General Director in charge of JICA technical assistance project, was present at the kick-off meeting on behalf of Mr. Trang, Deputy General Director in charge of EEREP Project, who was absent due to state level duties.

The Government of Vietnam and JICA has signed Loan Agreement in November 2009, which was about two months behind the schedule. Nevertheless, with the assistance of SAPI Team, PMU was officially established at VDB Head Office in December 2009 and it has ever since been taking the initiative to steadily prepare for the first disbursement of EEREP sub loans. In the months ahead, PMU aims to make the first disbursement of sub loans by the third quarter of 2010. In order to achieve it, PMU is to do the following things step by step: i) get the official approval on "Program Document" from VDB's General Director (by mid-February); ii) organize the first Advisory Committee (late-February, 2010); iii) complete the final draft of EEREP Operation Manual and issue it officially at VDB after getting the permit from JICA (by early-March); iv) make an official decision on the EEREP loan disbursement (by early-March); v) get the MOF endorsement of the EEREP loan disbursement (by early-March); and vi) open the Special Fund and Revolving Fund Accounts (by mid-March). By the third quarter of 2010, VDB will select 5 sub projects from the list of potential sub projects, and take necessary procedures for making appraisal and disbursement of each 5 sub loan, based on the JICA concurrence.

Figure 1-3: Detailed schedule of EEREP preparation



2 Outcomes of each TOR

2.1 TOR-1: To assist in creating the Operation Manual for the Project

2.1.1 Background: VDB's business practices

(1) Business outline of VDB and its position in the banking sector in Vietnam

Vietnam's banking sector comprises five state-owned commercial banks, thirty-eight joint-stock banks, thirty-five foreign bank branches and five joint venture banks, and two development and policy banks. There have been various steps in the liberalization and reform of Vietnam's formal banking sector. The most significant steps include the followings: (i) the deregulation of domestic interest rates on both VND and foreign currency deposits and loans during 1996 to 2002, (ii) the decision in May 2005 to restructure the state-owned commercial banks and have them equitized by 2010, and (iii) the recent decision to permit 100 percent foreign-owned banks to enter the market as per commitment to WTO. As a result, the formal financial markets in Vietnam have grown and diversified rapidly in recent years.

In the above-mentioned transition of the Vietnamese banking sector, policy lending was separated from commercial lending and regrouped into specialized institutions, explicitly benefiting from budget support. At present, there are two such institutions in Vietnam, namely, Vietnam Bank for Social Policies ("VBSP"), which provides support for the poor and other disadvantaged group, and VDB, which lends for large priority projects, especially in infrastructure.

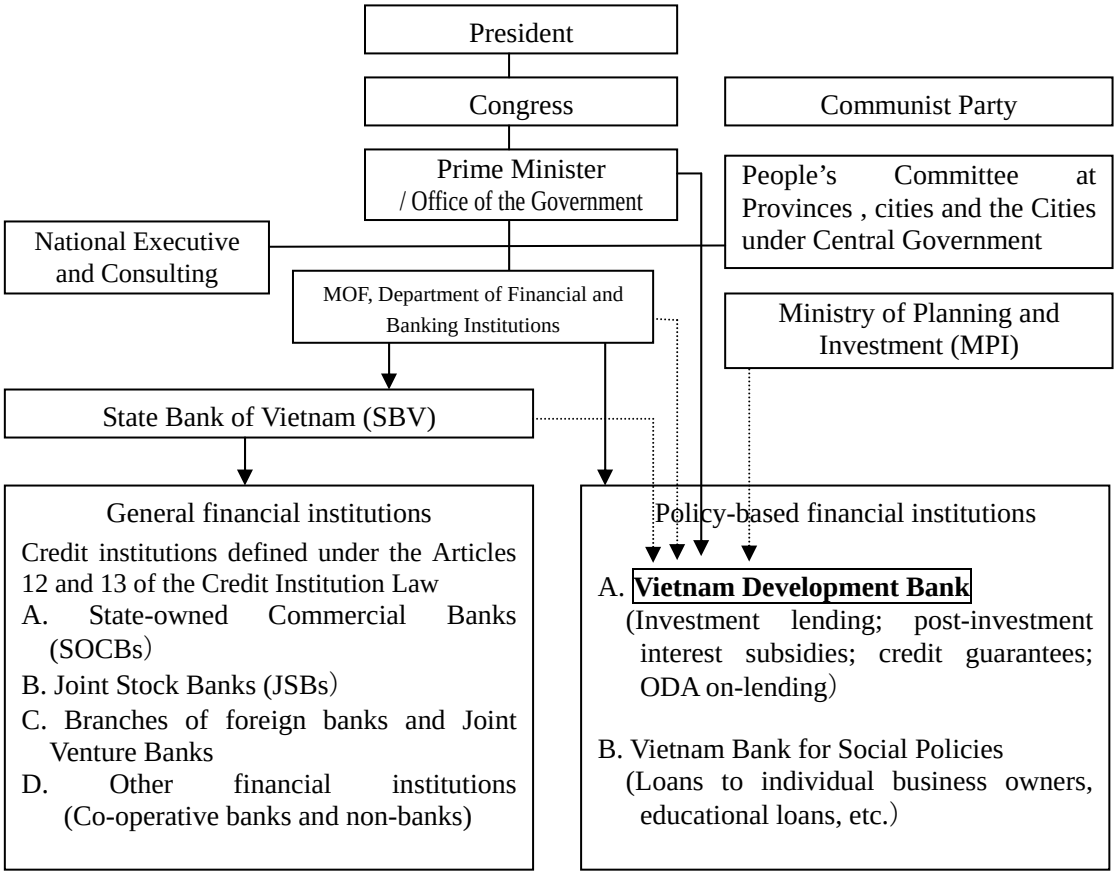
The Development Assistance Fund (DAF) was established in 1999 to inherit the policy-based finance function (known as "state development- investment credit") conducted both by MOF and state-owned commercial banks under the Domestic Investment Promotion Law and the Decree No. 50/1999/ND-CP dated July 8th 1999. DAF was later reorganized as VDB under Decision No. 108/2006 QD-TTg dated May 19th, 2006. The financial products and services of VDB includes investment lending, post-investment interest subsidy, credit guarantee, export credit, export credit guarantee issuance, export contract bonds issuance and ODA on-lending. Its major clients are (i) state-owned enterprises including ministerial enterprises and enterprises governed by provincial people's committee; and (ii) private enterprises including processing industries of agricultural, forestry and aquaculture products and export products.

The main functions and features of VDB can be summarized as follows: (i) Non-profit

organization, (ii) obligatory reserve rate of 0% (exempt from minimum reserve requirements), (iii) not required to provide deposit insurance, (iv) payment liquidity will be guaranteed by the Government, (v) exempted from tax and other payments to State Budget, (vi) entitled to mobilize capital by both issuing bonds & deposit certificates and borrowing from Postal Savings, Social Insurance Funds and other domestic and foreign financial institutions, and (vii) permitted to open accounts at the SBV, State Treasury and other domestic and foreign financial/credit institutions.

VDB is currently under the direct control of the Prime Minister and under the joint supervision of MOF, MPI and SBV.

Figure 2-1: VDB's position in the Vietnamese financial sector and its supervising authorities



(Source) Compiled by JERI based on the relevant laws and the information acquired through VDB interviews.

As for the basic strategy of VDB, the Government is currently scrutinizing the draft of "Strategy to Develop VDB to 2010 and 2015, Vision to 2020" that suggests the medium- to long-term

strategy to develop VDB into a self-independent policy-based financial institution. VDB is required to take further steps to strengthen its profit structure. However, at the same time, the roles and functions of VDB as a policy-based financial institution has been highly expected by the government and the domestic business community especially in the worldwide economic recession.

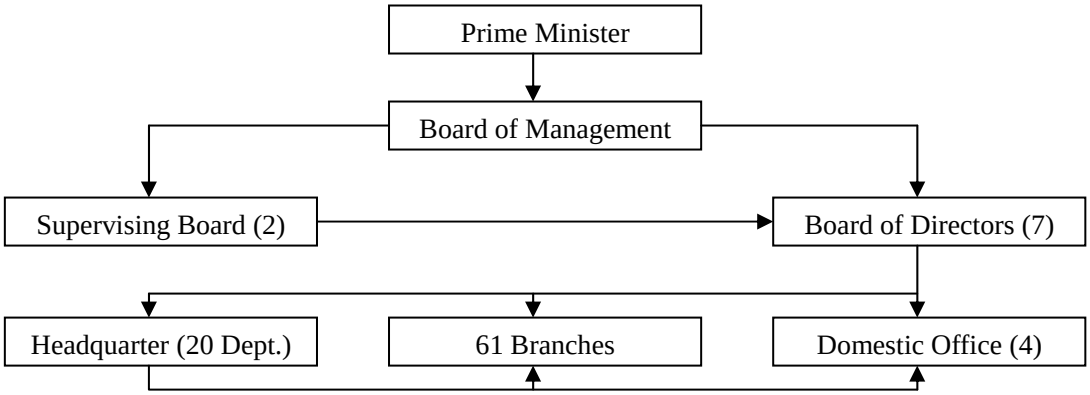
As a swing strategy, VDB has revised the eligible loan projects stipulated in Decree No. 151/2006/ND-CP dated 20 December 2006 by issuing the Decree No.106/2008/ND-CP dated 19 September 2008. The purpose of Decree No.106 was to narrow the target of infrastructure projects which are directly controlled by the Government. The Government and VDB are currently discussing the ways in which to expand the scope of eligible loan projects including infrastructure projects.

In addition, VDB, by submitting the draft of "Strategy to Develop VDB to 2010 and 2015, Vision to 2020", has been requesting the government to allow VDB to provide mid-to long-term working capital necessary for their customers. In general lending practice in Vietnam, banks require exclusive control over customer's property as collateral; and therefore, if VDB exclusively acquires its customer's property as collateral, it might be difficult for the customer to get the necessary mid-to long-term working capital from any other commercial banks.

(2) VDB's internal system and issues

Organization of VDB: As shown in Figure 2-2, VDB has its head office in Hanoi, one representative office in Ho Chi Minh City, two transaction centers, 61 branches across the country. The number of employees is 2,543 (as of may 2009). Under the Project, PMU member departments include Foreign Capital Management Department (20 staff) in charge of managing the on-lending of foreign funds, Appraisal Department (14 staff) in charge of technical appraisal of sub projects, Investment Credit Department (38 staff) in charge of financial appraisals of sub projects, and International Cooperation Department (13 staff) in charge of foreign affairs and international cooperation.

Figure 2-2: VDB's Organization Chart

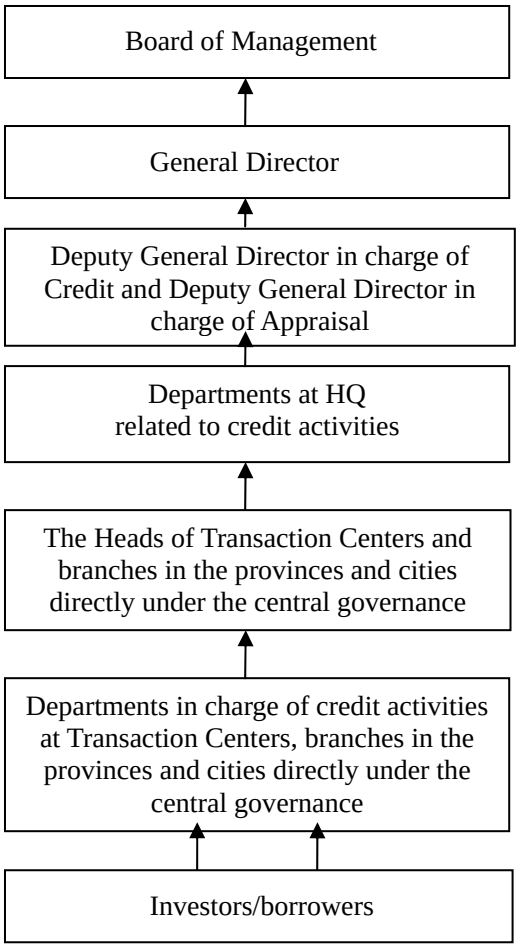


(Note) Among seven board members, there are three ex-officio members, namely, Mr. Ha, the Deputy Finance Minister, Mr. Doan, the Deputy MPI Minister and Mr. Minh, the Deputy SBV Governor.
(Source) "Organization Chart of VDB" [2009] and others.

Credit appraisal practices in VDB: There are mainly two manuals for instructing staff's lending practices in VDB, namely, Investment Credit Manual (September 2008) and Export Credit Manual (July 2009). VDB is currently implementing corporate appraisals as a part of the mid-to long term lending procedures in accordance with the Investment Credit Manual. In practice, it seems that more emphasis has been placed on project analysis than company (i.e. borrower) evaluations, and therefore the Bank is not yet making loan approvals based on a comprehensive analysis of projects and borrowers. As for the sources of corporate evaluations, VDB loan officer allegedly collects financial statements of the borrower in the last two consecutive years to make the list of financial ratios calculated according to the Investment Credit Manual and makes a perfunctory comparison of thus acquired results with those of the industry standards provided by the Credit Information Center (CIC), a public registry under the supervision of SBV. Regarding the sources of project analysis, in general, financial institutions would first estimate future cash flows and then make a comprehensive decision on the borrower's ability to repay debt obligations and the investment effects of the project. Nevertheless, VDB loan officers are not used to preparing own investment plan for the project and therewith making a future cash flow projection based on the Bank's own estimation and judgments. Instead, VDB officer has been passively accepted the Project Evaluation Report (prepared generally by independent consulting companies) as part of loan application documents, and perfunctorily evaluated the adequacy or inadequacy of the provided cash flow estimation.

Approval authority system for loan decision-making: VDB has established an investment credit approval authority system (Figures 2-3 and 2-4) stipulated in the Investment Credit Manual and other relevant regulations. In VDB's daily lending activities, the fundamental roles of loan related departments are to assist or give advises to the General Director, who makes the final loan decisions for Groups A and B projects (or branch General Manager in case of "Group C projects"). Therefore, loan officers at branches and the headquarters are not accustomed to writing the reasons for their judgment regarding the acceptance of a loan application in any of the related internal documents. Due to this, the whereabouts of real decision-makings have been left unclear in the past, and accordingly staff involved in monitoring and debt collections seem to have relatively low sense of responsibilities, which reveals a weakness of the Bank. Furthermore, VDB is currently not equipped with an adequate corporate financial data collection and input system, and is in the process of establishing a client data base with the technical assistance provided under JICA's VDB Capacity Development Project.

Figure 2-3: Investment credit approval authorities at VDB



(Source) VDB Investment Credit Manual [2008]

Figure 2-4: Investment credit approval authorities at VDB

Category		Decision-maker	In charge of Appraisal
Group A projects	Maturity: more than 10 yr	Board of Management	Appraisal Dept. & Credit Investment Dept. (Deputy General Director in charge of credit & appraisal)
	Maturity: 10 yr or less	General Director	
Group B projects	Maturity: 10 yr or more	Board of Management	Branch (Appraisal Unit) + Appraisal Dept. & Credit Investment Dept. (Deputy General Director in charge of credit & appraisal)
	Maturity: less than 10 yr	General Director	
Group C projects	46 branches	Branch General Director	Branch (Appraisal Unit) *Report to head office.
	15 branches	Same as Group B project in case of ">C's upper project amount x 50%".	
		Same as Group C project in case of "<C's upper project amount x 50%".	

(Note 1) At VDB, loan projects are categorized into three groups of A, B, and C, based on the project total amount and industry types. (Decree No.12)
(Note 2) Decision-makers at VDB for all sub projects of EEREP shall be the General Director.
(Source) Interviews with VDB, Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009.

VDB's decision-making systems for interest rates, maximum loan amount and collaterals: VDB, as a policy-based financial institution, can not make a decision on its interest rates. Decree No.151/2006/ND-CP stipulates that the rates of mid-to long term loans should be the same as 5-year government bonds + 0.5%. But in practice, VDB adopts the rates which MOF decides from the political point of view. As of end-November 2009, the interest rates of State investment (i.e. mid- to long-term loans) are 6.9% per annum for loans denominated in Vietnamese dong and 5.4 % per annum for loans in US dollars. And VDB generally can lend a maximum 70 percent of total project cost according to Decree No.151/2006/ND-CP. In the matter of collateral practice, as a general rule, VDB requires the collateral which fully covers the loan amount. As generally not accepted by commercial banks, VDB accepts loan collaterals using property funded by the loans, but it does not accept other banks attach their security rights on the concerned property. Only in case of co-financing with other banks, VDB allows other banks to attach their security rights on the same property. In such a case, the bank providing the largest loan amount for the project generally gets the first priority security interest to the concerned property.

2.1.2 Operation Manual for the Project completed in SAPI

PMU has taken the initiative to prepare a Project Operation Manual for the Energy Efficiency and

Renewable Energy Promoting Project (EEREP). SAPI Team achieved the following two purposes of TOR-1: [1] to provide assistance for the drafting of the Project Operation Manual; and [2] to revise thus drafted Manual in accordance with the needs of end users (i.e. end borrowers).

[1] Providing assistance for the drafting of a Project Operation Manual for the Energy Efficiency and Renewable Energy Promoting Project (EEREP)

The EEREP Operation Manual comprised the following eight key components:

(i) Eligible end-borrowers and sub projects, including eligibility criteria for sub projects;
(ii) Sub project data management methods;
(iii) Terms and conditions of sub-loans (including loan period, interest rates, collaterals, reimbursement of 50% of FS fee (i.e. preparation fee of investment report that does not include energy audit fee));
(iv) Lending procedures from loan application to disbursement;
(v) Credit appraisal system, including appraisal methods and procedures;
(vi) Loan disbursement and debt collection methods, including making clear which department is in charge;
(vii) Establishment and management of EEREP Special Fund Account as well as the fund management method of EEREP's Revolving Fund Account (including the possibility of using the Fund to cover the costs of technical assistance services); and
(viii) Monitoring methods.

[2] Revision of drafted EEREP Operation Manual in accordance with the needs of end borrowers

SAPI Team grasped the end-user needs and discussed the revision of the Manual accordingly during the second mission to Vietnam in early to mid December 2009. The Operation Manual for the Project has been compiled by the staff of Foreign Capital Management Department according to the table of contents shown in Figure 2-5. Based on the input and recommendations from SAPI Team, the Manual is planned to be drafted completely by mid-February 2010, and later PMU plans to get the internal approval for issuing the Manual by the early-March 2010, based on the permit from JICA.

Figure 2-5: EEREP Project Operation Manual: table of contents

2.5 Repayment of JICA loan
2.6 Accounting
2.7. Monitoring
2.7.1 Risk management policy
2.7.2 Inspection
2.7.3 Quarterly collection of financial statements (including cash flow statement)

III. Technical assistance:

1. Activities
2. Consultants selection (procurement)
3. Special account and Payment for consultants

IV. Reports and auditing

1. Reports
2. Auditing

V. Miscellaneous

1. Modification of the EEREP Project Operation Manual
2. Implementation organization

Annexes

1. Agreement

1.1 Loan Agreement between JICA and the Government of Vietnam
1.2 On-lending Agreement of JICA Loan between MOF and VDB
1.3 Sub-loan Contract between VDB and End-borrowers

2 Model of reports (Reporting formats and model cases)

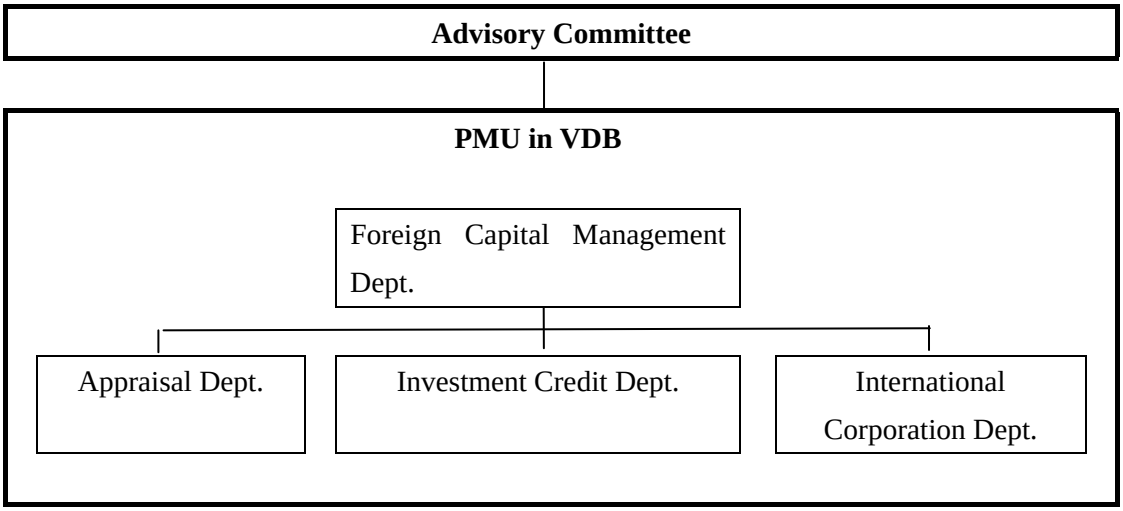
3 Check list for Technical Appraisal

2.2 TOR-2: To assist PMU for the smooth start up of the Project

2.2.1 Setting up of PMU and Advisory Committee

The relevant organizations of the Project were established as seen in Figure 2-6. On the process of establishing the organizations, as SAPI Team suggested, PMU members understood their functions clearly for the smooth implementation of the Project. In addition, PMU, in collaboration with SAPI Team, tried to keep relevant staff of VDB informed about the Project, including its concept, procedures, schedule and Operation Manual.

Figure 2-6: Organizations of the Project



PMU, through the discussions between VDB and SAPI Team, was officially established by the issuance of the VDB Decision No. 695/QD-NHPT on establishment of project management unit of energy efficiency and renewable energy development sponsored by JICA. PMU is led by Foreign Capital Management Dept. and consisted of the following three departments besides itself: Appraisal Dept., Investment Credit Dept., and International Corporation Dept. The PMU members comprise names listed in Figure 2-7:

Figure 2-7: PMU candidate members

PMU	Department	Name	Title
PMU Director		Mr. Nguyen Chi Trang	Deputy General Director
PMU members	Foreign Capital Management Department	Mr. Nguyen Hoang Trung	Deputy Director
		Ms. Nguyen Thuy Ha	Deputy Manager of ODA Management Division
	Investment Credit Department	Ms. Bui Thi Hien Thao	Officer
	Appraisal Dept.	Ms. Vu Thi Mai Huong	Officer
	International Cooperation Department	Ms. Hoang Thu Hang	Officer

(Source) VDB Decision No. 695/QD-NHPT on establishment of project management unit of energy efficiency and renewable energy development sponsored by JICA (signed by VDB's General Director and came into effect on Nov. 26th. 2009)

2.2.2 Roles of PMU and Advisory Committee

PMU is in charge of managing the Project, and the responsibilities of its member departments are clarified in Figures 2-8 and 2-9, following an extensive discussion between PMU and SAPI Team.

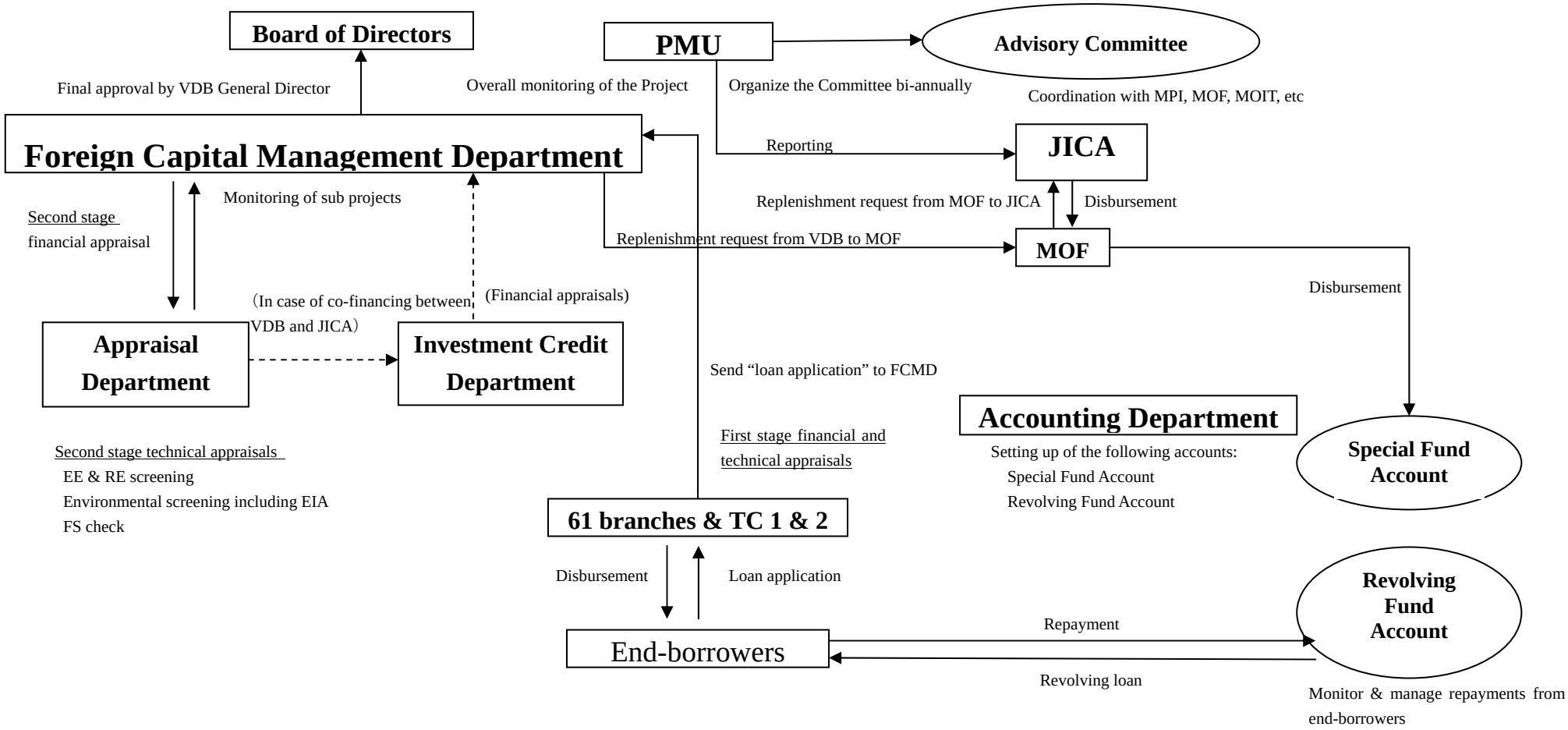
In addition, during the third field survey, SAPI Team prompted to organize the meeting of 1st Advisory Committee and agreed with PMU that the 1st Advisory Committee chaired by Mr. Trang, PMU Director, will be organized in late-February 2010. The participants will be from relevant organizations such as VDB, JICA, MOF, MPI, MOIT, Energy Efficiency and Conservation Office/EECO under MOIT and MONRE. At the meeting, the committee members will exchange opinions in terms of the line of policies on energy efficiency and renewable energy、and discuss the formulation of business unit for the Japanese ODA loan project and the scheme for finding out sub projects. Regarding the scheme for finding out sub projects, it is supposed to be agreed by the committee members that PMU shall make alliances with domestic consultants such as IE, ECC Hanoi and HCMC, etc.

Figure 2-8: Roles of PMU

Area	Action	Responsible Dept.
Account	Set up of Special Account for JICA disbursement	Accounting Dept.
	Set up of Revolving Fund Account	Accounting Dept.
	Arrangement of the request for the disbursement through MOF to JICA	Accounting Dept.
Operating Guideline	Prepare the Operation Manual	PMU
	Monitoring the Project in line with the Operation Manual	Foreign Capital Management Dept.
Appraisal	Receive Loan application form VDB branches	PMU
	Consulting with technical experts	Appraisal Dept.
	EIA screening	Appraisal Dept.
	Credit risk appraisal	Foreign Capital Management Dept., Appraisal Dept.
	Financial appraisal	Foreign Capital Management Dept., Appraisal Dept., Investment Credit Dept.
	Final appraisal decision	Foreign Capital Management Dept.
Fee Payment	Fee payment to consultant	Accounting Dept.
Auditor	Arrangement for the Audit and informing JICA of the result	Accounting Dept.
Advisory Committee	Set up and organize the Advisory Committee	PMU
Review & Reporting	Quarterly Progress Report (PSR)	Foreign Capital Management Dept.
	Sub project Summary Report (Annually)	Foreign Capital Management Dept.
	Monitoring and Evaluation of the sub projects based on the Operation and Effect Indicators	Foreign Capital Management Dept.
	Statement of Special Account and Revolving Fund Account	Accounting Dept.
	Current Repayment Status Report	Accounting Dept.
	Annual Report of VDB	Accounting Dept.
Consultant	Selection of the Consultant	Foreign Capital Management Dept.
Completion	Project Completion Report	Foreign Capital Management Dept.

(Note) Investment Credit Dept. shall be assigned a role (financial appraisals) only in the case of co-financing.
(Source) Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009.

Figure 2-9: Roles of PMU and the functions of PMU member departments



(Source) Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009. Information acquired through interviews with FCMD, Appraisal Department and Investment Credit Department.

2.3 TOR-3: To Support PMU to create the Program Document

2.3.1 Preparation for the Program Document

Based on the Decree 131/2006/ND-CP dated November 09, 2006, SAPI Team has been assisting PMU in preparing the ODA Program Document for EEREP to get the approval from the General Director of VDB by the end of November 2009.

Around 30-page draft Program Document was prepared by the staff of the Foreign Credit Management Department, currently awaiting approval by the General Director. SAPI Team assisted PMU in preparing the Document's Vietnamese-English translations as well as giving advices and support to PMU staff whenever necessary. The Program Document is likely to be approved by the Tet (mid-February 2010).

2.3.2 Program Document

The Program Document, according to the Government Decree No. 131/2006/ND-CP on Issuance of Regulation on Management and Utilization of Official Development Assistance (Article No. 15, "ODA Program Document"), contains the following eleven items:

1. Rational & background
2. Overall target
3. Details of guidelines
4. Total investment cost, funding plan, lending mechanism
5. Organization structure
6. Management methodology
7. Overall plan, implementation plan of first year
8. Risk assumptions, proposed solutions
9. Monitoring and evaluation plan
10. Sustainability of plan after completion
11. Management and implementation capacity of executing agency

2.4 TORs-4&5: To Assist PMU for selecting and evaluating candidate sub projects

The organizations that are related to the energy conservation and renewable energy in Vietnam include the following:

・ Ministry of Industry and Trade (MOIT)

MOIT plans energy-saving policies. The Ministry has the "Energy Efficiency and Conservation Office (EECO)" which coordinates among the relevant ministries as the supervisor in the National Management Commission. The information of up-to-date energy policies shall be gathered by SAPI Team.

・ Institute of Energy (IE)

IE, an affiliation of MOIT and Electricity of Vietnam (EVN), is under the direct control of the Vietnamese government. It participates in various energy projects across the country, executes energy conservation diagnosis, and supports the execution of energy-saving projects. In addition, IE has made the feasibility study of a hydroelectric power project in local area, and has participated in several JICA projects as a local consultant.

・ Energy Conservation Center - Hanoi (ECC-Hanoi)

ECC-Hanoi was founded in 2007 by the Hanoi People's Committee with the approval from MOIT. The Center supports energy conservation projects and makes energy-saving diagnosis etc.

・ Energy Conservation Center - Ho Chi Minh City (ECC- HCMC)

ECC-HCMC was founded in 2002 by the HCMC People's Committee with the approval from MOIT. The Center has been providing support for energy conservation and renewable energy projects, executing energy-saving diagnosis, and providing information and project engineering services.

2.4.1 Gathering information for candidate sub project

2.4.1.1 Ministry of Industry and Trade

SAPI Team visited MOIT-EECO (hereinafter referred as "the Center) in Hanoi to obtain the information on the outline of the activities of the Center and the possibility of its involvements in SAPI project, especially in the listing process of candidate sub-projects.

1) Date and Time:	10 November 2009, 8:30-11:00	
2) Venue:	MOIT office	
3) Attendees:	MOIT-EECO:	Mr. Phuong Hoan Kim, Deputy Director General of Science and Technology Department Mr. Dang Hai Dung, Office Science and Technology Department Mr. Okamoto, ECCJ
	SAPI Team:	Moritaka Kato, Toshiaki Takeda, Yukio Fujii, Yoichi Mori and Ms. Huyen (Interpreter)

4) Summary of discussions

SAPI Team explained the purpose of the visit and the outline of SAPI project.

The following are the comments made by MOIT-EECO:

- Mr. Kim complained that, despite their cooperation with JBIC/ VDB project, they have so far received no feedback. (Since Mr. Kim left the meeting early, the following are the comments by Mr. Dung)
- The new energy-saving basic law is planned to be approved next May 2010, followed by the issuance of relevant decrees. The law covers renewable energy as well as energy conservation, referring to Japanese Energy Conservation Law. Mr. Okamoto, dispatched from ECCJ at the request of METI, has been working as an advisor assisting its documentation.
- The targets for energy-saving efficiency will be renewed every 5 years: 3-5% for years 2006 to 2010 and 5-8% for years 2011 to 2015. The Law currently sees that the energy management is important in addition to the energy-saving efficiency.
- In the renewable energy sector, the focus has been put on hydropower and its share is targeted at 2% of all power generation.
- Energy-saving projects provided by MOIT-EECO had been already screened and included on the long list of future candidate projects, and their original data are kept by MOIT-EECO. The data include information similar to those included in FSR and Energy Audit Report, which are not mandatory.
- The projects are usually first approved by MOIT, secondly by MOF and then

submitted to VDB for loan applications.

- In terms of evaluating energy-saving project, the first priority is the technology involved and the next is its financial viability.
- Guidelines on the commercial profitability of energy-saving projects vary from project to project; therefore, there is no universal guidance available.
- Energy audits have been implemented by certified consultants. MOIT has their list. Procedures of the audit, however, are not standardized.
- MOIT has voiced concern over the guidance of selecting sub projects specified in SAPI-TOR.
- MOIT can provide SAPI Team with additional information on sub projects upon receipt of a written request for the documents.
- Major sectors that have greatest potential in energy saving in Vietnam are Cement, Steel, Food Processing and Textile industries.
- The Government plans to expand its energy-saving investments 10 times, from US$ 2 million to 20 million.

As a result of the above discussions, it was agreed that MOIT and SAPI Team will keep close communication through the local consultant to be employed by SAPI Team.

2.4.1.2 Institute of Energy

SAPI Team visited the Institute of Energy (IE) to contract the consignment work and obtain the information on the outline of its activities and discuss their methods of gathering information on candidate sub-projects.

1)	Date and Time:	16 November 2009, 09:00-11:30	
		17 November 2009, 14:00-16:00	
2)	Venue:	IE Office	
3)	Attendees:	IE :	Dr. P. K. Toan, Director General (11/16 partial) Dr. N. A. Tuan, Manager, International Relations (11/16 partial attendance)

	Mr. N. H. Anh, Energy Economics, Demand Forecast & DSM Dept.
	Mr. N. D. Song, Energy Economics, Demand Forecast & DSM Dept.
SAPI Team:	Mr. Yoshiyuki Oba (11/16)
	Mr. Moritaka Kato
	Ms. Huyen (Interpreter)

4) General information

- Profile
  - Established in 1989
  - A focal Body and Consultant for the Government and the Power Sector in formulation of national strategies and policies on energy and electricity development
  - Provides consulting services for formulation of national strategies and policies and electricity development
- Major current activities related to energy system includes the following areas:
  - National renewable energy master plan
  - Power Master Plan Period 2006-2015, Perspective up to 2025
  - National Energy Master Plan

    Institute of Energy is coordinating with JICA Study Team (Japan) in implementing the study of National Energy Master Plan for Vietnam in the period up to 2025.

5) Sub project

The adding and updating of the sub projects on the List attached to Appendix 6 of ICR shall be done by IE. The following additional items shall be included: (i) energy consumption before the project, (ii) construction year of existing facility, (iii) types of EE, (iv) project implementation schedule and (v) impediments to project implementation.. IE clarified that all the projects listed in the table have been completed energy audit, therefore all projects should have satisfied the EE or RE criteria.

Interview was conducted to grasp the current status of proposed candidate sub projects and to further collect information about new projects. The information gained is summarized below:

- Among the listed cement projects, No. 5 and 8 seems to be active.
- They are being on energy audit of other cement plants.
- We got a request for quotation of Energy Audit from Thanh Cong Cement on

November 11.

6) TSL

IE and end borrowers did not have enough information about the terms and condition of EEREP TSL. And it seems difficult for the end borrowers to decide on applying for the EEREP loans while ADB loans are also available. SAPI team has not the information of terms and condition of ADB loan, but it seems difficult to offer more profitable conditions because they are operating under the condition that they never disturb the financial environment of the country. The key point of fund selection seems to be which party catch the end borrower first.

2.4.1.3 ECC-HCMC

SAPI Team visited the Energy Conservation Center, Ho-Chi-Min City (ECC-HCMC) to obtain the information on the outline of activities of the Center and their possibilities to get involved in SAPI project, especially in the listing process of candidate sub-projects.

1) Date and Time:	11 November 2009, 14:00-16:00	
2) Venue:	ECC-HCMC office	
3) Attendees :	ECC-HCMC:	Ms. Dinh Kim Nhung, Investment Director
		Ms. Mai To Nga, Vice Director
		Mr. Tran Dang Nhon, Manager Technology
		Ms. Tran Ha Kim Thanh, Investment Department
	SAPI Team:	Toshiaki Takeda,
		Yoichi Mori

4) Summary

- Profile
  - Founded in 2002 by the HCMC People's Committee with the approval from MOIT to provide technical support to energy conservation and renewable energy projects, including energy audit and project engineering services.
  - A total of 40 employees, 25 out of which majored in electricity, environmental, or energy at universities.
  - Has been providing domestic and overseas training opportunities to the employees

- Currently covering the following business areas:
  - Development of energy-saving and renewal-energy technologies
  - Consulting services for implementation of energy-saving measures
  - Energy audits
  - Technical assistance for the introduction of energy management system, or energy efficiency improvement program for buildings, hotels and factories
  - Various surveys commissioned by government entities, such as
    - Assistance for CDM application (E.g. 2 projects at the request of Ministry of Environment of Japan in 2007)
    - Joint development of renewable energy with NEDO or with other consulting companies in South Korea and France
    - Promotion of energy-saving activities in private sector
    - Market survey of the potential of reuse of rice husk at the request of NEDO
    - Energy consumption distribution of water supply network at the request of the Asia Development Bank
  - Investment in:
    - Solar photo cell manufacturing
    - Ethanol manufacturing
- Energy audit activities outline:
  - Results : about 100 sites/year
  - Procedures:
    - Sent out questionnaires regarding the energy consumption related data (including the below) on the subject sites for the last two years :
      - Monthly energy consumption and its cost
      - Unit price of energy
      - Monthly output by product
      - Operating conditions of manufacturing facilities (number of employees and daily/annual operation hours)
      - Plant utility drawings, such as electricity, air and piping drawings
      - Operating conditions of all energy-consumption equipments, such as those of HVAC, lighting, motors and boilers
    - Visit the site to survey consumption data (usually it takes 3-4 staff x 1

week)

- Analyze the data and make a report

- Purpose and necessity of an energy audit report
  - Used as a basis for establishing an energy-saving program of the site (The report usually does not contain an energy-saving program)
  - In case of loan borrowed from a domestic bank, the Report is not required
  - UN-related organizations require the report
- The Report, however, would become a must to obtain government approvals for any EE/ RE projects after the enactment of the new energy saving law in 2012.
- Cost for the audit is usually around several thousand US dollars per site, which is to be borne by either the project owner or the project sponsor (such as UNDP).
- As a sample, SAPI Team has checked the audit report of a foreign-invested company (150 pages plus some drawings), which was compiled with the workload of a total of "4 staff x 8 weeks" and the costs of US$ 15,000.

- Possible involvement in SAPI project

  As described below ECC-HCMC was involved in the first phase of SAPI project and is expected to be continuously involved in the Project. EEC-HCMC handles about 100 energy audit projects annually, which accounts for about 60% of the total number of audits conducted in Vietnam. This indicates their high ability to undertake energy audit services upon receiving requests from the potential end borrowers of EEREP TSL. And they also have a high potential for undertaking energy related studies upon the requests of Japanese government related entities. Such studies may also develop into EE/ RE projects that are eligible for loans under EEREP.

  - Long list for SAPI candidate projects (Prepared in May 2009)

    Some projects, which satisfied the conditions specified under EEREP, were selected out of the Energy Audit Reference List at hand, and then provided to VDB; the sugar plant has completed both the FSR and the audit report, and the wood processing (furniture) plant has completed the investment analysis report.
  - Short list for SAPI candidate projects

    In this August the following 5 projects were provided as the candidates sub projects to VDB, of which 3 projects were included on the short list and 2 projects on the final list:

i) Ben Tre Sugar project (Short list ④)
ii) Duo Nhan Wood processing project（Short list ②）
iii) Que Han's Gas Processing project (Short list ⑤)
iv) An ethanol manufacturing project
v) Taxi fuel switch to LPG project

As a result of the visit, it was confirmed that ECC-HCMC has a wide variety of experiences in the field of energy saving and a sufficient capacity jointly working with overseas entities.

2.4.1.4 ECC-Hanoi

SAPI Team visited the Energy Conservation Center, Hanoi (ECC-Hanoi) to obtain the information on the outline of activities of the Center and information of candidate sub-projects which they nominated in the long list.

1) Date and Time: 18 November 2009, 09:00-11:00
2) Venue: ECC-Hanoi office
3) Attendees:

ECC-Hanoi:	Mr. D. H. Thai,	Director
	Mr. H. D. Huynh, Assistant Head of Training and Propaganda	
	Mr. Hoang Quan, Division of Electricity Energy	
SAPI Team:	Mr. Moritaka Kato	
	Ms. Huyen (Interpreter)	
IE:	Mr. N. H. Anh	

4) General information

- Profile
  - Established in 2007
  - NPO (Non Productive activity Unit) under Hanoi Industrial and Trade Department
- Major current activity covering the following areas:
  - Development of data base of energy consumption of domestic industry and building
  - Energy audit
  - Education and training of Energy Efficiency and Conservation, Renewable Energy
- In accordance with the introduction of ECC Hanoi, the major targets of energy audit were buildings, like hotels and governmental buildings. The proposed energy conservation

items are 4 to 6; the outstanding item was control of electric motor by adding inverter and addition of temperature sensor and controller for HVAC.

- ECC-Hanoi performed as one of the organizer of ENTECH Hanoi 2009 (The First[t] International Exhibition Fair on Environment and Energy Technology) held on June 18 to 21. Its total number of entrance was 22,000 and the total amount of business contract was 4 million dollars during the event. There were a total of 100 exhibition booths among which 5 booths were occupied by two Japanese organizations, namely, EECJ and a heat pump organization.

5) Sub project

SAPI Team has conducted interviews with ECC-Hanoi to grasp the current status of proposed 7 candidate sub projects and to further collect new project information. The current status of the potential projects listed in the appendix 6 is as follows.

- Among the 4 textile projects, IE will select two sub projects including the one whose energy audit was to be completed within 10 days; No. 39 and 42 may be high potential borrowers;
- Regarding 3 machinery and metal projects, No. 49 factory will be moved to other place, No. 50 could not identify and to be informed later, and No.51 has already been completed.

EEC-Hanoi currently has 10 energy audit projects which exceed the energy consumption of 1,000 toe and is expecting to conduct the feasibility studies of the five of them. The types of industries include cement, food, shipbuilding and building material. Of these five projects, three projects will complete FS by June 2010 and the rest by September 2010.

6) TSL

EEC-Hanoi commented that there are many potential borrowers which meet the requirements of EEREP, but end borrowers do not yet have the information of the terms and conditions of EEREP TSL. If such conditions will be available, EEC-Hanoi can allegedly gather at least 150 candidates to attend the SAPI seminar. SAPI Team explained the current situation of SAPI project, and the fact that such seminar would actually be held on January in Hanoi and HCMC.

2.4.1.5 Survey of current situation of sub projects included in Long List of future EEREP project

candidates

Eighty-one sub projects have been listed in the MOD signed between JICA and VDB on May 22, 2009. The survey of the current situation of these sub projects has been conducted by IE in order to update Long List. The questionnaires were sent out directly to the owner of each sub project via mail or fax. The total number of sub projects to which IE sent out questionnaires was around 90 including the new projects added to the List recently after completion of EA. Hydropower electricity generation and buildings were not included on the List. Out of 90 sub projects to which IE sent out questionnaires, it received response from 32, including 21 sub projects that were listed on the original Long List. The updated Long List is attached to APPENDIX 6. This Long List also includes additional projects surveyed in advance by VDB (namely, Nos. 4, 5 and 82 – 87, 4) and those recommended by MOIT-ECCO (No. 88) and ECC-Hanoi (Nos. 89 and 90) during the questionnaire survey. The sub project No. 91 was offered by CITOH which is one of the sub projects introduced from JICA Hanoi. The sub projects No. 94 to104 are added by IE during this survey.

2.4.2 Selection of EEREP candidate sub projects

The top priority criterion of selecting the candidate sub projects was the timing of loan disbursement, since these projects are the first model of VDB's two step loan under EEREP. VDB selected 4 sub projects (No.82,83,85,86) based on its own investigation and recommended them to JICA before the first SAPI site survey. Considering the initial target date of end-January 2010 for EEREP sub project selection, SAPI Team decided to conduct site survey of these 4 projects during the first SAPI site survey period. As well, during the first site survey period, SAPI Team visited the offices of MOIT-EECO, IE, ECC-Hanoi and ECC-HCMC to grasp the current situation of the energy efficiency in Vietnam and to collect up-to-date information on potential EEREP sub projects. As a result, MOIT-EECO recommended SAPI Team to conduct a site survey on the cement project No.88; and ECC-Hanoi recommended the textile company No.89 as well as the shipbuilding company No.90 for site survey. As well, during the communication between JICA Head Office and SAPI Team, JICA recommended SAPI Team to conduct a site survey on the ceramic production at Bat Trang village (No.87) and the brick production of which the Vietnamese Ministry of Science and Technology is currently planning to improve energy efficiency.

All in all, SAPI Team has conducted site surveys of the above selected 8 sub projects, the summary of which is included in Short List attached to Appendix 7.

2.4.3 Survey and evaluation of EEREP candidate sub projects

2.4.3.1 Cement Thanh Cong

1) On site survey schedule

Name of Entity: Thanh Cong Joint-Stock Production and Construction Material Company No.3

Place: Hiep Son Industrial Zone, Hiep Son Commune, Kinh Mon District, Hai Duong Province

Date and Time: Nov. 11, 2009, 9:45 - 11:30

Survey Team: SAPI Team

Participant: Thanh Cong Cement

Mr. Le Van Dinh, Chairman – General Director

SAPI Team

Mr. M. Kato,

Mr. Y. Fujii

Ms. Huyen (Interpreter)

VDB Head Office

Mr. N. H. Trung, Deputy Director,
Ms. N. T. Ha, Specialist, International Relations Dept,
Mr. Huy, Appraisal Dept.
Mr. L.V. Son, Director, Hai Duong Office

2) Plant site observation

This factory is a new and small sized one equipped with 2-horizontal dry type kilns with suspension pre-heater (SPH) and pre-calciner, of which total calcining capacity is 2,500t-clinker/d (1,250t/d x 2), 750,000t-clinker/y and 1,000,000t-cement/y, respectively. From the third year, the production capacity is planned to be increased up to 3,000t-clinker/d, 900,000t-clinker/y and 1,200,000t-cement/y, respectively.

The site works (such as erection, cabling, refractory lining, etc.) for No.2 production line are almost completed. Drying-up of kiln lining and concrete stack lining are being prepared. The automation and control system are under checking. The ground for No. 1 production line is prepared, but neither erection work nor piling work has started yet. Therefore, any equipment of the power generation system is not observed

in the site during this visit.

No.2 production line is scheduled to be put into operation in mid-November. No. 1 production line is ready for piling and is scheduled to be completed within 2012.

This cement factory was planned and designed by Beijing Office of Krupp in Shanghai China and the waste heat recovery power generation system was also included in their engineering works. The major equipment including the power generation system is imported from China. The FS of factory construction including the power generation system has been done by a cement engineering entity in Vietnam.

Environmental Requirements are fully confirmed. The Energy Audit has not yet been done. VDB has instructed the end-borrower to prepare for it.

(1) Name of Project: Cement Thanh Cong

(2) Factory data

Planned Production		750,000t-clinker/year
		1,000,000t-cement/ year
		100,000t-white cement/ year
Kiln		
	Type	Rotating Dry Type with SPH
	No. of Kiln Set	2 lines
	Capacity	1,250t-clinker/day kiln x 2 lines
Annual Operation		300days

3) Energy efficiency project

The energy efficiency equipment is planned to be completed at the same time as the completion of No.1 production line, i.e. at end-December, 2012. The equipment is a waste heat recovery power generation system which recovers the exhaust heat from kilns and air quenching chambers (AQC) and generates electricity for self-use in the factory. A set of SPH boiler and AQC boiler is provided in each kiln line. All the steam generated from four boilers will be introduced into one steam turbine/generator

for generating 4MW electricity. The amount of thus generated electricity corresponds to approximately 27% of the total electricity required in the factory; which will displace the equivalent amount of electricity from the national grid. This system, therefore, can save much energy and reduce greenhouse gas emissions.

(1) Project technology

The technology to be applied to this project is well proven technology, same as those developed in Japan in 1980s and ever since used widely in Taiwan, China, Pakistan, India and other countries with more than 100 installation cases. In Viet Nam, similar system was installed in Hai Tien – II cement plant and is currently under operation. The system is composed of SPH boiler(s), AQC boiler(s), steam turbine/generator, condenser, cooling tower with air fans and control equipment. Waste heat from SPH exhaust gases is recovered by a SPH Boiler installed in a gas duct between the SPH outlet and the induced draft fan. In parallel with the SPH boiler, a bypass duct with a damper is arranged to enable to bypass the exhaust gas. Waste heat from AQC exhaust air is recovered by installing an AQC boiler on the upstream side of an electrostatic precipitator along the air duct of AQC. Part of the air passing through AQC boiler returns to the suction at AQC to keep the air temperature high enough for achieving effective heat transfer. A steam turbine works with the obtained steam and drives electricity generator for producing considerable amount of electricity, which accounts for almost 27 % of the total electricity required in the cement plant.

(i) Basic specification

Steam Turbine	1 set per 2 kiln lines
Rated output	4.5MW
Inlet steam pressure	1.27MPa
Inlet steam temperature	290^{o}C
Generator	1 set per steam turbine
Rated output	4.5MW
Gross generated electricity	4.0MW
Net generated electricity	Approx. 3.6MW
SPH Boiler	2 sets (1 for 1 kiln line)
Flue gas quantity	150,000Nm3/h
Inlet gas temperature	350^{o}C
Outlet gas temperature	250^{o}C
AQC Boiler	2 sets (1 for 1 AQC)

Air flow quantity	65,000 Nm3/h
Inlet air temperature	350°C
Outlet air temperature	100°C

Water Circulation System of Steam Turbine

Closed circulation system with two cooling towers by mechanical ventilation with 1,000t/h for each

(ii) Electricity consumption of factory and energy conservation

The planned electricity consumption of the factory is 95kWh/t-cement according to FSR and the planned cement production is 1,000,000tons per year. Thus, total electricity consumption per year amounts to 95,000MWh/y. All electricity will be imported from the national grid if this project does not exist. Therefore, by the installation of this technology in this waste heat recovery power generation plant, the total electricity generated from this plant can displace the equivalent amount of electricity imported from the national grid.

Estimated Displaced Electricity by this Technology:

= 3.6MW x 24h x 300d/y = 26,000MWh/y

Improvement Rate of Electricity Consumption:

= 26,000 / 95,000 x 100 = 27%

(iii) System diagram and plot plan

Refer to APPENDIX – 14-1 for the attached Project Document dated July 23, 2009.

(2) Greenhouse gas emission reduction effects

Since the power plant of this project generates electricity by recovering waste heat from the cement calcining process, and since no fuels are required for operating the plant, there is no generation of greenhouse gases due to the implementation of this plant nor are there any CO^2 emissions. There is no captive power generating equipment for this factory. Therefore, by the installation of this technology in the waste heat recovery power generation plant, the generated electricity will displace the equivalent amount of electricity imported from the national grid. Thus, the grid CO^2 emissions are directly counted as emissions reduction from this project. For the calculation of the CO^2

emissions, the value (EFgrid,CD,y = 0.5993t-CO^2/MWh) shown in the paper of CDM PDD "15MW Hiep Son Coke Ovens Waste Heat Power Project Version: 1.0 Date: 10/10/2008" which is published on a website, is used.

Estimated Reduced GHG
= 26,000 x 0.5993 = 15,581 t-CO^2/y

(3) Project schedule

No.2 kiln line is scheduled to be completed in November 2009 and put into operation by the end-November, 2009. No.1 kiln line is scheduled to be completed in December 2012. The waste recovery power generation equipment will be installed in parallel with the construction of No.1 kiln line.

(4) Investment cost

The planned investment cost is as below:

Project Cost (Total Investment Cost)	127,000mVND
Equipments	105,000mVND
Imported equipment (incl. tax, duty & others)	95,000mVND
Domestic purchasing equipment	10,000mVND
Civil Works	10,000mVND
Construction works incl. foundation, concrete	5,000mVND
Assembling equipment	5,000mVND
Contingencies	12,000mVND

Remarks: As cost details are not yet clear, VDB loan officer has to confirm with the end borrower at the initial screening stage that all costs, fees and charges for such design, trial operation and other necessary works to complete the energy efficiency system for smooth operation are included in the total investment cost.

4) Evaluation

(1) Background of the applied technology

The technology to be applied to this project is a well proven technology, same as those developed in Japan in 1980s and ever since used widely in Taiwan, China, Pakistan, India and other countries with more than 100 installation cases. Viet Nam itself has an experience of a quite similar system installed at Hai Tien – II Cement Plant.

The most critical point of this technology is how to keep the heat transfer tubes in SPH boiler clean by avoiding accumulation of very soft and fine adhesive dust heavily contained in the flue gas from the pre heater. To solve this problem, SPH boiler with a horizontal gas passage having vertically arranged tubes with hammering dust removers becomes a standard design in Japan today, while a traditional vertical gas passage having horizontally arranged tubes has disappeared due to insoluble dust troubles since 20 years ago.

(2) Matching with the existing production system and operation

From the above background of this technology and taking into account of the safety measures provided for shut-down of the power generation system, it cannot be deemed that any difficulty on matching with the existing plant and operation will occur as long as well experienced and sophisticated planning, engineering and construction works are executed by the project contractors at every stages of the project works.

(3) Operation and maintenance of the applied system

As the end borrower has no experience on such plant, it seems to be necessary to employ some experienced management to supervise operators and/or labors for a smooth and safe operation of this plant. A sufficiently long period of training and supervising course by the plant supplier may be required to attain safe operation and the planned performances.

(4) Energy efficiency effects and GHG emissions reduction

Electricity generation of 26,000MWh per year is not so large, but it saves 27% of the total electricity required in the factory. Thus, this project brings about a very effective means of reducing energy use in the factory. The value of 15,581 tons per year of CO^2

emissions reduction is also considered as effective.

(5) Environmental assessment

The special environmental assessment may not be necessary because the system is installed inside the cement factory and no fossil fuel is used.

5) Conclusion

This end borrower seems to desire for receiving the financing support from VDB for the installation of the power generation system. The system is included in the new factory construction schedule as a package. Given these two conditions, the condition to install the power generating system seems to be expedient, although the plant size is small.

Because all the aspects of the project have been proceeding at the pace of the Chinese manufacturer from the initial stage, there is no room at all for other countries to intervene in the project. Nevertheless, unless other EEREP candidate sub projects with bigger sizes come up in time, SAPI Team has no choice but to evaluate this project.

6) Reference

Project Document including the system diagram and plot-plan, signed by Mr. L. V. Dinh, Chairman, July 23, 2009 (Vietnamese)

FS Report singed by Mr. L. V. Dinh, Chairman, July 27, 2008 (Vietnamese）

2.4.3.2 Hoa Phat Energy

1) On site survey schedule

Name of Entity: Hoa Phat Joint-Stock Energy Company

Place: Hiep Son Commune, Kinh Mon District, Hai Duong Province

Date and Time: Nov. 11, 2009 14:30 - 17:00

Survey Team: SAPI Team

Participant: Hoa Phat Energy JSC
Mr. Nguyen Duc Tuan, General Director Hoa Phat Energy JSC
Mr. Do Hong Anh, Project Manager Hoa Phat Energy JSC
SAPI Team

Mr. M. Kato,

Mr. Y. Fujii

Ms. Huyen (Interpreter)

VDB Head Office

Mr. N. H. Trung, Deputy Director,
Ms. N. T. Ha, Specialist, International Relations Dept,
Mr. Huy, Appraisal Dept.
Mr. L.V. Son, Director, Hai Duong Office

2) Plant site observation

The factory locates beside a river at North-East Hanoi City and it takes one and a half hour by taxi. The factory consists of 2 coal processing plants. Each plant has 40 x 2 coke ovens, i.e. a total of 80 ovens. The plant construction works are progressing in two stages. The first plant is almost completed but the second plant has not started yet. Forty ovens of the first plant are already in operation and producing red cokes. Dry-up firing for refractory works is being prepared for the remaining 40 ovens. The energy efficiency equipment is also installed and is currently under testing for commissioning scheduled in mid-December when the remaining 40 ovens are put into operation. The boiler feed water pump is in test-run. The high temperature waste flue gas from operating ovens is released to atmosphere from the top of (approx. 30 meter high) concrete stack, bypassing the energy-efficient equipment with two guillotine dampers.

The design of this coal processing plant, including the installation of the energy efficiency system, was done by Technological Design Institute in Tianjin, China. Major equipment is also made in China.

Coal for cokes are blended with domestic coals and imported bituminous coals from Australia, Russia, Indonesia and others. Coke products are sent to global markets through a resale entity.

(1) Name of Project: Hoa Phat Energy

(2) Factory data

Planned Production	700,000 t-cokes/year (350,000 t-cokes/y x 2 stages)
Annual Operation	330 days

3) Candidate energy efficiency project

The energy efficiency project proposed this time is for the second plant. The project is to provide an exactly the same energy efficiency system as those installed in the first plant for generating 15MW of electricity. Of the total generated electricity, 2MW is planned to be used in the factory, 2MW for in-house-use and the remaining 11 MW is to be sold to Hoa Phat JS Steel Co., which is the same entity adjacent to this factory that consumes electricity of more than 100MW. CDM credit is also expected for this second plant, considering the fact that CDM credit of approximately 1, million USD per year could be found and a contract has already been made with a German entity for the first plant.

(1) Project technology

The energy efficiency system to be installed will be the technology to produce electricity by recovering sensible heat of high temperature flue gas gathered from the coal processing plant of 40 x 2 coke ovens. The major equipments of the system include one set of steam turbine generator, two waste heat recovery boilers, two sets of desulfurization with electrostatic precipitator, one set of cooling tower, one control and electric system and one concrete turbine house.

(i) Basic specification

Steam Turbine	1 set per stage
Steam inlet pressure	3.43MP
Steam inlet temperature	435^{o}C
Steam flow	58t/h
Exhaust steam pressure	15KPa
Revolving speed	3,000rpm
Generator	1 set per steam turbine
Normal capacity	15MW
Revolving speed	3,000rpm
Voltage	6.3kV
Frequency	50Hz
Output power factor	0.8
Cooling	by water
Waste Heat Recovery Boiler	
Flue Gas Flow	83,000 m^3/h
Flue Gas Temperature to Boiler	950 – 1,050^{o}C
Flue Gas Temperature leaving Boiler	180 – 200^{o}C

Flue Gas Composition	
Dust content	30 mg/m^3
SO2	1,700mg/m^3
N2	70.7%
CO2	5.56%
O2	8%
H2O	15.6%
SO2 after desulphurization	570mg/m3
Evaporation	35t/h/boiler
Steam temperature	450^oC
Steam pressure	3.82MPa

Water Circulation System of Steam Turbine

Closed circulation system with cooling towers by mechanical ventilation

(ii) Electricity consumption of factory and energy conservation

The planned electricity consumption of the factory and use of the generated electricity are as below:

- Providing for Coal Processing Plant: 2MW
- Self-using in Energy Efficiency System 2MW
- Remaining 11MW will be sold to Hoa Phat Joint-Stock Steel Co. in Steel Producing Complex at Kinh Mon, Hai Duong, which is same project entity.
-In the 1st year, average electricity output is 75%, i.e., 13.5MW.
-From 2nd year, the out put will be 100%, i.e., 15MW.

If this project does not exist, high temperature waste flue gas will be released to atmosphere from a stack without utilization and 100% or more electricity will be imported from the national grid. Therefore, when the waste heat recovery power generation plant with this technology is installed, the generated electricity will displace the equivalent electricity imported from the national grid. This equivalent electricity can be deemed as Energy Efficiency and Conservation.

Estimated Displaced Electricity by this Technology:
= 13MW x 24h x 330d/y = 102.96GWh/y

(iii) System diagram and plot plan

Refer to APPENDIX – 14-2 for the attached FSR dated July 23, 2009.

(2) Greenhouse gas emissions reduction effects

The same technology is already installed in the first plant and is ready for operation. CDM PDD "15MW Hiep Son Coke Ovens Waste Heat Power Project Version: 1.0 Date: 10/10/2008" for the first plant has been already prepared and is currently under validation by DOE. This project document is proposing GHG emissions reduction by avoiding CO^2 emissions from the business-as-usual scenario electricity generation from fossil fuel-fired power plants connected to the national electricity grid.

For calculation of the CO^2 emissions in the project for the second plant, the same value (EFgrid,CD,y= 0.5993t-CO^2/MWh) shown in CDM project document published on website is used.

Estimated Displaced Electricity:

For 1st year

= (13.5 – 2)MW x 24h x 33days/y = 91,080MWh/y

From 2nd year

= (15 - 2)MW x 24h x 330days/y = 102,960MWh/y

Estimated Reduction in GHG emissions:

For 1st year

= 91,080 x 0.5993 = 54,584 t-CO^2/y

From 2nd year

= 102,960 x 0.5993 = 61,703 t-CO^2/y

(On the above CDM PDD, GHG reduction 66,450t-CO^2/y by using 308days/y operation, self-consumed electricity 2MW counted in the displaced electricity)

(3) Project schedule

The first plant (with 350kton/y cokes production capacity) construction including the waste heat recovery power generation equipment is scheduled to be completed and put into operation in mid-November 2009. The second plant (with the same capacity as 1st plant) is scheduled to be completed in December 2012. The waste recovery power generation equipment for the second plant will also be constructed in parallel with the construction of the second plant.

(4) Investment cost

The total investment estimated for the whole second coal processing plant – Stage-II is VND 815 bill. In which the portion for the energy efficiency project is VND 251 bill, the detail is as follows;

Figure 2-10: Investment cost of Energy Efficiency System for Second Plant (Unit: VND)

Order No.	Work Items	Cost Estimation
I	Civil Works	63,402,748,189
1	Concrete pile works 400x400	2,112,580,000
2	Building cool-tower	4,688,628,000
	-concrete piles 250 x 250mm	531,360,000
	-press concrete piles 250 x 250mm	116,640,000
3	Dust filter-compressor and desulfurization room	1,436,011,000
4	Water sample and qualitative room	203,760,000
5	Transmission line 6KV	4,500,000,000
6	Purchasing electrical test equipment	1,000,000,000
7	Purchasing and installing grill quicklime	1,500,000,000
8	Building turbine house	3,014,927,104
9	Foundation for turbine house	217,653,975
10	Infrastructure works	1,500,000,000
11	Foundation for ventilation device and shelf of chimney	436,868,000
12	Foundation for steam boiler equipment	1,542,318,110
13	Foundation for desulfurization equipment and ESP	1,743,331,000
14	Foundation for turbine, generator	2,310,772,000
15	Brackets for pipes in the factory	3,472,876,000
16	Foundation for additional equipment of main workshop	1,075,023,000
17	Assembling electric equipment, mechanical equipment for power plant	28,000,000,000
18	Fire alarm equipment	1,500,000,000
19	Main water pipe assembling for the whole factory	2,500,000,000
II	Purchasing domestic material	2,500,000,000
III	Import equipment	177,242,567,329
1	Main production line	163,549,800,000
2	Examination fee for import goods	179,904,780
3	Transport equipment for power plant	2,626,446,196
4	Insurance for transportation	152,000,000
5	Turnover tax of foreign contractor	1,977,591,356
6	VAT of foreign contractor	448,012,687
7	VAT of import goods	8,308,812.310
IV	Profit	2,252,521,534
V	Contingencies	6,000,000,000
	Total	251,379,837,052

4) Evaluation

(1) Background of the applied technology

The original technology to be applied to this project was developed in USA and Europe and brought into China by Germany. It seems that China started to build copy plants at the inlands of China and Mongol and is today exporting similar plants to South America and other countries like Vietnam. Hoa Phat Energy is the first importer of a complete set of Chinese plant including engineering and supply to Vietnam. The plant also includes the energy efficiency system.

(2) Matching with the existing production system and operation

The heat recovery boiler and flue gas treatment equipment are installed at the exhaust pipe-line to stack and are able to be completely isolated by gas dampers, if the energy efficiency system is shut-down. The waste flue gas is directly released to a stack via a by-passing line. The grid electricity is imported at any time when the energy efficiency system is unavailable. Thus, there is not any anxiety about the miss-matching and interference of operation with the process.

(3) Operation and maintenance of the applied system

This EEC technology is rather new, but seems to be proven technology because there are many similar plants in operation.

(4) Energy efficiency effects and GHG emission reduction

Electricity generation of 102.96 GWh per year is sufficiently large amount as energy efficiency effect and 61.703 ton per year of CO2 emissions reduction is also highly effective.

(5) Environmental assessment

The special environmental assessment is not necessary because the system is installed inside the coal processing plant site and no fossil fuel is used.

5) Conclusion

It is not clear whether the end borrower is anxious for loan support from VDB.

6) Reference

Summary on Electric Generator Construction dated August, 2009（attached with

6-drawings, Vietnamese）

2.4.3.3 Duc Nhan Wooden -Refuse Power Generation

1) On site survey

(1) Name of Entity: Duc Nhan Corporation

(2) Location: Nhan Kontum Factory

(3) Date and Time: November 13, 2009, 9:00 - 11:30 AM

(4) Survey Team:

JCI: Toshiaki Takeda, Yoichi Mori (SAPI Team)

(5) Participants:

Duc Nhan Corporation: Mr. Nhan, Chairman; Ms. Xuam, Sales Manager

VDB Head Office: Mr. Trung and Mr. Huy

VDB Kontum Office: Three personnel

ECC HCM: Ms. Nhung, Mr. Nhon

2) Profile of the company:

- Established in 1999.
- The following three factories are in operation.

Factory	No. of employees	Production Capacity (containers/year)	Annual Sales in 2008 (Million USD)
Nhan Kontum	550	540	5.5
Qui Nhon	500	480	4.5
Binh Duong	350	960	3.5
Total	1,400	1,980	13.5

- Utility facilities: Currently the three factories have no power generation facilities and have been purchasing electricity from Vietnam Electricity Company.
- Product line-up : Wooden furniture for in-door and out-door use
- Major market: EU, Asia, US

3) Outline of project

(1) Project description :

This project aims to install a total of 30MW power generation system in the open space (1.5 ha) of their Kontum factory and sell most of generated power to Viet Nam Power Grid. Current electricity consumption by the Kontum factory (the

project site) is approx. 1.5 MWh/year, equal to about 0.5% of the estimated power generation of 195GWh/year. As for the fuel, wasted wood is to be collected through its collecting companies from Quy Hon City and Binh Duong Province.

The company has already been implementing a hydropower project with a possibility of applying for CDM; therefore, this project is also expected to be applied for CDM in the future.

This project was already evaluated by ECC-HCMC and the company is expecting to obtain finance for the project in March 2010.

(2) Project specifications

- Power generation: 196 GWh/year at 6,500 annual operation hours
- Boiler:

Capacity:	20.5 tons/hr x 6 units
Steam:	3.82 MPa and 435 degC
Stoker:	Fixed type
Firing temp.:	1,283 degC
Fuel consumption:	1,083kg/kWh or 30 tons/hr of wasted wood (19,000KJ/kg)

- Turbine/Generator:

Capacity:	5MW x 6 units (30MW)
Type:	Condensate steam turbine with air cooling and 130 degC hot water

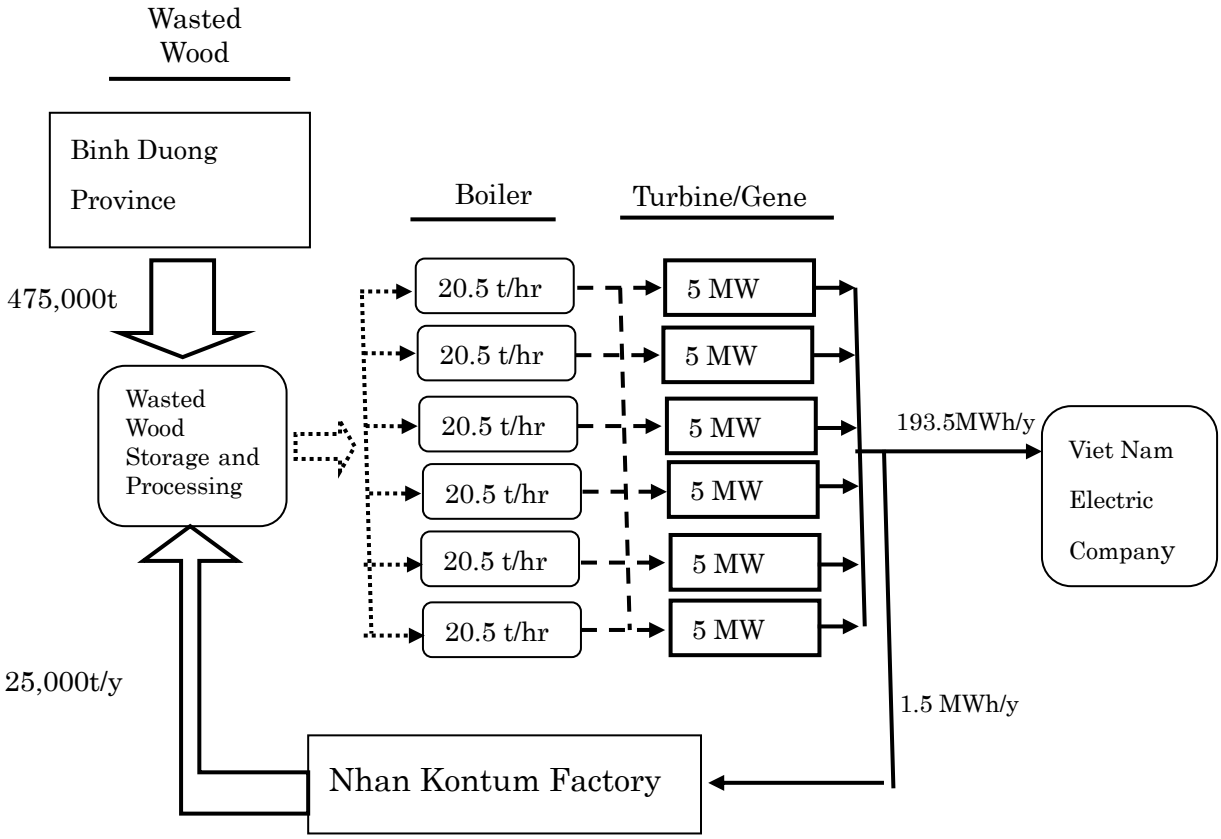
- Fuel collection/arrangements:

  A total of 500,000 tons/year wasted wood pieces are required to manage planned power generation. Out of them, 25,000 tons/year are to be managed by using the in-house site wastes. The rest, 475,000 tons/year, that equals to one-third of the total wasted wood generated yearly inside the Province, will be purchased from waste collecting companies at 0.25 million VND/ton. For this operation, purchasing amount allocation among the intermediate collecting centers will be decided by the Project owner.

  Wasted wood collected should be cut into pieces before being dumped into the boilers.

- Annual operation hours: 6,500 hours

Figure 2-11: Duc Nhan Wooden -Refuse Power Generation



(3) Project technologies

According to the project owner, the introduction of conventional and proven technologies is planned with the following arrangements:

- Ex-country of major equipment: Boiler China
  Turbine/Generator China
  Condenser China/Sweden
- Project management: An engineering firm in China

(4) Generated electricity sale

- When visited, negotiations with Viet Nam Electricity Company had not yet been finalized.
- Expected feed-in tariff: 0.05 USD/kWh
- There is a substation of the Electricity Company 1 km from the project site.

(5) Estimated project cost

- Rough breakdown is shown below:

➢ Infrastructure	217,854 million VND
➢ Equipment	417,188
➢ Project Management	9,423
➢ Consulting/Eng'g	39,032
➢ Others	12,959
➢ Contingency	73,544
Total	770,000 million VND
	(= approx. 49 million USD)

- Expected payback period : 10 years without CDM revenue
  8 years with CDM revenue

(6) GHG emissions reduction

- Eligibility

Since wood is regarded as a renewable energy source, this project is expected to reduce GHG emissions by replacing electricity otherwise supplied by Viet Nam Electricity Company, which has many fossil-fuel fired power plants.

.

Currently in Viet Nam, wood wastes has been used as fuel with coal at brick factories or otherwise simply discarded to be stacked in open space, such as the backyard of a factory; wood wastes therefore are expected to be consumed as the fuel in the project in order to minimize the wood wastes discarding problems in the Province. However, the use of wood wastes as fuel at brick factories is going to be prohibited by law in 2011.

- Calculation of Amount of GHG Emission Reduction
  - Net grid supply electricity: 196 GWh/year x 0.9* = 176.4 GWh/year
    *: Efficiency factor assuming total 10% losses: 5% for self consumption for the power plant operation and 5% for consumption for operation of wasted-wood treatment processes.
  - Annual reduction: 176.4 GWh/year x 0.6 *(tCO_2e / kWh)
    = 105,840 (tCO_2e/year)
    *: Assumed based on data applied in the PDD of a recently-registered CDM hydropower project in Viet Nam.

(7) Project Schedule

As described above, the company was expecting to obtain financing for the project

in next March and then to take actions to proceed with the project.

4) Conclusion of the project assessment

(1) Technology

There would be no significant difficulties with the technologies to be introduced with this project. The combination of the six units of power generation equipments is rather of small scale (20.5 tons/hr Boiler, 5 MW Turbine and 5 MW Generator) and its built-in technologies are all proven ones. In addition, a Chinese engineering firm supposed to be familiar with these technologies is expected to be hired and act as the project manager, since the project owner does not seem to have sufficient skills and experiences in managing this kind of project.

(2) Environmental impact

The project is expected to contribute to not only GHG emissions reduction, but also to minimizing waste-wood discarding problems in the region.

With the use of a carbon-free fuel such as waste wood, the project is expected to reduce GHG emissions by over 100,000 tCO_2e/year, and to supply over 170 GWh/year to Viet Nam Electricity Company which has many fossil-fuel fired power plants.

At the same time, using as much as 500,000 tons/year of waste wood as the fuel, the project is expected to contribute to the reduction of waste wood discarding problem in the region, which is anticipated to worsen further after the year 2011 when the use of waste wood as a fuel for brick manufacturing will be prohibited by law.

(3) Implications with current factory operation

There found no anticipated influence by the project implementation to current factory operation. Though the planned project site is located in the open space within the factory site, it is planned to be physically and completely separated from the current factory operation area for manufacturing furniture, including the allocation of a dedicated access to the project site from the main road.

5) Critical monitoring issues

Through the survey, SAPI Team had a concern about the feasibility of the operation of collecting as much as 500,000 tons/year of waste wood from the

neighboring area continuously for the years ahead. To realize this target, the project has to collect and transport the wood to the site at an average rate of about 1,400 tons/day. This means that the project needs to mobilize a total of 140 10-ton tracks or 350 4-ton tracks per day. When detailed information becomes available, this issue shall be carefully reviewed and monitored.

6) Reference

Investment report of the project

2.4.3.4 Bentre Suger -Refuse Power Generation

1) On site survey

(1) Name of Entity: Bentre Sugar Joint stock Company

(2) Location: Bentre Factory

(3) Date and Time: November 12, 2009, 14:50～17:30 PM

(4) Survey Team:

Toshiaki Takeda, Yoichi Mori (SAPI Team)

(5) Participant:

Bentre Sugar Joint stock Company: Mr. Son, Chairman; Mr. Tam, Vice President
Mr. Hoang, Chief Accountant

VDB Head Office: Mr. Trung and Mr. Huy

VDB Kontum Office: Three Personnel attended

ECC HCMC: Mr. Nhon

2) Profile of the company

- Established in 1999.
- No. of employees: 364
- Annual output: 22,000-28,000 tons of raw sugar
- Annual sales: 200-250 billion VND
- Operation data
  a. Sugar manufacturing: 150 days/year (dry season)
  b. Sugar cane processing: 2,000 tons/day
  c. Bagasse generation: 500 tons/day (equivalent to 20% of sugar cane)
  400 tons/day (consumed by the existing two boilers)

100 tons/day (stacked in the open spaces)

About 14,400 tons of bagasse has been left-over annually since the start of sugar production in 1999.

- Current utilities: Boiler: 25tons/hr x 2 units
  Turbine/Generator: 1.5MW x 2 units

All the generated steam and electricity have been used for operation of the sugar manufacturing facilities.

3) Outline of Project

(1) Name of Project: Bentre Sugar-Refuse Power Generation

(2) Project description :

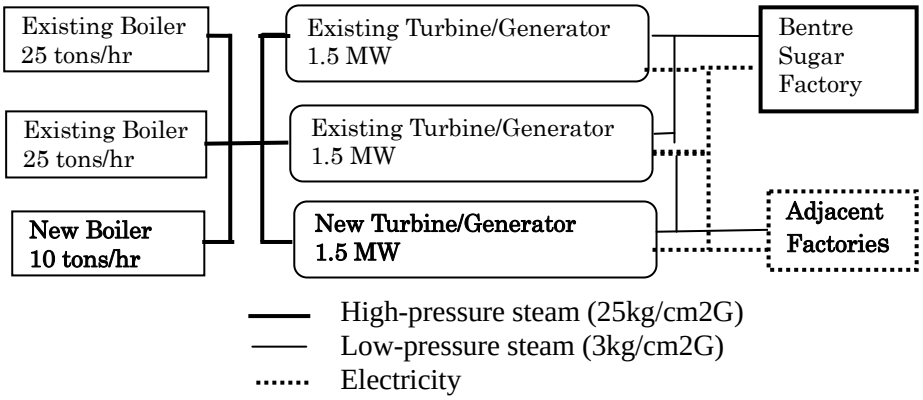
This project aims to generate electricity and steam, and sell them to the adjacent factories, newly installing a boiler and a turbine/generator unit. The boiler will use the un-used bagasse 100 tons/day; as such the factory is expected to stop stacking excess bagasse in the open space.

(3) Project specifications:

- Boiler — Capacity: 10 tons/hr x 1 unit; Steam: 25kg/cm2; Stoker: Fixed type
- Turbine/Generator: Capacity: 1.5 MW x 1 unit; Type: Back-pressure steam turbine

- Wired-diagram of the utility system after the project implementation

Figure 2-12: Bentre Suger -Refuse Power Generation



As electric motors have been used for crushers for sugar cane, high-pressure

steam are not required in the Bentre factory. In some factories steam motors are used for crushers, where high-pressure steam is required.

(4) Project technology

The project owner planned to purchase the major equipment from the same supplier(s) who had supplied the existing boilers and turbine/generator units. The technologies involved in the project, therefore, are conventional and proven ones.

Expected exporting countries of the major equipment are as follows:

- Boiler China
- Turbine/Generator China or Czech

(5) Generated Utility Sale Plan

Steam and electricity to be generated by the project is planned to be sold to the adjacent factories as follows:

Utility	Amount	Expected price
Electricity	4,143 MWh/year*	700 VND/kWh***
Steam	15,120 tons/year**	150,000 VND/ton

*: 1.151 MW x 24hr x 150days = 4,143 MWh/year
**: 4.2 tons/hr x 24 hr x 150 days=15,120 tons/year
**: Current tariff x 0.7 (30% discount assumed)

(6) Estimated project cost : around 1.0 million USD

(7) GHG emissions reductions

- Eligibility

Since bagasse is regarded as a renewable energy source, the project is expected to reduce GHG emissions by replacing electricity otherwise supplied by Viet Nam Electricity Company which employs many thermal power plants using fossil fuels for power generation. And the project would also supply steam to the adjacent factories where steam are generated by boilers using fossil fuels; thus by the fuel switch, the project will also contribute to GHG emissions reduction.

Currently, excess bagasse has been stacked in the open space around the factory for 150 days/year at the rate 100 tons/day for almost 10 years and available space has been closing to the limit. With implementation of the project, the factory would be able to stop dumping of bagasse, which will

contribute to minimizing environmental pollution in the region.

- Calculation of the amount of GHG emission reduction
  - Emission reduction by electricity supply to the adjacent factories
    4,143 MWh/year x 0.6 tCO_2e / MWh* = 2,485 tCO_2e/year
    * Emission factor of Viet Nam Electricity Company
  - Emission reduction by steam supply to the adjacent factories
    15,120 tons-steam/year x 2,800 KJ/kg-steam* /0.6** x 0.07*** tCO_2e/ GJ
    = 4,939 tCO_2e/year
    * Enthalpy of 3 bar steam, under which condition steam would be sold
    ** Assumed boiler efficiency of the adjacent factories
    *** Emission factor of heavy-oil
  - Annual total emission reduction estimate:
    2,485 + 4,939 = 7,424 tCO_2e/year

4) Conclusion of the project assessment

(1) Technology

As explained above, the technologies to be introduced are conventional ones and almost similar to those of the existing facilities except for some upgrading of electrical control systems to be built-in. The suppliers expected are the same who supplied the existing ones 10 years ago; with this combination the factory could implement their maintenance work easily with easier access to and communication with the suppliers. Therefore, the selection of the vender and the technologies by the project is considered reasonable and appropriate.

(2) Environmental impact

The project is expected to contribute to both GHG emission reductions and improvements of the environment surrounding the factory as a renewable energy project.

As calculated above, about 7,200 tCO_2e/year reductions is expected with the project implementation by supplying electricity and steam to the adjacent factories, which will be generated with use of bagasse as the fuel.

At the same time, the project could minimize the environmental pollution issue associated with dumping of excess bagasse to open spaces around the factory.

Currently, the open spaces around the factory have been long used for stocking unused bagasse. By the project, the unused bagasse would be thoroughly used up for the operation of the new boiler and thus further extension of the stock space would be avoided.

(3) Implications with current factory operation

The equipment is expected to be installed next to the existing facilities with a minor-scale expansion of the existing utility building towards the adjacent open space. Especially for the installation of the turbine/generator, an open space is already prepared inside the building.

It is expected, therefore, that there would be no negative influence by the project to the current operation as far as only the excess amount of electricity and steam would be sold to the adjacent factories.

5) Reference

Energy audit report

2.4.3.5 Nam Triew Shipbuilding Industry Corporation-Energy Saving

The information of this project has come from ECC-Hanoi which conducted the energy audit of the shipbuilding facilities in November 2009.

(1) On-site survey

Name of Entity: Nam Triew Shipbuilding Industry Corporation
Place: Hai Phong
Date and Time: December 8, 2009, 9:30～13:00
Survey Team: JCI
M. Kato
Ms. Yen (Interpreter)
Participant: Nam Triew Shipbuilding Industry Corporation
Nguyen Van Toan, Vice General Director
Le Minh Duc, Chairman & Director of Vinashin Electric JSC
And 5 staffs
IE
Mr. Anh
ECC-Hanoi
Mr. An, Deputy Director

Mr. Lian

Mr. Quan

(2) Outline of the enterprise

Nam Triew Shipbuilding is one of the subsidiary company of Vietnam Shipbuilding Group, which is the largest government owned shipbuilding group in Vietnam that owns 38 shipyards and 80,000 employees all over the nation. The location of Nam Trew Shipbuilding is in Hai Phong about 120 km north east of Hanoi. The company was established in 1966 and its capital amount is 2,313 billion VND.

(i) Ship building capacity: 17 ships/year

(ii) Maximum production capacity: 70,000 ton

(iii) Major products:

53,000 ton carrier for UK

700 TEU container carrier for Germany

56,200 ton carrier for Japan

6,900 ton car ferry for Norway

150,000 ton FSO for domestic

13,500 ton oil tanker for domestic

Others:

Repair

Machinery

(iv) Energy supply

Electricity supply: 33,600 kVA via 13 sub stations

Others: Diesel Oil (DO), Fuel Oil (FO) and LPG

(3) Background of the project

MOIT selected this shipyard as one of the enterprise with annual energy consumption exceeding 1,000 toe. MOIT will bear 50 % of total cost of energy audit (EA). EA has finished in November 2009, but the owner has not yet decided to implement the project. Therefore, the feasibility study report has not prepared yet.

(4) The results of EA and Discussion

Mr. An of ECC-Hanoi presented the results of EA which is listed in Figure 2-13. The opinions of the company staffs were all positive. Mr. Toan, Vice Director of the

company expressed his intention to implement all items included in the project. SAPI Team presented the outline of TSL. The company officials expressed a positive evaluation regarding the EEREP loan. They have two other options, namely, MOIT grant (Maximum 30% of the project cost or 300,000US$), which is very difficult to be accepted due to the limited total budget and a complicated application procedure, and commercial bank loans.

Figure 2-13 Results of Energy Audit

TT	Solution	Expected Efficiency			Investment cost	Payback period (year)
		Fuel kind	Energy saving (kWh; litle/year)	Cost savings (1000 VND)		
1	Energy management model	Electricity	530.499,9	522.012	750.000	0,5
		Others	-	954.286		
2	Pipeline improvement and leak management	Electricity	112.406	110.607	250.000	2,3
3	Add a pressure receiver in workshops, construction area, wharf,…	Electricity	224.811	221.214	900.000	4,1
4	Install inverter for air compressed system	Electricity	2.085.283	2.051.919	4.399.710	2,1
5	Replace 2000 fluorescent T10 with electromagnetic ballast by fluorescent T8 with electronic ballast	Electricity	59.136	58.190	144.375	2,5
6	Improve lighting condition in corrugated iron cleaning workshop	Electricity	19.712	19.397	18.000	0,9
7	Install inverter for port cranes and crane system	Electricity	150.058	147.657	250.000	1,7
8	Install inverter for Cleaner fan at cleaning workshop.	Electricity	94.864	93.346	185.000	2,0
9	Install the second line for circuit at transformer station	Electricity	455.495	448.207	2.500.000	5,6
10	Install the capacitor for Transformer No 2	Electricity	-	182.704	250.000	1,4
11	Install the Power boss for DC Welding machine	Electricity	1.217.395	1.197.917	970.500	0,8
12	Replace zinc line 6m by 12m line	DO	576.000	4.293.504	16.500.000	3,8
	Total	Electricity	4.949.660	5.053.170	27.117.585	-
		DO	576.000	4.293.504		
		Others	-	954.286		
Total				**10.300.960**	**27.117.585**	**2,6**

(5) Plant site observation

Plant site observation was conducted with company officials and got individual explanations of the modification points including the below:

Air piping and Air compressors

Welders

Electricity sub-stations

Galvanizing pool

Cranes

(6) Evaluation

Since this project has completed EA just recently, the detailed plans of the project are currently not available. In addition, the shipbuilding industry is not an energy intensive industry, but one of typical machinery manufacturing industry. The proposed measures therefore seem to be standard ones based on the current situation of Vietnam, taking also into account the fact that EA has been conducted by ECC-Hanoi, an authorized organization in Vietnam. The actual technical evaluation has to await completion of the feasibility study.

2.4.3.6 Thai Nguyen Cement

1) On-site survey schedule

Name of Entity: Vietnam Industrial Construction Corp./ Thai Nguyen Cement Factory
Place: Quangson Commune, Donghy District, Thai Nguyen Province
Date and Time: December 08, 2009, 11:30 - 14:30
Survey Team: SAPI Team
Participant: Thai Nguyen Cement
Mr. Le Van Ky, Vice Director
Mr. Vn Van Bien,
An Phuong Investment and Trading Stock Company
Mr. Nguyen Ba Phuong, Doctor-eng.
Mrs. Nguyen Thi Hoa
SAPI Team
Mr. Y. Fujii
Mr. Le Hai Doan (Interpreter)
Institute of Energy
Mr. Nguyen Duc Song, Energy Economic, Demand Forecast & Demand Side Management Dept.

2) Plant site observation

This factory is one of the factories owned by the Vietnam Industrial Construction Corp. (VINAICON), which is a major general contractor in Vietnam located in Quangson Commune, Donghy District, Thai Nguyen Province. The factory is a fairly new one

installed as 1-horizontal dry type kiln with 5 stages suspension pre-heater (SPH) and pre-calciner, of which total calcining capacity is 4,000t-clinker/ and the factory capacity is 1,400,000t-cement/y. production.

The erection works of the factory are completed and pre-commissioning works are being done for putting into commercial operation by end-December. A French company, Fives FCB, has done the engineering works and supplied major machines and equipments. The civil and erection works are performed by VINAICON themselves. The site condition is well in order and every works have been finished and good looking.

(1) Name of Project: Thai Nguyen Cement

(2) Factory data

Planned Production		4,000 t-clinker/ day
		1,400,000 t-cement/ year
Kiln		
	Type	Rotating Dry Type with NSPH
	No. of Kiln Set	1 line
	Capacity	4,000t-clinker/day kiln x1 line
Annual Operation		270 days (300days x 90%)

3) Energy efficiency project

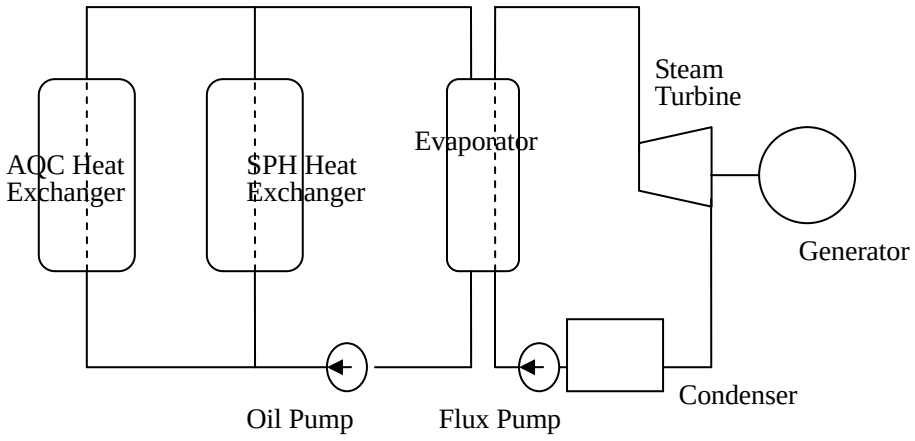
Two participants representing Thai Nguyen Cement/ VINAICON and Dr. Phuong of An Phuong Investment and Trading Stock Company have been contemplating the establishment of a new entity to develop energy conservation business in Vietnam. Thus, they have made the feasibility study to install an energy efficiency system to this cement factory, which will be their first business to be realized. The system is planned with ABB's Organic Rankine Cycle (ORC) power plant, having 5MW rated output and 3MW normal output. Its normal output corresponds to approximately 25% of the total electricity consumption in the cement plant (95,000MWh per year).

(1) Project technology

The technology to be applied to this project is planned to be an Organic Rankine Cycle (ORC) which is used for geo-thermal power plants in USA since 1980 for recovering heat from lower temperature heat source and currently being studied to apply to industrial fields, especially to low temperature waste heat sources. The heat cycle is same as conventional water-steam cycle, but the heat flux material is different, i.e., water for the conventional cycle but petroleum thermo-oils, ammonia or pentane, etc. for ORC.

The planned ORC consists of two closed loops, one for recovering waste heat from suspension pre-heater (SPH) and air quenching chambers (AQC) with thermo-oil heat flux, another for rotating a steam turbine with organic heat flux like ammonia water or pentane. The thermo-oil heat flux is heated at the heat exchangers installed in the waste flue ducts after SPH and/ or AQC and circulates to an evaporator wherein the heating coils are arranged to evaporate the organic heat flux. The vapor of the organic heat flux flows into the steam turbine, rotates it and generates electricity as same as the conventional water-steam turbine. See figure 2-14 for a conceptual diagram.

Figure 2-14: Conceptual Diagram of the planned ORC



(i) Basic specification

Steam Turbine	1 set
Rated output	5MW
Net generated electricity	3.5MW
Revolution	3,000rpm
Inlet steam pressure	12.5bar
Inlet steam temperature	318°C
Generator	1 set per steam turbine
Rated output	5MW
Net generated electricity	3.5MW
SPH Heat Exchanger	1 set
Flue gas quantity	307,865Nm3/h
Inlet gas temperature	350°C
Outlet gas temperature	230°C
AQC Heat Exchanger	1 set
Air flow quantity	122,188Nm3/h
Inlet air temperature	255°C
Outlet air temperature	90°C

(ii) Electricity consumption of factory and energy conservation

The planned total electricity consumption of the factory is 90 MWh per year according to FSR, and the cement production is planned to be 1,400,000 tons per year.

All that electricity has to be imported from the national grid if this project does not exist. Therefore, by the installation of this waste heat recovery power generation plant (using this technology), the generated electricity at this plant shall be able to displace the equivalent amount of electricity imported from the national grid.

Estimated Displaced Electricity by this Technology:

= 3.5MW x 24h x 300d/y x 90% = 22,680 MWh/y

Improvement Rate of Electricity Consumption:

= 22,680 / 90,000 x 100 = 25.2 %

(iii) System diagram and plot plan

Not available.

(2) Greenhouse gas emission reduction effects

Since the power plant of this project generates electricity by recovering waste heat from the cement calcining process, and since no fuels are required for operating the plant, there is no generation of greenhouse gases due to the implementation of this plant, nor are there any CO2 emissions. There is no captive power generating equipment for this plant. Therefore, when the waste heat recovery power generation plant with this technology is installed, the generated electricity will displace the equivalent amount of electricity imported from the national grid. Thus, the grid CO2 emissions are able to be directly taken as the emission reduction of this project. The CO2 emission reductions by using of the value (EFgrid,CD,y = 0.5993t-CO2/MWh) are shown below;

Estimated Reduction of GHG
= 22,680 x 0.5993 = 13,592 t-CO2/y

(3) Project schedule

The tentative project schedule is as below;

Final FS Report	January, 2010
Detail Engineering	August, 2010
Manufacturing	August, 2010
Assembly	November, 2010
Test and Take-over	February, 2011

(4) Investment cost

The investment cost is planned as below:

Project Cost (Total Investment Cost)		152,623 m VND
VAT		4,455 m VND
Equipment	Foreign Currency Portion	76,000 m VND
	Domestic Portion	25,000 m VND
Construction		7,900 m VND
Others		39,300 m VND

More detailed break-down costs are required.

4) Evaluation

(1) Background of the applied technology

The ORC technology to be applied to this project is not popular yet in the industrial field. However the technology has been applied to geo-thermal power plants in USA since almost 30 years ago.

(2) Matching with the existing production system and operation

This waste heat recovery system can be connected to the ducts in the cement production facilities through the isolating gas dampers, and the system itself can be isolated if any defect appears. By taking into account of such safety measures provided for shut-down of the heat recovery system, any difficulty on miss-matching with the existing plant and operation can not be deemed, so far as well experienced and sophisticated planning, engineering and construction works are executed by the project contractors at every stage of the project works.

(3) Operation and maintenance of the applied system

As the end-borrower has no experience on such plant, it seems to be necessary to employ some experienced management team to supervise operators and/ or laborers for a smooth and safe operation of this plant. A sufficiently long period of training and supervising course by the plant supplier may be required to attain safe operation and the planned performances.

(4) Energy efficiency effects and GHG emissions reduction

Electricity generation 22,680MWh per year is not so large but saves 27% of the total electricity required in the factory. Thus, this project is very effective for energy conservation in the factory. The value of 13,600 ton per year CO2 emissions reduction is also effective.

(5) Environmental assessment

The special environmental assessment may not be necessary because the system is installed inside the cement factory and no fossil fuel is used.

(6) Other outstanding matters

Plot plan, system diagram and more detailed cost break down are required.

5) Conclusion

It is the one which has interest in the exhaust-heat-recovery and energy conservation business, and makes the installation of the equipment to this factory for contemplating commercialization of their experience in the future. It is not cleared this time how VINAICON will be involved to such activity. This thing should be carefully investigated at the financial screening stage.

ORC technology is already adopted in USA and Europe; and it thus seems to be a proven technology though commercial applications are not so much prevalent. (In Japan, chlorofluorocarbon gas turbine was once commercialized at the end of 1970s.)
ORC technology has an advantage to recover heat from lower temperature heat sources. However, in case of heat recovery from the higher temperature heat source like a cement kiln exhaust heat, the conventional type of water-steam Rankine cycle power plant is enough in view of easy operation, maintenance, so on.

6) Reference

FS Report of July, 2008 (Vietnamese)

2.4.3.7 Ceramic

SAPI Team visited Bat Trang village to obtain the information on the outline of the project activities of the new ceramic kiln introduction as recommended by JICA as a candidate for EEREP sub-projects.
In November 2008, a Japanese consultant company made a report on the survey result of a project of converting old-type coal-fired kilns to a new LPG-fired one in the ceramic factories in Bat Trang village, which is famous as a center for ceramic factories in Vietnam.

1)	Date and Time:	12 December 2009, 09:00-12:00	
2)	Venue:	BAT TRANG Designing & Producing CERAMIC Joint Stock Company (BTDPC), Bat Trang village, near Hanoi	
3)	Attendees:	BTDPC:	Mr. Le Duc Trong, Managing Director
		SAPI Team:	Mr. Toshiaki Takeda
			Mr. Yoichi Mori
		IE:	Mr. N. H. Anh

4) Background and outline of the project

- Bat Trang village, located 10 km south from the center of Hanoi, has many small ceramic factories and many retail shops, which draw many tourists.
- The village reportedly has a total of approx. 500 kilns, and at present about 100 out of them are of old-type, coal-fired kilns. The old-type ones have been gradually converted to the new type kiln to improve productivity and minimize negative impacts of coal-firing on the environment.
- Many of the factories have only one kiln each and are, however, capable of completing within a factory all the manufacturing process consisting of forming, drying, painting and baking.
- In the village, a typical kiln has an inside capacity of around 10 m3 and 5-6 m in length/width/height in a box shape and is mostly located in the center of the factory.
- The manufacturing process has not yet been automated and therefore conducted manually. The factory of BTDPC, which is of an average in size, is currently employing 36 young people. It indicates the fact that the ceramic industries in the village have been contributing to providing job opportunities to young people.

5) New LPG-fired kiln

- The above report indicated that the old-type coal-fired kilns have poor productivities compared with the new LPG-fired kilns, requiring longer baking cycle times and causing higher defective product ratios due to poor uniformity of the temperature inside the kiln.
- The new-type kilns are designed so that the waste heat gas can be circulated inside the kiln and part of the gas is introduced to the drying room located next to the kiln. Thus the new–type kilns have been contributing to the reduction in defect ratios with better uniformity of the temperature inside the kiln, the reduction in the baking cycle time from 20-30 hours to 8-12 hours per cycle and the reduction of fuel costs.

6) Current status of the project

- The project has been implemented by the leader, Mr. Trong. According to him, the project aims to convert around 40 old-type kilns to the new-type ones as the first step. The project plan was not yet designed when SAPI Team visited the village, but it was expected to be initiated soon by starting data collection through the survey on candidate factories.
- Including automation of some manufacturing processes, the conversion costs were

estimated at around 800 million VND per factory and Mr. Trong expected to borrow 500 million VND out of them from Vietnam Environmental Protection Fund at the loan rate of 3.6%.

7) Considerations

- The project of converting the old-type kilns to the new-type ones in ceramic factories in Bat Trang village is evaluated as appropriate; though the level of the technology is not of an advanced one, it is considered suitable for the factories since it does not require high skills and high investments and also is a proven technology.
- In terms of the application of TSL, however, the project is evaluated as not appropriate, as its plan has not yet been designed and fixed, and furthermore the leader Mr. Trong planned to apply the loan by Vietnam Environmental Protection Fund.

2.4.3.8 Textile

SAPI Team visited Dong Xuang Knitting Sole Member Limited Liability Company, the largest textile factory in Vietnam, to obtain the information on the outline of the energy-saving project that has been recommended by JICA as a candidate for EEREP sub-projects.

1) Date and Time: 9 December 2009, 09:00-10:30
2) Venue: Dong Xuang Knitting Sole Member Limited Liability Company (DXKSM), Hanoi
3) Attendees: DXKSM
Mr. Phillip Belling, Vice Chairman
Mr. LAqi Thi Dao, Finance Manager
SAPI Team
Mr. Toshiaki Takeda
Mr. Yoichi Mori
IE
Mr. N. H. Anh
ECC Hanoi
Mr. An, Vice Chairman

4) Profile of the company

- The factory is located 6-7km southwest from the center of Hanoi.
- Currently the company has only this factory, but has a plan to construct two new factories 30 km away from Hanoi to double the production capacity.
- Though raw materials are imported, the factory has functions of all the downstream processes: spinning, dying, weaving and sewing. 80% of the products are exported, and out of them 70% are for Japan market and the rest are for U.S., German, Italian and Swiss markets.
- Annual sales totals 8 million US Dollars
- The factory has a total of 1,000 employees, and 100 newly hired employees are currently under training to become the senior staff of the two factories.

5) The current status of the energy-saving project

- When visited, the factory had not yet initiated the energy-saving project. Nevertheless, according to the management interviewed, they had concerns over energy saving of their manufacturing processes. The company, in fact, had conducted an energy audit by ECC-Hanoi two years ago.
- So far the management has taken countermeasures for energy saving one by one, including the replacement of some old equipment with new equipment which consume less energy; however, this time they plan to take more thorough measures for energy saving through this project.

6) Considerations

- During the visit by SAPI Team to explain about EEREP TSL, the company was advised, to implement another energy audit and FS, since during the past two years there were a significant change in manufacturing processes which had resulted in changes in utilities consumptions.
- As argued above, the company's project shall be examined when it becomes available with an energy audit report and a FSR in the future.

2.4.3.9 Brick

SAPI Team visited the officers of the Ministry of Science and Technology (MST) to obtain the information on energy-saving projects of ceramic industries in Vietnam. MST has been in charge of promoting energy-saving by smaller enterprises, for instance, in paper, food and ceramic industries. MST has been involved in an energy-saving project of brick industries,

which is one of the candidates for EEREP sub-projects, but SAPI Team couldn't visited the site due to a scheduling mismatch.

1) Date and Time: 11 December 2009, 13:50-14:50 p.m.

2) Venue: MST office in Hanoi

3) Attendees:

MST

Dr. Pham Thi Nga, National Sr. Tech. Advisor

Mr. Nguyen Ba Vinh, Project Manager

SAPI Team

Mr. Moritaka Kato

Mr. Toshiaki Takeda

Mr. Yoichi Mori

4) Explanation of the project status by MST

- The project has been implemented with the assistance of the Japanese Government
- Necessary investment is estimated to be around 5-7 billion VND and it therefore is considered finically feasible in addition to the following energy saving projects of ceramic factories in Bat Trang village:

Factory	Project IRR	Estimated Energy Saving Ratio
Ceramic	25%	-
Brick	30%	50-60%

- With the project, the achievement of significant labor-saving effects is expected by the automation of brick baking process in addition to the reductions in GHG emissions by waste gas.
- MST expects to apply for a loan under the EEREP TSL scheme for the energy -saving project, since the maximum available loan amount from Vietnam Environmental Protection Fund is set at below 500 million VND which is insufficient to cover the estimated total investment. MST, therefore, proposes to obtain information on the procedures for requesting the EEREP TSL applications.

5) Comments by SAPI Team

- The mission of SAPI Team is only to evaluate EEREP candidate projects in terms of technologies, and do not include technical assistance.

- It seems appropriate for MST to attend the seminar to be held next January in Hanoi to obtain information on the TSL application procedures. Details can be obtained from IE who has been commissioned by JCI to organize the seminar.
- It might become necessary to organize a legal entity to qualify the minimum loan amount condition of TSL, which needs to be confirmed by VDB.

6) Considerations

- Same as the case of ceramic factories in Bat Trang village, it is anticipated that the TSL application by the project would be difficult. As described above, the estimated investment amount per factory is evaluated to be too low as compared with VDB lending criteria regarding the minimum loan amount; it also seems difficult to set up a new entity which can be legally approved and qualify the conditions set by VDB for the TSL applications.

2.5 TOR-6: To assist PMU in establishing targeted values of indicators to measure the sub project effectiveness

(1) The energy conservation efficiency

Minutes of Discussions signed between JICA and the Government of Vietnam on May 22 and June 19, 2009 stipulated that “The expected energy consumption effect is more than 20 %, which means the energy consumption amount (toe/ year) after the completion is expected to be reduced by more than 20 % compared to the amount calculated before the project started.”

To establish the targeted values of indicators to measure the sub project effectiveness, SAPI Team checked and calculated the efficiency improvement of NEDO model project. As reference is made under Appendix 8, the efficiency parameters are not specified uniformly, like energy improvement or reduction percentage as stipulated in the MOM.

The energy consumption effect of 20 % should be applicable for the energy efficient equipment, like air conditioning, lighting etc. other than industrial plant. SAPI Team concluded that the targeted values should be decided more flexibly for the industrial plant/ facilities in the EE&RE equipment list.

The technical experts from outside VDB should justify the suitableness of each individual

project. The appraisal comment should be necessary to add in the appraisal format.

To calculate the improvement of energy efficiency, the following conditions will affect the result.

- Project boundary
- Baseline energy consumption
- Energy sources

Each evaluation should be conducted based on the same conditions as referenced project.

The discussion on this subject has been made between JICA and SAPI Team, and concluded that the selecting criteria of energy efficiency should be applied as following.

The energy conservation efficiency improvement requirement for a sub project shall be more than 20% compared with the existing or conventional facilities as a general rule. (The meaning of conventional facility is the facility consisting of general equipments.) The extent of the sub project to be evaluated shall be the same as the extent of the loan application. Energy efficiency and conservation equipments to be introduced by the end borrowers, therefore, shall be those with potential energy efficiency and conservation improvement effects of more than 20% compared with the existing or conventional equipments. However, if thus selected equipment is proved to be the latest model or considered as the most appropriate model in Vietnam, it may not necessarily achieve 20% energy efficiency improvement. In such cases, verification by the end borrower as well as the technical appraisal by the VDB's technical expert shall be required.

(2) Other energy efficiency parameters

The quantitative parameters for the energy consuming or distribution equipments are as follows;

For boilers

- Air ratios
- Waste gas temperatures

For industrial furnaces

- Air ratios
- Waste heat recovery rate
- Wall outer surface temperature

For electrical equipment and power substation facilities

- Power factor

For electric motors

- Efficiency

The guidelines based on energy conservation law in Japan stipulate the above mentioned energy efficiency parameters. Each parameter has two different values, one is standard value which is applied for the existing facilities and another is target value which is applied for newly installed facilities. The most updated values of these parameters are attached to Appendix 13 for reference.

If the sub projects would include the above mentioned equipments or facilities, EA report generally includes current operating values and target values. The technical expert should appraise the target values considering the technical and economical situation of each project.

(3) Target of Efficiency Parameter of Overall project

Considering the overall project, the following items are the efficiency parameters.

(i) Numbers of attendee to the awareness campaign on energy efficiency and renewable energy investments.

Base: The energy efficiency and renewable energy seminar has been held 18 times from 2003 to 2009. The number of attendee was 70 to 90 for each seminar. The total attendee is estimated about 1,440. And the seminars held by this project in Hanoi and HCM city, the number of attendee was 120 respectively.

Target: This project will hold 3 seminars from 2010 to 2012, the target number is 360.

(ii) Emission reduction of CO_2

During the survey of this project, four potential subprojects have been identified as

ready to commencement of loan application. The emission reduction of CO_2 by these sub projects is also the efficiency parameter.

Base: 0

Target: 155,757 ton CO_2/year

(iii) Energy saving

The energy saving by these four sub project is also the efficiency parameter.

Base: 0

Target: 28,835 toe/year

2.6 TOR-7: To assist PMU in composing Technical Appraisal Manual

(1) Technical experts

The roles and functions of the technical expert of this project management unit (PMU) are as follows.

(i) To maintain the potential sub project list

(ii) To maintain the monitoring format

(iii) To evaluate the monitoring data (Energy consumption)

(iv) EE&RE screening by the technical appraisal format and eligible criteria

(2) Eligibility criteria for sub project

The technical eligibility criteria are included in the Appendix 3. The technical expert shall fill in the results of appraisal and comments.

(3) EE&RE List

The EE&RE list is attached in Appendix 8 which is based mainly on the NEDO model projects conducted in South East Asian countries and China. The energy efficiency parameters and its values of each project are listed as a reference for the appraisal work. The technical expert is requested to evaluate the energy efficiency of the specific sub project by comparing the efficiency parameters and justify the efficiency parameters of the specific project. This list should be updated based on the data of actual sub projects selected for

EEREP.

The list of Japanese energy saving equipment for common usage is also attached to Appendix 8. For those EE facilities and equipments which are not included in the eligible EE&RE List, they shall be added to the List by referring to the Japanese list. This list should also be referred to when preparing the new appraisal form format for the other sectors/equipment outside of the EE&RE List.

The eligible ER&RE List is to be updated by PMU according to the up-to-date information to be provided by the selected consultant (i.e. technical experts, such as ECC or IE). PMU shall submit the revised List to JICA for its review.

(4) Revision of eligibility criteria

The eligibility criteria stipulated in Appendix 3 may be subject to revision. The expected energy consumption effect of more than 20% should be applicable for limited equipments/ plants. Specific figures should be applied for specific equipments/ processes individually in consideration with the current and future situations in Vietnam. Technical expert should be responsible to propose the same to PMU.

(2) Energy audit (EA) report

The selecting criteria in the Appendix 3 stipulated the submission of EA report. This clause shall be applied for EE projects, but not for RE projects. Even for EE projects, EA report will not always be available if it is a new project with plant/ equipment not yet started operation. In such cases, feasibility study report shall be used (instead of EA report) for the technical appraisal.

(3) Technical appraisal form format

Technical appraisal form format for some technical sectors and other sectors are shown under Appendix 10.

It is desirable that the form is to be filled up by the end user who is implementing the sub project and moreover to be easily understood by VDB staff in charge of credit examination.

SAPI Team filled up the Technical Appraisal Form of 5 candidate sub-projects on a trial-basis. The filled up forms are shown on the Appendix 11.

As for the method to carry out the technical appraisal without disturbing the progress in the loan-application process, check list form may be useful. The check list could contribute to a concise and effective appraisal. In addition, by summarizing the results of the check list and making a summery table, the points for the technical appraisal may be understood by VDB staffs and would be accumulate as their know how. A sample format for the summary table of technical appraisal results is shown on Figure 2-15.

Figure 2-15: Summary table of technical appraisal results (sample format)

Technology, Facility Name	Appraisal Number	Energy Conservation , Energy Conversion		GHG Reduction	Financing Judgment	Remarks
		Kind of Effects	Effects			
Technology A	2009-00X					
Technology B	2009-00X					
Technology C						
Technology X (Addition)	2009-00X					
Technology Y (Addition)	2009-00X					

(4) Monitoring

The energy efficiency of the project shall be monitored. The monitoring should be conducted by the end borrower (owner). In principle, the data shall be based on the purchasing bills of energy. The amount of major products shall also be reported by the owner. The same format before the project start shall be submitted by the owner. The energy efficiency improvement shall be evaluated annually by the technical expert and reported to the PMU. The monitoring format is shown in the Appendix 9.

(5) Consultant selection

The technical expert shall be selected on normal purchasing basis. The technical experts are selected from the consulting organization like IE and ECCs. The technical appraisal of the loan application of specific sub project should be conducted by the consultant of other organization which prepared EA and/ or FS of the sub project.

2.7 TOR-8: To implement awareness campaign on energy efficiency and renewable energy investments

(1) Seminars on the Introduction of EE&RE Promoting Project (EEREP)

In order to deepen understanding of the system and the technology related to energy conservation and renewable energy, as well as PR activity of Two Step Loan, the seminars both in Hanoi city and Ho Chi Minh City were organized.
The contents of the seminar are included the financial aspects and the technical aspects. In terms of the financial aspects, the system of the two step loan for EEREP, procedure and incentive, etc. were included. On the other hand, in terms of the technical aspects, the introduction of the energy efficiency and CDM in Vietnam were included.

The agenda and list of attendees are in Appendix 12.

(2) Brochure of TSL

Brochure of TSL for EE&RE Promoting project of VDB has prepared. The draft is attached to Appendix 12.

(3) Web of TSL construction for VDB

The new web page on VDB web site will be constructed. The idea of the contents is attached to Appendix 12.

3 Conclusion

PMU was officially established at VDB Head Office on 26 November 2009 and it has ever since been taking the initiative to steadily prepare for the first disbursement of EEREP sub loans. With the assistance of SAPI Team, PMU has understood the basis structure and procedures of Yen Loan/ EEREP and prepared "Program Document" for its official approval and a draft of EEREP Operation Manual. Five candidate sub projects have been carefully examined by both PMU and SAPI Team. In addition, PMU and SAPI Team have already organized seminars for awareness campaign successfully both in Hanoi and Ho Chi Minh City.

However, due to the two months delay of the Loan Agreement between the Government of Vietnam and JICA, there are still some remaining things for the months ahead. Now PMU aims to make the first disbursement of sub loans by the third quarter of 2010 PMU is to do the following things step by step: i) get the official approval on "Program Document" from VDB's General Director (by mid-February); ii) organize the first Advisory Committee (late-February, 2010); iii) complete the final draft of EEREP Operation Manual and issue it officially at VDB after getting the permit from JICA (by early-March); iv) make an official decision on the EEREP loan disbursement (by early-March); v) get the approval on the EEREP loan disbursement from MOF (by early-March); and vi) open the Special Fund and Revolving Fund Accounts (by mid-March). By the third quarter of 2010, VDB will select 5 sub projects from the list of potential sub projects, and take necessary procedures for making appraisal and disbursement of each 5 sub loan, based on the JICA concurrence.

On the other hand, it is recognized that there are mainly three obstacles potentially against the smooth operation of EEREP; i) Because the two main PMU members from Foreign Capital Management Department holds appointments across several ODA projects at VDB, they will be quite busy for achieving all necessary procedures intensively for making the first disbursement of sub loans by March 2010; ii) The marketing activity of PMU and VDB staff need to be strengthened for the sustainability of EEREP; iii) Credit risk management systems and monitoring systems are not yet completely established in VDB, which seems to be currently a weak point of VDB as a financial institution; and iv) PMU members and staff at appraisal department are not technical experts, so they would need to make a reference

about EE&RE technology when making appraisal. After the initial disbursement of sub-loans, in order to overcome the above-mentioned potential obstacles, the continuous assistance would have to be made by the consultants in the next phase of EEREP.

During the field survey, SAPI Team has taken up the following issues specifically for discussion with the PMU members. Based on the discussion, in order to implement the Project efficiently and effectively, SAPI Team would propose some recommendations.

Examine the appropriateness of VDB's mid-to long-term working capital under EEREP.
In Vietnam, commercial banks require exclusive control over customer's property as collateral. Due to this, Vietnamese enterprises seem to face difficult situations in getting mid- to long-term working capital. VDB, however, is not legally allowed to provide mid-to long-term working capital for its investment credit loans. If end borrowers can get mid-to long-term working capital under EEREP, it might be a strong incentive for end borrowers. However, as discussed among PMU members and SAPI Team, it was not recognized as appropriate that the target of EEREP covered mid-to long-term working capital for the following reasons. i) In principal, VDB is prohibited to provide mid-to long-term working capital as of today. Now under the discussion on the draft of "Strategy to Develop VDB to 2010 and 2015, Vision to 2020", VDB has tried to propose to expand its loan products including not only mid-to long-term investment loans but also mid-to long-term working capital, but the answer of the prime minister is not sure as of now. ii) VDB officers seem to practically accept that the total investment project costs include taxes, interest payments, working capital, etc. iii) To some extent, Vietnamese companies can get the short-term working capital from commercial banks without collateral. iv) The projects related to EE&RE are not likely to need additional working capital in particular.

Examine the appropriate interest rate for EEREP sub loan.
EEREP's interest rate for end borrowers (which is currently set at 6.9 % per annum for VND denominated loans) is not differentiated from that of other policy lending program currently provided by VDB. Considering the additional documents (FS report, energy audit report, etc.) required under EEREP, it seems that end borrowers may have little incentive to choose EEREP over others. In Japan, since one of the most important roles of policy-based financial institution is to promote investments that would precede private-sector investments

and bring about a so-called "cowbell effect," policy-based financial institutions (including DBJ) have been providing special interest rates that are lower than the basic policy interest rates for special areas such as energy conservation and alternative energy.

For instance, Japan Finance Corporation (JFC), one of Japan's policy-based financial institutions, currently provides "Environment and Energy Measures Loans" for companies planning to install alternative energy facilities and energy conservation equipments. (Max. amount: ¥720 million; Max. loan period: (Facility funds) 15 years (Operating funds) 7 years). Under the Loan Program, JFC provides varied interest rates in order to promote higher performance equipment and facility usage among investors. For investments to acquire alternative energy facilities on the List of Eligible Facilities, interest rates varies among Basic Policy Rate (1.75% up to 5 years - 2.65% up to 15 years, for a maximum of 270 million yen), Special Rate (SR) 1 (1.35% – 2.25%) , SR 2 (1.10% – 2.00%), SR 3 (0.85% – 1.75%) and Special Interest Rate for Alternative Energy Measures (the lowest available rate for the sector), depending on facility types and their efficiency. As for investments to acquire any energy-saving equipment/ facility on the List of Energy-saving Equipment & Facilities, Special Rate 2 (1.10% up to 5 years – 2.00% up to 15 years) will be granted for the loan amount up to 270 million yen, and Basic Policy Rate (1.75% - 2.65%) for the loan amount exceeding 270 million yen. In addition, for specific high performance energy efficient equipments/ facilities, Special Interest Rate for Energy-saving Equipments and Facilities (the lowest available rate for the sector) will be granted for the loan amount up to 270 million yen.

With this in mind, SAPI Team, during the field surveys, took up the issue of appropriate interest rate under EEREP and suggested that VDB should make EEREP's interest rate lower than the ordinary interest rates for other VDB loans. Through our discussion with PMU, we came to an understanding that EEREP with maximum loan maturity of 20 years already entails enough incentives for potential sub borrowers since the ordinary VDB loan maturity is up to a maximum of 12 years.

Taking also into account the fact that the mid-to long-term loans are generally in short supply in Vietnam, SAPI Team came to the conclusion that it would be adequate for VDB to keep EEREP's interest rate at the same level as the other VDB loans.

Make the most use of credit appraisal tool generated by JICA TA project.

Credit risk management systems are not yet completely established in VDB, which are currently under development with the assistance of JICA's TA project. It is desirable that VDB officers will be able to make the most use of the new credit risk management systems under EEREP. However, given the current situation that the TA project members are still developing customers' database and credit appraisal tool through a trial and error process, it would not be appropriate that VDB officers are compelled to use the incomplete systems as of now. At the same time, according to the results of the recent data collection and input trial conducted by TA Project Team regarding one hundred comparatively good clients of VDB in textile sector, VDB staffs were not able to collect a complete set of the last three year's financial statements (i.e. balance sheet, income statement and cash flow statement) from many clients, except for a few; 27 companies did not provide financial statements at all, and only 13 of the remaining 73 companies did provide cash flow statement for more than one fiscal year. This reveals the fact that ordinary lending procedures have not been strictly followed by all VDB staff.

Therefore, SAPI Team would propose VDB officers to ensure the following: (i) to collect financial statements including cash flow statement (or at least the data on depreciation and the number of employees) of sub borrowers, (ii) to provide thus collected financial data to TA Team and (iii) to get the feedback from TA Project Team regarding the analysis result of the credit appraisal tool as a reference.

Facilitate training programs for realizing a better monitoring practice under EEREP.

In VDB's normal practice, the existing manual requires the officers to evaluate the investment effects by checking the increased number of employees and their annual contributions to the national coffers (i.e. through tax payments). However, under EEREP, much attention should be paid to the technical evaluation on the post-lending monitoring process. In addition, VDB officers should be able to fully take responsibility in monitoring the sub loans' investment effects and sub borrowers' latest financial position on the post-lending process. In order to achieve this goal, SAPI Team would propose to hold the following training program for the VDB officers under EEREP.

- Venue: VDB office (Hanoi, Da Nang, Ho Chi Minh City)
- Date: On the early stage of EEREP
- Form: Seminar

- Target: VDB staff (senior specialist, deputy director)
- Program contents:
  - Introduction of EEREP Scheme & Outline of the EEREP Operation Manual (2H)
  - Basic information on energy efficiency and renewable energy in Vietnam (2H)
  - Monitoring Methodology (2H)
    - Importance and necessity
    - Monitoring process
    - Check points to be examined (Technical and financial aspects)
- Lectures: invited from international and domestic experts on banking.
- Model Timetable:
  - 08:30-11:30 Morning Session (3H)
  - 11:30-13:30 Lunch-on meeting (2H)
  - 13:30-16:30 Afternoon Session (3H)

Strengthen the marketing activities for EEREP.

In order to find eligible sub projects under the EEREP, VDB would need to establish an extensive local networks with Vietnamese enterprises for constantly receiving necessary information on their updated investment plans. Therefore, SAPI Team would strongly propose the following measures. (i) PMU shall strengthen its networks with local consultants such as IE, ECC-Hanoi, ECC-HCMC, etc.; (ii) VDB branches shall improve their marketing networks with local business community; (iii) PMU shall conduct regular surveys on enterprises' investment plans all over Vietnam; and (iv) EEREP Advisory Committee members, especially those from MPI and MOIT-EECO, shall be requested to share the information about candidate sub projects and other similar loan programs in Vietnam with PMU members.

Support the small and medium enterprises for establishing the application of TSL.

The cases of ceramic factories in Bat Trang village and the bricks factories, it is anticipated that the TSL application by the project would be difficult, the estimated investment amount per factory is evaluated to be too low as compared with VDB lending criteria regarding the minimum

loan amount; it also seems difficult to set up a new entity which can be legally approved and qualify the conditions set by VDB for the TSL applications. Therefore, SAPI Team would propose to support the small and medium enterprises for establishing the application of TSL.

Energy Conservation Effect of the Project

(i) The extent of EE&C Loan

The extent of loan which VDB extends to the end user is not for the individual equipment but for the entire energy efficiency and conservation system. Therefore, the indicator of evaluation of energy conservation effect should be evaluated for the whole EE&C project. On the other hand, the energy audit is conducted for the whole plant or facility, the result of energy conservation effect is equal to the sum of individual energy efficiency and conservation equipments.

(ii) The energy conservation effect of NEDO model project

The Energy Efficiency and Conservation model projects in Southeast Asian countries and China which were supported by NEDO have higher potential to be applied for this loan. SAPI Team has conducted a study on energy conservation effect of these NEDO model projects based on the published information, and found out that almost none of the projects had used “energy conservation effects” as a parameter for the improvement in their efficiency compared with the previous, conventional system or equipment.

(iii) Energy Conservation Potential

Per the material of IE presented in the seminar in Hanoi on January 8, 2010, the energy conservation potential of the energy audited plants in steel, ceramic, cement and food processing sectors were between 3.7 to 13.7% for electricity, between 1.7 to 5% for fuel and between 3.7 to 13.7 % for cost. These results reveal the fact that to expect the energy conservation effect for a whole plant to reach 20 % seems to be unlikely in these sectors.

On the other hand, per the material of ECC-HCMC presented in the seminar in Ho Chi Minh City on January 12, 2010, the energy conservation effects of some projects using specific measures were reported to be between 10 and 30%.

(iv) The calculation of energy conservation effect

The energy conservation effect shall be calculated inside of the project boundary. If each of

the comprising equipments inside the project boundary has the energy conservation efficiency of more than 20% compared with the existing or conventional equipment, the energy conservation efficiency of the entire project is rightly considered to have achieved more than 20% energy efficiency. However in case the project contains equipment of less than 20% energy efficiency, the entire project's energy efficiency may not reach 20% threshold.

(v) The efficiency of energy saving equipment

If the standard energy efficiency values of each kind of energy-saving equipments can be specified, it would become possible for VDB loan officers to suggest end borrowers to select equipments with higher energy efficiency. However, such figures are not available at the moment and thus not reflected in the List (Appendix 8).

(vi) Requirement of energy conservation efficiency in this Project

The energy conservation efficiency improvement requirement for a sub project shall be more than 20 % compared with the existing or conventional facilities as a general rule. (The meaning of conventional facility is the facility consisting of general equipments.) The extent of the sub project to be evaluated shall be the same as the extent of the loan application. Energy efficiency and conservation equipments to be introduced by the end borrowers, therefore, shall be those with potential energy efficiency and conservation improvement effects of more than 20% compared with the existing or conventional equipments. However, if thus selected equipment is proved to be the latest model or considered as the most appropriate model in Vietnam, it may not necessarily achieve 20% energy efficiency improvement. In such cases, verification by the end borrower as well as the technical appraisal by the VDB's technical expert shall be required.

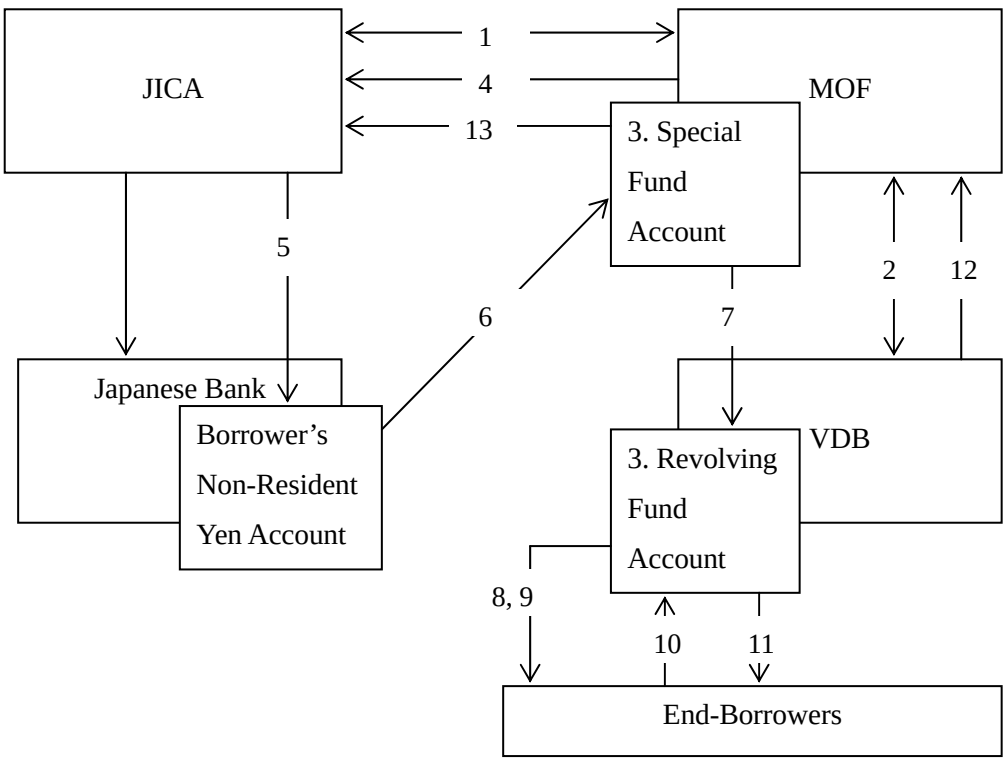
In conclusion, SAPI Team would propose the following action plan.

To whom	Recommended action	When
VDB	***Make the most use of credit appraisal tool generated by JICA TA project***. To ensure the following: (i) to collect financial statements including cash flow statement (or at least the data on depreciation and the number of employees) of sub borrowers, (ii) to provide thus	Mar 2010-

	collected financial data to TA Team and (iii) to get the feedback from TA Project Team regarding the analysis result of the credit appraisal tool as a reference.	
VDB/ JICA	***Relax the requirement of energy conservation efficiency in EEREP.*** If selected equipment is proved to be the latest model or considered as the most appropriate model in Vietnam, it may not necessarily achieve 20% energy efficiency improvement. In such cases, verification by the end borrower as well as the technical appraisal by the VDB's technical expert shall be required.	Mar 2010-
VDB	***Strengthen the marketing activities for EEREP***. (i) PMU shall strengthen its networks with local consultants such as IE, ECC-Hanoi, ECC-HCMC, etc.; (ii) VDB branches shall improve their marketing networks with local business community; (iii) PMU shall conduct regular surveys on enterprises' investment plans all over Vietnam; and (iv) EEREP Advisory Committee members, especially those from MPI and MOIT-EECO, shall be requested to share the information about candidate sub projects and other similar loan programs in Vietnam with PMU members.	April 2010-
VDB	***Support SME under EEREP.*** To support the small and medium enterprises (e.g. ceramic factories in Bat Trang village and the bricks factories) for enhancing the application of TSL.	April 2010-
JICA	***Facilitate training programs for realizing a better monitoring practice under EEREP***. VDB officers should be able to fully take responsibility in monitoring the sub loans' investment effects and sub borrowers' latest financial position on the post-lending process. It is highly recommended that JICA should hold a training program for the VDB officers under EEREP.	Mid 2010

Note: The recommended actions mentioned in the above table should be reflected in the EEREP Operation Manual completed by PMU.

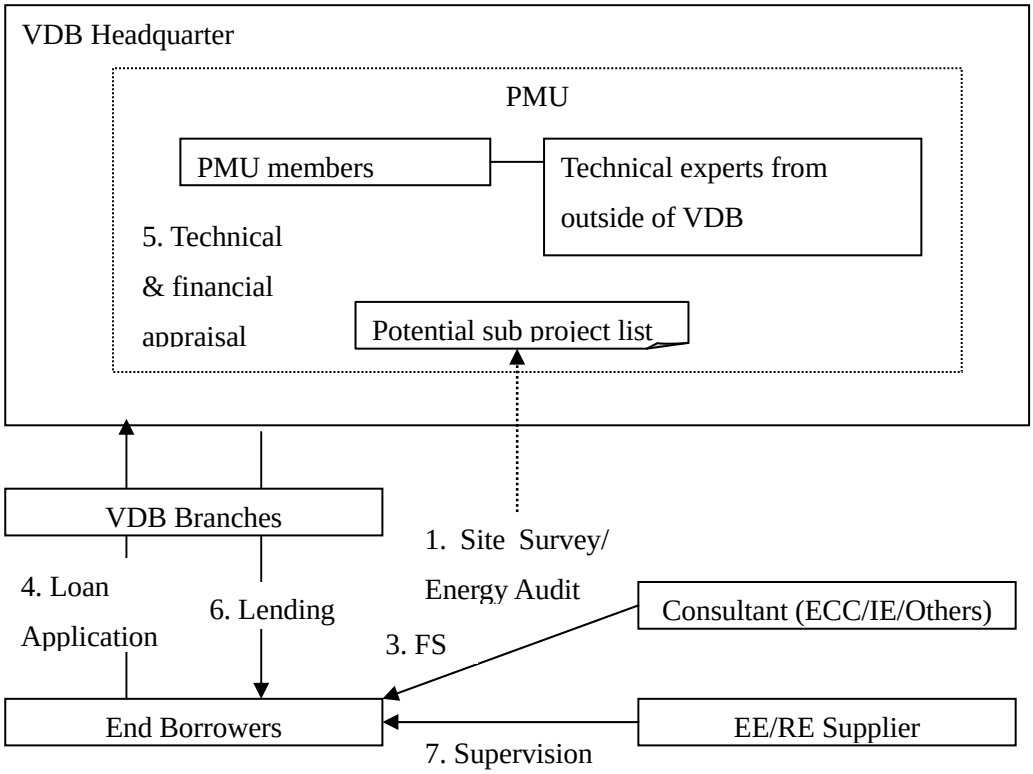
Appendix 1: Structure of EEREP



1. Conclusion of Loan Agreement (Total amount of TSL: JPY 4,000 mil, 0.25% <"Climate Change Term"> , 40 years including 10 years of grace period, General untied loans)
2. Fund Transfer Agreement of JICA Loan, if necessary (On-lending rates: 3.8%, 20 years including 10-year grace period)
3. Opening of Special Account and Revolving Fund Account (Yen)
4. Request for Initial Disbursement (Yen)
5. Initial Disbursement (Yen)
6. Remittance of Initial Disbursement (Yen)
7. Transfer and Currency Exchange (VND)
8. Appraisal and Approval for End-users Lending Request
9. EE&RE Lending (Sub-loan: VND or USD, Not exceeding 20 years including 5 years)
10. Repayment (VND or USD)
11. Revolving Loan (VND or USD)
12. Request for the Replenishment from VDB to MOF (VND)
13. Request for the Replenishment from MOF to JICA (Yen)

(Note 1) The conditions of on-lending from MOF to VDB are subject to the prevailing regulations of Vietnam such as Prime Minister Decision No. 181/2007/QD-TTg.
(Note 2) Commitment charges shall be covered by Japanese ODA loan. The rate of charges is 0.1 % per annum of the amount of undisbursed balance.
(Source) Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009.

Appendix 2: Work flow of VDB and EE consultant



No.	VDB Actions	EE Consultant Actions
1		Conduct site survey/ energy audit of the promising sub projects
2	Consult with EE consultants and update the potential sub projects list, using EE&RE list ("the List")	Share the information of thus energy audited sub projects with VDB on a voluntary basis
		For those sub projects that are on the List, make investment recommendations to end borrowers
3		Sign a contract with the end borrower and conduct a feasibility study ("FS")
4	Obtain loan application with a FS and a Certificate of Enterprise	Submit the contract documents signed between consultant and end borrower to VDB in order to get 50% of the FS fee reimbursement.
5	Conduct technical appraisal using Technical Appraisal Format by PMU technical experts. This process includes (i)EE&RE screening (PMU technical experts are responsible), (ii) Environmental screening (Appraisal Dept is responsible), and (iii) FS check (Appraisal Dept is responsible)	

	Upon receiving the loan application from the end borrower, conduct financial appraisal of the concerned sub project under VDB's normal appraisal procedures.	
6	Provide the loan approval, including the 50% FS fee reimbursement	
7		Conduct on-site supervision of the concerned sub project

(Source) Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009.

Appendix 3: Eligible end borrowers and eligible sub projects

1. Eligible end borrowers

Eligible end borrowers are the enterprises under the Law on State owned Enterprises and the Enterprise Law (Order No.33/2005/L-CTN, 12 Dec, 2005).

2. Eligible sub projects

Sub projects under the Project should be either EE or RE projects that meet the criteria of EEREP sub projects. As well, the well-balance of the sub projects should be considered in terms of the variety of region, industrial sector and enterprising body.

(1) First tier criteria

i) Expected energy consumption effect is more than 20%, which means the energy consumption amount (toe/ per year) after the project completion is expected to be reduced by more than 20% compared to the amount calculated before the project started. This criterion is intended to provide demonstration effect for promoting energy efficient society in Vietnam.

ii) Sub projects, categorized as “energy intensive industries” (e.g. steal, cement, food processing, textile), will be prioritized. The definition of “energy intensive” in the Project is that the energy consumption of a factory is more than 1,000 toe per year, or 3,000,000 kWh per year.

iii) Each sub project is expected to install the appropriate technology, whose energy-saving effect has been proven.

iv) Manufacturing and installation of the equipment of each sub project shall be completed in 2 years maximum from the start of sub-loan disbursement, in order to assure that the disbursement of the Project will be completed in 2012.

v) Each sub project has to submit the result of an energy audit, including expected GHG reduction amount (CO2/per year).

(2) Second tier criteria

Eligible EE/RE sub project means that the project which requires specific technology as

contained in the list of the EE/RE equipment (hereinafter referred to as "the List"). But even if the concerned sub project is not in the List or in line with Vietnamese regulation, end borrower can still apply for a loan under the Project, as long as the sub project uses advanced and cost-effective technology that are equivalent of those in the List.

The potential sub project list is to be updated by PMU according to the up-dated information to be provided by the selected consultant (i.e. by either ECC or IE).

(Source) Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009,
Minutes of Discussions between JICA and the Government of Vietnam, June 19, 2009.

Appendix 4: Terms and conditions of sub loans

1. Loan amount

There is no limit for the loan amount of single sub project. But in case of RE sub project, if the total loan amount exceeds USD 5 million, PMU shall report to JICA in order to obtain JICA concurrence. As for the initial 5 sub projects, JICA concurrence is required before VDB finally decides its lending, according to the Minute of Discussion on EEREP between VDB and JICA dated on June 19, 2009.

2. Maturity and grace period

Maturity of each sub loan is within the duration of the project life but not exceeding 20 years. Maximum grace period is 5 years.

3. Financing sources

Under the Project, VDB's financing ratio will be as below:

- End borrowers: Minimum 15% of total project costs.
- VDB: Maximum 85% of total project costs.

4. Lending currency

End borrowers can select the lending currency between VND and USD according to their demands.

5. Interest rate

Same as the rates of the state investment credit loans.

Cf. The interest rate to end borrowers is MOF on-lending rate to VDB plus VDB's credit risks, administration costs and margins, but it shall not exceed the interest rate of the state investment credit loans (which is currently set at 6.9% per annum for loans denominated in Vietnamese dong and 5.4 % per annum for those in convertible foreign currencies such as USD dollars by Decision No. 291-QD-BTC/ 12 Feb, 2009).

6. Collaterals

Collaterals for loans will be required according to VDB's regular practices.

7. EE consulting fees

50 % of FS preparation fee will be reimbursed to end borrower.

(Source) Minutes of Discussions between JICA and the Government of Vietnam, May 22, 2009.

Appendix 5: Business profile of VDB

Establishment & governing law	Development Assistance Fund (DAF) was established in 1999 as a DFI under Domestic Investment Promotion Law and Decree No. 50/1999 ND-CP dated July 8th 1999, and reorganized as the Vietnam Development Bank (VDB) under Decision No. 108/2006 QD-TTg dated May 19th, 2006. DAF/VDB is under the direct control of the Office of the Government, and under the joint supervision of MOF, MPI and SBV.
Registered capital	VND 10 trillion (Chartered capital: VND 5.1 trillion as of end of 2008)
Shareholder	100% owned by the Government of Viet Nam

Board of Management & Board of Directors (As of end-2008)

Organization of DAF includes Board of Management, Board of Directors and Supervising Board.

- Board of Management is under the direct supervision of MOF. Four of the six members are ex-official including General Director of Personnel Department of MOF as Chairman, Vice Minister of MOF, Vice Minister of MPI and Deputy Director of SBV as members of the Board.
- Mr. Nguyen Quang Dung is General Director of Board of Directors as well as Vice-Chairman of the Management Board.
- Board of Directors consists of a General Director and six Deputy General Directors.

Missions

- Its mission is to mobilize and receive funds from domestic and foreign organizations for the implementation of the State's development investment assistance and export credit policies conforming to the regulations of the Government.
- It will play a vital role in implementing Vietnam's international commitments in the prelude to its accession to the WTO, continuing its course of industrialization and modernization; revising development investment credit policies and boosting investment in export activities.

History

1999: DAF was established under the 1999 Law on Domestic Investment Promotion and Decree No. 50/1999/ND-CP to succeed the policy-based finance function (called state development- investment credit) of MOF and the state-owned commercial banks (SOCBs) according to the banking sector reform guided by WB and IMF.

1999-2005: DAF mobilized medium- to long-term funds, received and managed state capital allocated for development, and implemented government policy on development investment assistance.

May 19th 2006: Decision No. 108/2006 QD-TTg on establishment of the Vietnam Development Bank (VDB).

May 30, 2006: VDB was officially established in accordance with the Prime Minister's Decision.

Features of VDB according to Decision No. 108/2006

- Non-profit organization
- Obligatory reserve rate of 0% (exempt from minimum reserve requirements)
- Not required to provide deposit insurance
- Payment liquidity will be guaranteed by the Government

Products and Services	
・Investment lending, post-investment interest subsidy, credit guarantee, export credit, issuing guarantee for export credit, issuing bonds for export contracts, ODA on-lending, etc.	・ Exempted from tax and other payments to State Budget ・ Entitled to mobilize capital by (i) issuing bonds and deposit certificates, (ii) borrowing from Postal Savings, Social Insurance Funds and other domestic and foreign financial institutions. ・ Permitted to open accounts at the SBV, State Treasury and other domestic and foreign financial/credit institutions.

Lending Infrastructure

・VDB has its head office in Hanoi, one representative office in Ho Chi Minh City, two transaction centers, 61 branches across the country (As of Oct 2009)
・2,543 employees (As of May 2009)
・Its major clients are state-owned enterprises (including ministerial enterprises and enterprises governed by provincial people's committee) and private enterprises (including SMEs) operating within processing industry of agriculture, forestry and aquaculture product, export production, etc.

Lending performance

Between January 1, 2000 and Dec 31, 2008 (8 years)

	Mid/long-term lending	**ODA on-lending**
Number of projects	3,972	376
Loan commitment	128,780 VND billion	119,880 VND billion
Total disbursement	n.a	69,660 VND billion
Outstanding	n.a	54,621 VND billion

Loans/ Assets

	Dec. 31, 2007	**Dec. 31, 2008**
Total assets:	VND 135,941 billion	VND 171,128 billion
Total loans:	VND 110,374 billion (82% of total assets)	VND 134,989 billion (79% of total assets)
Past due rate (overdue, bad or frozen debt/total lending)		
Medium/long-term	8.9%	n.a.
Short-term/export-support	1.4%	n.a.
ODA on-lending	0.5%	n.a.

Sources of funds

VDB's liabilities consist of: (VND billion, %)

	Dec. 31, 2007	**Dec. 31, 2008**
Deposits from State Treasury &FI:	272 (0.2%)	184 (0.1%)
Customer deposits:	4,312 (3.4%)	4,032 (2.5%)
Borrowing from State Budget &FI:	17,316 (13.6%)	21,386 (13.2%)
Trust funds:	53,179 (41.7%)	58,232 (35.8%)
Government bond and note:	49,588 (38.8%)	74,787 (46.0%)
Account payable:	2,201(1.7%)	2,796 (1.7%)

Income Statement		**2007**	**2008**	
	Total revenues:	VND 5,350 billion	VND 8,149 billion	
	Interest on loans:	VND 2,490 billion	VND 4,199 billion	
	Interest on deposits:	VND 1,658 billion	VND 1,967 billion	
	Non-interest revenues:	VND 1,203 billion	VND 1,983 billion	
	Total Expenses:	VND 5,078 billion	VND 7,034 billion	
	Net earning:	VND 272 billion	VND 1,115 billion	
Loan portfolio	**Loan portfolio share by sector (2006-2008)**			
		2006	**2007**	**2008**
	Industry, construction	76%	78%	81%
	Agro-forestry/aqua production	10%	10%	9%
	Transport	10%	8%	6%
	Others	4%	4%	4%

Other liabilities	793 (0.6%)	1,108 (0.7%)
Total liabilities	**127,661 (100.0%)**	**162,525 (100.0%)**

*Trust funds include VND 54,349 billon of “ODA funds for on-lending” as of Dec 31, 2007.

(Source) VDB Annual Report 2008 and information acquired through interviews with VDB.

Appendix 6: Candidate Subproject Long List

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Steel	Hoa Phat Steel Factory	Roll & Bar steel	250,000 ton/year	Hung Yen	Billet reheating furnace: Introduction of Regenerative burner	7,227	1,140 ton FO/Y				Need to detailed investigate for some measures		J Power-IE	2010,July (Lack of capital, No intention))	NO	?
2	Steel	Thai Nguyen Iron & Steel Co. (VSC)	Steel	550 kton/Y	Thai Nguyen	Billet reheating furnace: Introduction of Regenerative burner, Improve blast furnace	?					Need to detailed investigate for some measures			No reply	NO	?
3	Steel	Southern steel Co.	Steel	930 kton/Y	Hochiminh	Billet reheating furnace: Introduction of Regenerative burner, Improve blast furnace	?					Need to detailed investigate for some measures			No reply	NO	?
4	Cement	Tam Diep Cement Factory	Clinker & Cement	4,000t/d Clinker &1,500,000 ton/year Cement	Ninh Binh	Waste heat recovery 5MW Power generation	23,344	30,000 MWh/Y		708,000,000	163,902,000	120,000	27,780	IE-VCEM	2011 (Lack of capital)	NO	YES
5	Cement	Hoang Thach Cement Factory	Clinker & Cement	2,300,000 ton/year	Hai Duong	Waste heat recovery 6.5 MW Power generation	46,612	42,000 MWh/Y		1,026,600,000	229,462,800	174,000	38,892	IE-VCEM	2011 (Lack of capital, High investment)	NO	YES
6	Cement	Hoang Mai Cement Factory	Clinker & Cement	1,400,000 ton/year	Nghe An	Waste heat recovery equipment	?	35,880 MWh/Y		1,144,600,000	196,026,792	194,000	33,225	NEDO	No reply	NO	?
7	Cement	Bim Son Cement Factory	Clinker & Cement	1,200,000 ton/year	Thenh Hoa	Waste heat recovery equipment	?	43,090 MWh/Y		1,030,317,000	235,417,906	174,630	39,901	NEDO	No reply	NO	?
8	Cement	But Son Cement Factory	Clinker & Cement	1,400,000 ton/year	Ha Nam	Waste heat recovery equipment	123,462	36,280 MWh/Y		1,144,771,100	198,212,152	194,029	33,595	NEDO	2010 (Lack of capital)	NO	YES
9	Cement	Hai Phong Cement Factory	Clinker & Cement	1,200,000 ton/year	Hai Phong	Waste heat recovery equipment	?	27,970 MWh/Y		968,656,100	152,811,298	164,179	25,900	NEDO	No reply	NO	?

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
10	Cement	Phutho Cement JSC	Clinker & Cement	200,000 tons/year	Phu Tho	Facility improvement	24,146	1,766 MWh/Y & 657 tons coal/Y		18,514,200	6,908,900	3,138	1,171	IE	(No intention)	NO	NO
11	Cement	Haivan Cement JSC	Cement		Danang	Facility improvement	1,635	340.9 MWh/Y		2,629,630	1,862,630	445.7	316	IE	2010 (Lack of capital, No applicable vender)	NO	NO
12	Cement	Saigon Cement JSC	Cement		Hochiminh	Facility improvement	?	89.6 toe/Y	448	5,337,730	8,149,670	905	1,381	MOIT	No reply	NO	NO
13	Cement	Cem Pha Cement JSC	Cement	2,300,000 ton/year	Quan Ninh	Waste heat recovery equipment	?								No reply	NO	?
14	Cement	Hachi Son Cement	Cement	2,200,000 ton/year	Thenh Hoa	Waste heat recovery equipment	?								No reply	NO	?
15	Food stuff	Hanoi Milk Factory	Milk		Hanoi	Boiler, Motors and air Compressors	?	205 MWH & 48 ton FO/Y		4,454,500	2,796,600	755	474	IE	(Operation reduce, Personnel change, No intention)	NO	NO
16	Food stuff	Saigon Milk Factory	Milk		Hochiminh	Boiler, Motors and air Compressors	?	154 MWh/Y & 40.5 KL FO/Y		10,362,760	5,271,414	1,756	893	IE	No reply	NO	NO
17	Food stuff	Cantho Brewery JSC	Beer	23,000,000~ 32,000,000 liter/year	Cantho	Facility improvement	379	31.9 toe/Y	160	1,297,410	2,358,230	220	400	MOIT	Mid. 2010 (Lack of capital, Personnel change)	NO	NO
18	Food stuff	Saigon Brewery Factory	Beer	250,000,000 liter/year	Hochiminh	Facility Improvement	7,796	9,314 toe/Y	24,403	120,950,000	210,464,800	20,500.00	35,672	NEDO	(Lack of capital)	NO	?
19	Food stuff	Hai Phong Brewery Factory	Beer	25,000,000 liter/year	Hai Phong	Facility Improvement	?	1,322 toe/Y	3,464	218,300,000	28,119,400	37,000.00	4,766	NEDO	No reply	NO	?
20	Food stuff	Hue Brewery Factory	Beer	250,000,000 liter/year	Hue	Facility Improvement	3,075	1,100 kL/y	3,200	120,360,000	34,220,000	20,400.00	5,800	NEDO	(Lack of capital)	NO	?
21	Food stuff	Saigon-Dac Lak Brewery Factory	Beer	50,000,000 liter/year	Dac Lak	Facility Improvement	?	950 kL/y	2,700	120,360,000	40,120,000	20,400.00	6,800	NEDO	No reply	NO	?
22	Food stuff	Saigon-Song Lam Brewery Factory	Beer	200,000,000 liter/year	Nghe An	Facility Improvement	?	1,800 MWh/y		103,250,000	9,834,120	17,500.00	1,667	NEDO	No reply	NO	?
23	Food stuff	Phu Minh Brewery JSC	Beer	26,000,000 liter/year	Phu Yen	Facility improvement	?	120 toe/Y	582	6,392,060	15,286,900	1,083	2,591	MOIT	No reply	NO	NO

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
24	Food stuff	Phu Yen Brewery JSC	Beer	20,000,000 liter/year	Phu Yen	Facility improvement	?	230.9 toe/Y	1,124	11,525,650	26,443,210	1,953.50	4,482	MOIT	No reply	NO	NO
25	Food stuff	Tuy Hoa Sugar Company	Sugar		Phu Yen	Facility improvement	?	1,041.8 toe/Y	3,382	35,790,580	40,692,890	6,066	6,897	MOIT	No reply	NO	NO
26	Food stuff	Mekong Seafood JSC	Seafood			Facility improvement	?	57.2 toe/Y	286	3,404,890	4,826,200	577	818	MOIT	No reply	NO	NO
27	Food stuff	Saigon Seafood JSC	Seafood		Hochiminh	Facility improvement	?	157.7 MWh/Y	65	860,810	861,577	146	146	ECC-HCM	No reply	NO	NO
28	Food stuff	Hai Viet Seafood processing JSC	Seafood			Facility improvement	?	17.7 toe/Y	86	1,129,850	4,124,100	192	699	MOIT	No reply	NO	NO
29	Food stuff	AVA food Industries Co. Ltd,	Food products		Hochiminh	Facility improvement	?	3,177 MWh/Y			17,357,210		2,942	IE	No reply	NO	?
30	Food stuff	KCP Vietnam Industries Ltd.	Sugar	The licensed crushing capacity of the plant is 2,500 TCD with 6 MW	Phu Yen	Expandable to 5000 TCD with adder 15 MW, Producing electricity based on baggass	1,474	49,550 MWh/Y	27,500	973,500,000	270,711,470	165,000	45,883	IE	(No intention)	NO	NO
31	Food stuff	HiepThanh Seafood JSC	Catfish	60,000 ton/year	Can Tho	Renewal of Flourescent lamps, Air cooler defrost system, Water pump frequency converters	?	700 MWh		6,230,400	3,824,380	1,056	648	MOIT	No reply	NO	NO
32	Textile	Hoa Khanh Textile JSC	Material	1,000,000 meters/year	Danang	Motor,Lighting improvement and Boilers	262	185 MWh		1,681,500		285		IE	To be confirmed(Lack of capital)	NO	NO
33	Textile	PhuocToan private enterprise	Material			Facility Improvement	?	15.5 toe/Y	78	1,246,670	1,093,270	211.30	185	MOIT	No reply	NO	NO
34	Textile	Tien Dat Co., Ltd	Material			Facility Improvement	?	21.2 toe/Y	190	2,272,090	2,826,690	385	479	MOIT	No reply	NO	NO

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
35	Textile	An Hung Company	Clothes		Phu Yen	Facility Improvement	?	25.7 toe/Y	129	1,847,880	2,872,710	313	487	MOIT	No reply	NO	NO
36	Textile	TCM	Fibre, Garment		Hochiminh	Facility Improvement	?	1,031 MWh/Y & 987 tons coal/Y	2,993	13,784,760	5,632,789	2,336	955	ECC -HCM	No reply	NO	NO
37	Textile	Tan Phu Cuong Company	Dyeing	1,482 tons/Y	Hochiminh	Facility Improvement	?	246 MWh/Y & 83.8 KL -Oil/Y	370	3,823,790	1,344,020	648	228	ECC -HCM	No reply	NO	NO
38	Textile	Minh Khai Texile Company	Towel		Hanoi	Facility Improvement	2,383	220 toe/Y	1,422	5,265,750	5,900,000	893	1,000	ECC-HN	2011(Lack of capital,Relocation)	NO	NO
39	Textile	Dong Xuan Textile Company	Fibre, Garment		Hanoi	Facility Improvement	-	598.4 toe/Y	848	5,433,900	17,700,000	921	3,000	ECC-HN	To be confirmed(Lack of capital,Relocation,Any finnacial support for relocation)	NO	NO
40	Textile	Hanoi Industry Textile	Towel		Hanoi	Facility Improvement	?	41.5 toe/Y	160	1,707,460	29,500,000	289	5,000	ECC-HN	No reply	NO	NO
41	Textile	Gia Dinh Textile Company	Material, Clothes		Hochiminh	Facility Improvement	1,225	287.7 MWh/Y & 84.6 KL FO/Y		5,900,000	5,953,100	1,000	1,009	IE	2011(Lack of capital,Relocation,Operation reduce,Any finnacial support for relocation)	NO	NO
42	Textile	X28 Company	Material	6 million meters/Y	Hochiminh	Facility Improvement	4,643	606.8 MWh/Y & 251.6 KL FO/Y		11,404,700	17,535,390	1,933	2,972	IE	2010(Lack of capital,Relocation)	NO	NO
43	Textile	Thuong Dinh Footwear Company	Shoes		Hanoi	Facility Improvement	?	249.9 toe/Y	1,129	4,537,100	2,950,000	769.00	500	ECC-HN	No reply	NO	NO
44	Pulp & Paper	My Xuan 1 Paper Factory	Carton paper, toilet paper			Facility improvement	?	165.3 toe/Y	827	7,960,280	15,539,420	1,349.20	2,634	MOIT	No reply	NO	NO
45	Pulp & Paper	My Xuan 2 Paper Factory	ditto			Facility improvement	?	841.1 toe/Y	1,526	6,875,270	15,016,090	1,165.30	2,545	MOIT	No reply	NO	NO
46	Pulp & Paper	Vinh Hue Paper JSC	Wrapping paper, toilet paper	9,600 tons/Y	Hochiminh	Facility improvement	?	405.8 MWh/Y	168	2,221,350	2,217,043	376.50	376	ECC-HCM	No reply	NO	NO

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
47	Electric & Electronic	Electronic Binh Hoa	Transformer, Spark coil, Electronic circuit		Hochiminh	Facility improvement	?	416.9 MWh/Y	321	2,442,600	2,277,695	414.00	386	ECC-HCM	No reply	NO	NO
48	Machinery & Metal	Mai Cuong Company	Machine		Binh Duong	Facility Improvement	?	213.9 MWh/Y	165	1,513,940	1,168,613	256.60	198	ECC-HCM	No reply	NO	NO
49	Machinery & Metal	Thong Nhat Mechanical & Electrical Company	Fans& Motors	10,000 units/Y	Hanoi	Facility improvement	?	80 toe/Y	150	1,598,900	2,360,000	271.00	400	ECC-HN	No reply	NO	NO
50	Machinery & Metal		Fans& Motors	10,000 units/Y	Hanoi	Facility improvement	?	44 toe/Y	283	2,407,790	590,000	408.10	100	ECC-HN	No reply	NO	NO
51	Machinery & Metal		Tanks, Solar heat tanks	12,000 units/Y	Hanoi	Facility improvement	?	44 toe/Y	283	1,927,530	885,000	326.70	150	ECC-HN	No reply	NO	NO
52	Plastics	Dai Dong Tien Plastics Company	Plastic products		Hochiminh	Facility improvement	?	1,358.5 MWh/Y	584	7,563,800	7,422,023	1,282.00	1,258	ECC-HCM	No reply	NO	NO
53	Plastics	Quang Thanh Co.,Ltd.	PVC Plate	7 million meter /Y	Danang	Facility improvement	?	76.03 MWh/Y		643,100	415,360	109.00	70	IE	No reply	NO	NO
54	Plastics	ALTA plastics Factory	Plastic products		Hochiminh	Facility improvement	266	188 MWh/Y		646,050	1,027,131	109.50	174	IE	(Lack of capital,Operation reduce)	NO	NO
55	Plastics	Tan Tien Plastic Packaging JSC	Plastic products		Hochiminh	Facility improvement	994	83.7 toe/Y	42	5,510,010	4,209,650	933.90	714	MOIT	(Lack of capital)	NO	NO
56	Ceramics	CMC Tile JSC	Tile	5 million m2/Y	Phu Tho	Facility improvement	5,209	572 MWh		118,755,200	3,125,053	20,128.00	530	IE	As soon as possible(Lack of capital,Operation reduce)	NO	YES
57	Ceramics	COSANI Ceramic JSC	Lavabo,	300,000 products/Y	Danang	Facility improvement	519,079	111.8 MWh/Y & 12 tons LPG/Y		2,177,100	1,398,300	369.00	237	IE	Quarter 2, 2010(Lack of capital)	NO	NO
58	Ceramics	Viet Thanh Ceramic Corporation	Ceramics			Facility improvement	?	41.6 toe/Y	136	2,400,120	2,661,490	406.80	451	MOIT	No reply	NO	NO

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
59	Others	Hai Thanh Co., Ltd				Facility improvement	?	46.8 toe/Y	234	3,213,730	11,346,880	544.70	1,923	MOIT	No reply	NO	NO
60	Others	TrungAn Co., Ltd				Facility improvement	?	61.2 toe/Y	306	2,832,590	3,118,150	480.10	529	MOIT	No reply	NO	NO
61	Others	Company No. 32				Facility improvement	?	77.7 toe/Y	389	5,036,240	9,492,510	853.60	1,609	MOIT	No reply	NO	NO
62	Others	Tan Hung production and trading Co., Ltd				Facility improvement	?	215.4 toe/Y	995	4,246,230	2,338,760	719.70	396	MOIT	No reply	NO	NO
63	Others	Saigon industrial corporation				Facility improvement	?	31.6 toe/Y	158	4,089,290	6,742,520	693.10	1,143	MOIT	No reply	NO	NO
64	Others	Ben Nghe Ball-Point Pen & Stationery Co. Ltd	Stationery			Facility improvement	?	69.6 toe/Y	348	5,036,830	11,354,550	853.70	1,925	MOIT	No reply	NO	NO
65	Others	Savimex	Wood furnitures	95,840 products/Y	Hochiminh	Facility improvement	?	293.4 MWh/Y	226	1,560,550	1,602,971	264.50	272	ECC-HCM	No reply	NO	NO
66	Others	Trung Company	Exported Rice	46,457 t/Y	Can Tho		?	28.2 MWh/Y	12	148,680	154,049	25.20	26	ECC-HCM	No reply	NO	NO
67	Hotel	Majestic Hotel	Building commercial		Hochiminh	Facility improvement	?	250.5 MWh/Y	108	2,221,940	1,368,564	376.60	232	ECC-HCM	–	NO	NO
68	Hydro power	Duc Thanh Gia Lai JSC	Electric power	10 MW	Dak Psi, Dak Ha, Kon Tom	Renewbale Energy	-	61,320 MWh/Y	57,763	1,462,515,600	11,074,759	247,884	1,877	VDB-Gia Lai	–	NO	–
69	Hydro power	LICOGI 12 JSC	Electric power	9MW	Ia Hiao, Ayunpa, Gia Lai	Renewbale Energy	-	55,188 MWh/Y	51,987	1,180,702,100	9,967,283	200,119	1,689	IE, VDB-Gia Lai	–	NO	–
70	Hydro power	Investment & Development Hydroelectric, Dak Psi	Electric power	15MW	Dak Ha, Tu Mo RONG Gia Lai	Renewbale Energy	-	91,980 MWh/Y	86,645	2,232,170,600	16,612,158	378,334	2,816	VBD-Gia Lai	–	NO	–

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
71	Hydro power	Ayun Thuong JSC	Electric power	12MW	Lo Pang, Mang Yang, Gia Lai	Renewbale Energy	-	73,584 MWh/Y	69,316	1,716,746,600	13,289,691	290,974	2,252	IE, VDB-Gia Lai	–	NO	–
72	Hydro power	Investment & Instruction Hydroelectric Quoc Cuong	Electric power	15MW	Kon Thup, Mang Yang & Trang, Dak Doa, Gia Lai	Renewbale Energy	-	91,980 MWh/Y	86,645	1,906,732,500	16,612,158	323,175	2,816	IE, VDB-Gia Lai	–	NO	–
73	Hydro power	Bao Long Hydroelectric Company	Electric power	8MW	Ia Gang, Ia Gai, Gia Lai	Renewbale Energy	-	49,056 MWh/Y	46,211	1,110,616,000	8,859,794	188,240	1,502	IE,VDB-Gia Lai	–	NO	–
74	PV+Hydro power	Gia Lai Electric Power	Electric power	PV:100kW MH:25kW	Trang, Mang Yang	Facility improvement	-	273.3 MWh/Y	257	89,550,200	49,383	15,178	8	NDEO	–	NO	NO
75	Hydro power	Quang Duc Group	Electric power	7MW	Dak Gia, Mang Yang	Renewbale Energy	-	42,924 MWh/Y	42,925	397,365,000	7,752,305	67,350	1,314	IE, ID Gia Lai	–	NO	–
76	Hydro power	Quang Duc Group	Electric power	5MW	Kroong, K' Bang	Renewbale Energy	-	30,660 MWh/Y	28,882	376,833,000	5,537,386	63,870	939	IE, ID Gia Lai	–	NO	–
77	Hydro power	Duc Tai Enterprise	Electric power	1.2MW	Dak Troi, Mang Yang	Renewbale Energy	-	7,358.4 MWh/Y	6,931	115,168,000	1,328,916	19,520	225	IE, ID Gia Lai	–	NO	–
78	Hydro power	Duc Tai Enterprise	Electric power	5MW	Kroong, K' Bang	Renewbale Energy	-	30,660 MWh/Y	28,882	186,971,000	5,537,386	31,690	939	IE, ID Gia Lai	–	NO	–
79	Hydro power	Bao Long JSC	Electric power	5MW	Ia Hrung, Ia Grai	Renewbale Energy	-	30,660 MWh/Y	28,882	267,329,000	5,537,386	45,310	939	IE, ID Gia Lai	–	NO	–
80	Hydro power	Duc long Group	Electric power	10Mw	Kroong, K' Bang	Renewbale Energy	-	61,320 MWh/Y	57,763	805,173,000	11,074,772	136,470	1,877	IE, ID Gia Lai	–	NO	–
81	Hydro power	Song Da 4 JSC	Electric power	9MW	Ha Tay, Chu Pah	Renewbale Energy	-	55,188 MWh/Y	51,987	1,127,136,000	9,967,283	191,040	1,689	IE, ID Gia Lai	–	NO	–
82	Wood processing industry	Duc Nhan Corporation	Wooden Furniture	1,980 Containers/year	Binh Duong province	Supply electricity from the thermal power factory which use biomass from waste of sylviculture	-	17,468 toe/Y	83,850					VDB/(ECC-HCMC)	2010	YES	YES

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
83	Food processing	Ben tre Sugar Joint stock Company			Ben tre province	Installing new turbine and generator to produce heating and electricity from sugar cane dregs	N.A	276 toe/Y	1,742	104,152,700		17,653		VDB/(ECC-HCMC)	Short Listed	YES	YES
84	Industrial Gas	Industrial gas & welding electrode Co., Ltd			Binh Duong province	Installing new industrial gas processing chain	?	1,197 toe/Y	12,452	1,401,132,000		237,480		VDB/(ECC-HCMC)	Short Listed	?	?
85	Coal processing for steel plan	Hoa Phat Energy Jointstock Company			Hai duong province	Install new turbin to recover heat from coal processing to generate power	?	1,290 toe/Y	-	1,475,000,000		250,000		VDB	Short Listed	YES	YES
86	Cement	Thanh Cong Construction Materials Joint stock Company			Hai duong province		?	2,580 toe/Y	-	749,300,000		127,000		VDB	Short Listed	YES	YES
87	Ceramic production	to be defined			Hanoi	Convert fuel use of 57 ceramic kiln from coal and firewood to LPG by installing LPG kiln and new dying room	?		3,376	234,519,100		39,749		VDB	Short Listed	YES	?
88	Cement	Vietnam Industrial Construction Corporation			Thai Nguyen province	Install new turbin to recover heat from coal processing to generate power	?			579,385,900		98,201		MOIT	Short Listed	YES	YES
89	Textile	Kim Dong Xuan			Ha Noi	Inovation Technology, Increase power, moving and retrofit workshop	?							ECC-Hanoi	Short Listed	YES	NO
90	Shipbuilding	Nam Trieu ship building Cooperation	New Ship	16 ships/y	Hai Phong	Investing energy saving equipments and systems	?	1,002 toe/Y	2,500	159,300,000		27,000		ECC-Hanoi	Short Listed	YES	YES

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
91	Bio Fuel	Orient Bi-Fuels Company	Bio Ethanol	Ethanol: 100,000 Kl/Y	Binh Phuoc	Production of ethanol from cassava			93,180	8,000,000,000		1,355,932		CITOH/Hanoi	2010.3 Construc. Start 2011.9 Production Start	NO	YES
92	Food	Hanoi beer			Ha Noi	Facility improvement and High EE equipment procurement	6,243		?			514		IE/UNIDO	2011 (Lack of capital,No apreciate vendor)	NO	NO
93	Textile	Trung thu textile co.,			Ha Noi	Facility improvement and High EE equipment procurement	1,966	56,234 toe/Y	?			375		IE/EPRO	(Lack of capital,Relocation,Not easy to access the commercial loan for EE)	NO	NO
94	Food	Thong Nhat milk factory			HCMC	Facility improvement	939,346	?	?	8,002,760		1,356		IE/Enerteam	During 2010(Lack of capital,Operation reduce)	NO	NO
95	Textile	Thai Tuan textile co.,			HCMC	Facility improvement	3,618	?	?			900		IE	2010(Lack of capital)	NO	NO
96	Textile	Quang Thanh textile co.,			Da Nang	Facility improvement	131	0.7 toe/Y	?	643,100		109		IE	Next quarter(Lack of capital)	NO	NO
97	Packing	Vinh Phat co.,			HCMC	Facility improvement	286	?	?	4,301,100		729		IE	2010(Lack of capital)	NO	NO
98	Rubber	Sao Vang rubber co.,			Ha Noi	Facility improvement	14,399		?			2,575		IE	2011(Lack of capital,Relocation)	NO	NO
99	Food	Tan Binh cooking oil co.,			HCMC	Facility improvement	-	?	?			"Low Investment Cost"		IE/UNIDO	2010(Lack of capital,Operation reduce)	NO	NO
100	Undefined	Arico co.,			HCMC	?	26	?	?			"Low Investment Cost"		IE	(No intention)	NO	NO
101	Food	Duc Viet food co.,			Hung Yen	Using Solar energy for hot water	-	?	?			700		IE/UNIDO	2010(Lack of capital)	NO	NO
102	Paper	Tan Thanh paper co.,			HCMC	Facility improvement an operation changes	337	?	?	30,090		5		IE/Enerteam	2010(Lack of capital,Relocation)	NO	NO

Note : 1 VND= 0.0059 Japanese Yen
1 US $ = 17,000 VND

No.	Sector	Company name	Main Products	Capacity Production/year	Location	Energy Saving Measure ①、②	Current Energy Consumption (toe/y)*1	Reduced Energy Consumption MWh/Y, kL/Y, ton/Y (toe/Y)	Reduced GHG t-CO_2/Y	Facility Cost (Project cost) (JPY) ③	Reduced Energy Cost (JPY)	Facility Cost (Project cost) (Millions of VND)③	Reduced Energy Cost (Millions of VND)	Reference sources	Status ④*1 Project Starting, if loan applied (Barriers)	Site Survey ⑤*1	Applicability TSL ⑥*1
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	Cement	Tam Diep Cement Factory	Clinker & Cement	4,000t/d Clinker &1,500,000 ton/year Cement	Ninh Binh	Waste heat recovery 5MW Power generation	23,344	30,000 MWh/Y		708,000,000	163,902,000	120,000	27,780	IE-VCEM	2011 (Lack of capital)	NO	YES
5	Cement	Hoang Thach Cement Factory	Clinker & Cement	2,300,000 ton/year	Hai Duong	Waste heat recovery 6.5 MW Power generation	46,612	42,000 MWh/Y		1,026,600,000	229,462,800	174,000	38,892	IE-VCEM	2011 (Lack of capital, High investment)	NO	YES
8	Cement	But Son Cement Factory	Clinker & Cement	1,400,000 ton/year	Ha Nam	Waste heat recovery equipment	123,462	36,280 MWh/Y		1,144,771,100	198,212,152	194,029	33,595	NEDO	2010 (Lack of capital)	NO	YES
56	Ceramics	CMC Tile JSC	Tile	5 million m2/Y	Phu Tho	Facility improvement	5,209	572 MWh		118,755,200	3,125,053	20,128.00	530	IE	As soon as possible(Lack of capital,Operation reduce)	NO	YES
82	Wood processing industry	Duc Nhan Corporation	Wooden Furniture	1,980 Containers/year	Binh Duong province	Supply electricity from the thermal power factory which use biomass from waste of sylviculture	-	17,468 toe/Y	83,850					VDB/(ECC-HCMC)	2010	YES	YES
83	Food processing	Ben tre Sugar Joint stock Company			Ben tre province	Installing new turbine and generator to produce heating and electricity from sugar cane dregs	N.A	276 toe/Y	1,742	104,152,700		17,653		VDB/(ECC-HCMC)	Short Listed	YES	YES
85	Coal processing for steel plan	Hoa Phat Energy Jointstock Company			Hai duong province	Install new turbin to recover heat from coal processing to generate power	?	1,290 toe/Y	-	1,475,000,000		250,000		VDB	Short Listed	YES	YES
86	Cement	Thanh Cong Construction Materials Joint stock Company			Hai duong province		?	2,580 toe/Y	-	749,300,000		127,000		VDB	Short Listed	YES	YES
88	Cement	Vietnam Industrial Construction Corporation			Thai Nguyen province	Install new turbin to recover heat from coal processing to generate power	?			579,385,900		98,201		MOIT	Short Listed	YES	YES
90	Shipbuilding	Nam Trieu ship building Cooperation	New Ship	16 ships/y	Hai Phong	Investing energy saving equipments and systems	?	1,002 toe/Y	2,500	159,300,000		27,000		ECC-Hanoi	Short Listed	YES	YES
91	Bio Fuel	Orient Bi-Fuels Company	Bio Ethanol	Ethanol: 100,000 Kl/Y	Binh Phuoc	Production of ethanol from cassava			93,180	8,000,000,000		1,355,932		CITOH/Hanoi	2010.3 Construc. Start 2011.9 Production Start	NO	YES

Note : 1 VND= 0.0059 Japanese Yen
1 US $ = 17,000 VND

Appendix 7: Candidate Sub project Short List

ID	Sector	Project Name	Location	Project Type	Company Name	Technical Solution	Project Cost		Loan Amount		Input			OUTPUT SECTION								Project Status
											New			Base Model Efficiency	Annual Energy Cost Savings				Lifetime Energy Cost Savings			
							VND (Mil)	Japanese Yen equivalent (Mil)	VND (Mil)	Japanese Yen equivalent (Mil)	New Capacity	Annual Energy Use	Annual Energy Cost		Energy saving (toe/Y)	CO2 emission reduction (ton/year)	VND(M)	USD(M)	Life Expectancy (yrs)	VND(M)	USD(M)	
1	Cement	XI MĂNG THÀ NH CÔNG	Hai duong province	**New:** Energy Efficiency	**Thanh Cong Construction Materials Joint stock Company**	Install new turbine to recover heat from kiln to generate power	127,000	749	107,000	631	4 MW	9,5000 MWh	87,500 mVND		26,000MWh	15,581	24,000	1.41	10	240,000	14.12	Ready to commence.
2	Coal processing for steel plan	HOA PHAT ENERGY	Hai duong province	**New:** Energy Efficiency	**Hoa Phat Energy Jointstock Company**	Install new turbine to recover heat from coal processing to generate power	250,000	1,475	200,000	1,180	13 MW	15,840 MWh			15.840MWh 102,960MWh	54,584	14,600 82,400	0.859 4.94	10	146,000 824,000	8.59 48.48	Ready to commence.
3	Wood processing industry	DUC NHAN WOODEN PROJECT	Binh Duong province	**New:** Renewabl e Energy	**Duc Nhan Sai Gon Company**	Supply electricity from the thermal power factory which use biomass from waste of sylviculture	770,000	4,543			electricity: 6 MW x 5 heating: 20.5 ton/h x 5				17468.00 toe/Y	83,850	175,500	10.32	20	3,510,000	206.47	Investment report completed and financing expected in coming March
4	Food processing	BEN TRE SUGAR'S PROJECT	Ben tre province	**New:** Energy Efficiency	**Ben tre Sugar Joint stock Company**	Installing new turbine and generator to produce heating and electricity from sugar cane dregs	17,653	104	7,600	45	electricity: 1.5MWh - heating: 10ton/h - Pressure 24kg/cm2				276.75 toe/Y	1,742	5,535	0.33	10	55,350	3.26	Energy audit completed and ready to commence
5	Ship Building	NAM TRIEW SHIPBUIDING INDUSTRY CORPORATIO N	Hai Phong province	**New:** Energy Efficiency	NAM TRIEW SHIPBUIDING INDUSTRY CORPORATIO N	Investing energy saving equipments and systems	27,118	160		0							10,301	0.61	10	103,010	6.06	Nov. 2009 EA Completed
6	Cement	CEMENT THAI NGUEN	Thai Nguyen province	**New:** Energy Efficiency	**Vietnam Industrial Construction Corporation**	Install new turbin to recover heat from kiln to generate power	152,624	900	129,700	765	3.5 MW	90,000 MWh	90,000 MWh		22,680MWh	13,592	20,900	1.25	10	20,900	12.50	Still under preliminary planning stage.
7	Ceramic production	BAT TRANG VILLAGE	Hanoi	**New:** Energy Efficiency	**to be defined**	Convert fuel use of 57 ceramic kiln from coal and firewood to LPG by installing LPG kiln and new dying room	39,749	235	33,787	199	57 kilns					3,376	727	0.04	10	7,270	0.43	The project leader was ready to initiate project planning.
8	Textile	Kim Dong Xuan	Hanoi	**New:** Energy Efficiency	Kim Dong Xuan			0		0												The company plans to initiate an enrgy saving project from scratch.

Note : 1 VND= 0.0059 Japanese Yen
1 US $ = 17,000 VND

Note: Figures in "Annual Energy Cost Savings" and "Lifetime Energy Cost Savings" of ID4&5 are provided by local consultant, which SAPI team could not confirm.

Appendix 8: EE&RE EQUIPMENT/TECHNOLOGY

Eligible Equipment/Technology	Efficiency Parameter (Unit)	Efficiency Value (NEDO Handbook)	Nominal Capacity	CO2 Emissions Reduction per Year	Note(Implemented in)
1. Steel					
- Blast Furnace Hot Stove Heat Recovery	Heat consumption reduction (kcal/t-PI)	30,000	1,000,000t/y Blast Furnace	22,000	India, China
- Coal Moisture Control	Energy saving effect and productivity improve (Mcal/T-Coal reduced)	Carbonization heat amount : 30 - 50	—	18,600	China
- Blast Furnace Top Pressure Recovery Power Generation	Energy saving effect (kW)	7,000	1,000,000t/y Blast Furnace	3,936	China
- Sinter Cooler Waste Heat Recovery	Steam recovery rate(kcal/t-SI)	60,000	1,000,000 t/y sintered ore	38,100	China
- Coke Dry Quenching	Electricity generation (kWh/t-coke)	150	450,000 t/y coke	68,000	China, India
- Effective Energy Utilization in Pre-Heating Furnace	Energy saving effect (kWh/t-steel)	25 - 35	Crude steel productio:200,000t/y, Furnace capacity: 70-80t/heat		Thailand
- Waste Gas Recovery from Oxygen Converter	Heat recovery (kca/t-PI)	200,000	Crude steel production 200,000t/y, Converter capacity 110t/charge	40,000	China
- High Efficiency Combustion Control System in Pre-Heating Furnace	Energy saving (Gcal/y)	8,000 - 10,000	Heating capacity: 110t/h, Heating temperature: 1050°C,	7,800	China
- Utilization of Sensible Heat from Blast Furnace Hot Stove Waste Gas	Energy saving (kcal/t-PI)	30,000	1mill.t/y blast furnace	224,000	India

Eligible Equipment/Technology	Efficiency Parameter (Unit)	Efficiency Value (NEDO Handbook)	Nominal Capacity	CO2 Emissions Reduction per Year	Note(Implemented in)
2. Cement					
- Application of Pre-Grinder	Power consumtion reduction (kWh/t-meal)	5 - 10	3,000t/d-cement	(39-43) - (29-38)	Indonesia
- Waste Heat Recovery Power Generation from Kiln Exhaust gas	Electric power generation (kW/t/d cement)	2.2	3,000 t/d cement		China
- Reduction of Electric Power Consumption utilized from Kiln Exhaust gas	Electricity power generation (kWh/y)	19,940,000	3,000t-clinker/d 2,950kW	14,230	Viet Nam
- Utilization of Waste Heat (NSP)	Heat reduction (kcal/kg-clinker)	130	3,000t-cement/d		China
3. Power Generation					
- Soot Blower					China
- Variable Speed Clutch for IDF and FDF	Energy saving (t-coal/y)	1300(*13)	200MW		China
- Improvement of Boiler and Turbine Efficiency	Fuel saving (t/y)	6,000(heavy oil equivlent)(*11)	200MW(*12)	15,000	Indonesia
- High Efficiency Gas Turbine Technology	Fuel saving (t/y)		Replacing GT 73.5MW(F5x3)(*14)		Myanmar
4.Environmental Protection					
-Utilization of Waste Heat of Refuse Incineration	Electric power generation (kW/t/d Refuse)	19.2	390 t/d Refuse		China
-Utilization of Waste Heat from Incineration of Industrial Waste	Fuel conservation t/y-crude oil	7000(*5)	140t/d	Assumed from Koh Sumit data	Thailand
5.Pulp and Paper					
- Utilization of Paper Sludge and Solid Waste	Energy conservation (toe/y)	9,000toe/y(*2)		23,000t-CO2/y 3,200t-methane/y	Indonesia
-Heat Recovery Equipment of Waste Combustion	Fuel conservation (t/y-crude oil)	5000(*6)	100d/y		Thailand
- Waste Treatment of Paper Sludge and Utilization of Waste Heat from Paper Sludge Combustion	Fuel reduction (t/y-crude oil)	7,795	110t/d Sludge	102,500	Malaysia

Eligible Equipment/Technology	Efficiency Parameter (Unit)	Efficiency Value (NEDO Handbook)	Nominal Capacity	CO2 Emissions Reduction per Year	Note(Implemented in)
6. Textile					
- Energy and Water Saving in Textile Dyeing and Finishing Industry	Energy consumption reduction (%)	60(*1), 20(*15)	1,560t/y-dyed-finished cotton(*15)	7,800TOC/y	Thailand, Indonesia
7.Petroleum Refinery					
-FCC Power Recovery	Energy conservation (kl/y-coe)	13,600(*7)	35,000BPD		China
-Flare gas and Hydrogen recovery from off-gas	Energy conservation (toe/year)	86,900 (flare gas) 26,800 (hydrogen) (*8)	260,000bbl/d	274800(flare) 84,800(hydro)	Indonesia
8. Petrochemicals					
- Energy Recovery from Waste Gas and Water in Acrylonitrile Plant					China
9. Fertilizer					
- Waste Heat Recovery of Primary Reformer in Ammonia Plant	Fuel reduction(106 kcal/t-NH3)	0.15	1,000 t/d production		China
- Energy Conservation of Ammonia /Urea Fertilizer Plant	Energy conservation		100kt/y(Amm.) 150kt/y(Urea)(*9)		Myanmar
10. Metal Industry					
- Energy Conservation of Electric Furnace in Ferro-Alloy Refining	Energy conservation (t-coal/y)	5,859(*3)	38,300t/y	29,200	China
- High Performance Industrial Furnace in Aluminum Factory	Energy conservation (TJ/y)	34(*10)	18,000t/y	2,100	Thailand
11.Food & Brewery					
- Renovation to increase Efficient Energy use of Brewery Factory	Energy conservation (toe/y)	3,386(*4)	64,000kl/y	10,476	Viet Nam
-Ethanol Production from Molasses and Bagasse in Sugar Factory	Energy conservation (toe/y)	18,400(*2)	Molaresse ethanol=33,000kl/y Bagasse Ethanol=3,000kl/y	54,800	Thailand

Reference : Japanese Technologies for Energy Savings/GHG Emissions Reduction
(2008 Revised Edition)
(http://www.nedo.go.jp/library/globalwarming/ondan-e.pdf)

*1 : http://www.nedo.go.jp/kankobutsu/pamphlets/dounyuu/ashitano2008e.pdf
*2 : http://www.biomass-asia-workshop.jp/06workshop/presentation/08_Ishida.Pdf#
*3 : http:/unfcc.int/kyoto_mechanisms/aij/activities_implemented_jointly/items/846.php?plus=j
*4 : http://www.nedo.go.jp/kokusai/kouhou/150711/02.pdf#search='brewery factory vietnam nedo'
*5 : http://www.jfe-holdings.co.jp/en/release/nkk/39-1/art04.html
*6 : http://www.jfe-holdings.co.jp/en/release/nkk/40-2/art03.html
*7 : http://www.energymanagertraining.com/ECDirectory_NEDO/12-Chapter3-Section4-Oil%20Refining%
*8 : http://www.nedo.go.jp/english/archives/170701/170701.html
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*12 : http://strategis.ic.gc.ca/eic/site/imr-ri.nsf/eng/gr111897.html
*13 : http://www.energymanagertraining.com/ECDirectory_NEDO/17-Chapter3-Section9-Electricity%20Generation-Page316-339.pdf
*14 : http://www.nedo.go.jp/english/archives/120901/fy2000.doc
*15 : http://www.iges.or.jp/APEIS/RISPO/inventory/db/pdf/0075.pdf

Eligible Technology	Efficiency Parameter (Unit)	Efficiency Value (NEDO Handbook)	Nominal Capacity	CO2 Emissions Reduction per Year	Note(Implemented in)
1.Power generation sector					
-Solar photovoltaic power generation	CO2 emission reduction(kg-CO2/year)	297	1kW		
- Wind power generation	CO2 emissions reduction (g-CO2/kWh)	29.5	1,000kW/unit		
- Biomass power generation	Electric power generation (kW/t/d wood)	20.8	240 t/d wood biomass		Malaisia
- Small/Micro hydro power generation(upto 30MW)	CO2 emissions reduction (kg-CO2/kWh)	11.3	>100kW/unit		
- Geothermal power generation(binary system)	CO2 emissions reduction (t-CO2/y)	9,000	1,720 kW/plant		
- Oceanic power generation	CO2 emissions reduction (kg-CO2/kWh)	0.014			
2. Heat utilization sector					
- Solar thermal conversion/ Solar thermal utilzation	Fuel reduction(cal/y)	3,120,000	Solar system (6 m^2)		
- Biomass thermal utilization					
3. Others					
- Biomass fuel	GHG reduction(kg	18,720,359	390 tons town garbage/day		
4. Advanced technology					
- NG cogeneration system					
- Fuel cell	GHG reduction (t-CO2/kWyear)	164(*16)	250kW(DFC300)		

Reference : Japanese Technologies for Energy Savings/GHG Emissions Reduction (2008 Revised Edition)
(http://www.nedo.go.jp/library/globalwarming/ondan-e.pdf)

*16 : http://www.fuelcell-japan.com/environment/co2reduction.html
In comparison of the average CO2 emissions of all different type power generations.

The List of Japanese Energy Saving Equipments for common usage (JCI Original) Prepared by JCI

Equipment/Technology need	Advantages	Effects of Energy Conservation	Specifications	Note
1.Electrical Equipment				
1)inverter(VVVF Controller)			JEM201,225, 226,227	Harmonic suppressor
Additionally installation for motor	improve partial load efficiency			
VVVF Controlled pump,fan, brower,air compresser,refrigeration compresser,etc.	ditto			
2) High Efficiency Motor			JISC4212	
	high energy efficiency	efficiency 3-5% up	JEMA Standard	
3) High Efficiency Transformer			JEMA Standard	
	improve transformer loss		Total Load Loss less than 0.3%	
4) High Efficiency Lighting system				
Hf Fluorescent Lamp	save energy	EC25%cut		
Energy Saving Lamp(FL)	ditto	EC10%cut	Luminous efficiency over 80lm/w	
Metal halide lamp	ditto	EC33%cut	Luminous efficiency over 60lm/w	replace with Mercury
High pressure sodium lamp	ditto	EC60%cut	Luminous efficiency over 110lm/w	replace with Mercury
LED	ditto			
High luminescence guide lamp	ditto			
5) High Efficiency Air Compressor/Blower				
	save energy			
6) Capacitator				
	power saving by phase advancement			
7)(Night time) Ice thermal storage cooling				
	improve variable load efficiency			

Equipment/Technology need	Advantages	Effects of Energy Conservation	Specifications	Note
8) Elevator with VVVF control				
	save energy			
2. Thermal Equipment				
1) High Efficiency Boiler				
	save energy			
2) Recuperator				
furnace etc.	Heat recovery			
3) Co-generation				
	save energy		Generater η SS;30% MS;35% LS;40% up	Electr/Heat balance
4) Heat Pump System(heat recovery)				(primary energy base)
inverter contorolled	improve partial load efficiency		COP 1.32up*	
5) High Efficiency cooling refregirating Compressor system				
Turbo compressor			COP 2.2up	(primery energy base)
inverter contorolled	improve partial load efficiency			
6) Combustion control (proportional a/f ratio control)				
boiler,furnace,etc.	improve full/partial load efficiency			
7) Regenative burner system				
furnace	save energy	Ave.30-50% cut		
8) Steam drain recovery				
steam system	heat recovery			
9) Economizer				
boiler etc.	heat recovery			
10)Sludge combustion boiler				
	energy utilization			
11)Outdoor intake Control / VAV / Heat exchanger				
	save energy			

Equipment/Technology need	Advantages	Effects of Energy Conservation	Specifications	Note
3. Insulation				
Thermal Insulation				
Piping Steam,Cold & Hot Water,Refregirant,etc.	save energy			
Valves :Steam,Cold & Hot Water,etc.	save energy			
Insulation Wall of Buiding	save energy			
Windowpane:Heat Absorbing Glass, Low Emissivity Glass,high insulated window , windowpane,etc.	save energy			
Greening Roof tops	save energy			
Insulation Paint for Roof tops	save energy			
4. Water Equipment				
Reuse of waste water	save water			
Water treatment using membrane filter	save water			
Water treatment by bio-activator	save energy			
Bio gas recovery from organic waste water treatment	energy utilization			
5. BEMS for buildings energy management	save energy			
- Installation of Building Energy Management System(BEMS)	Lighting control, Electrical Plumbing Lift,Security management system, Energy Management, Facility Management			
- High Efficiency Air Condition	Max. 20% Electric saving per year, Inverter Air-Con			
- High Efficiency Refrigerator				
- High Efficiency Absorption Refrigerator				
- Heatpump Hot Water Supply System	Reduction of Running cost by 1/3			
- Fuel Cell Co-generation System	Reduction of 28% Energy Consumption, 42% reduction of CO2 emission			
- House purpose co-generation	More than 80% Energy efficiency, Reduction of CO2 by 1/3			
-Rain water reuse system				
- Ice Stirage system using night time electricity	Reduction of 7% Energy cost and 10% reduction of CO2			
- Elevator without Machine Room	Reduction of Electricity by 12.6%			
- Water saving and Electric saving Stool	Reduction of water from 13L to 5.5L			

Equipment/Technology need	Advantages	Effects of Energy Conservation	Specifications	Note
6. Power / Heat generation by Waste treatment (incineration etc.)				
7.Air compressor				
-Install large turbo compressor instead of small compressors in parallel	Save energy	Approx. 20%		More than 300kW
8. Instrumentation of Measuring and recording deveices for Energy management and control				
power supply/consumption				
heat supply/consumption				
fuel supply/consumption				
steam supply/consumtion				
water supply/consumption				
materials supply/consumption				
operation hr				
8-2 Potable Instrumentation for Energy Audit				
- Portable data logger to monitor energy use with analog and digital signals input capability				
- Digital thermometer, Infrared thermometer, Thermo-Hygrometer				
- Clip-on power meter, current meter, power factor meter, Demand Profile Meter				
- Combustion analyzer, O2 analyzer				
- Ultrasonic flow meter, Ultrasonic leak checker etc.				
9.Environment monitoring and recording devices				
flue gas analyzer O2,CO2,CO,Nox,Sox,HCl,SPM,etc.	(observance of environmental regulations)			
Waste water BOD,COD,SS,etc.	(observance of environmental regulations)			

Appendix 9: ENERGY CONSUMPTION CALCULATION

1st Table Energy Consumtion and Quantity of By-product Energy, etc.

Type of Fuel & Energy			Unit	2009 Fiscal Year					
				Consumtion		Quantity of Sold By-product Energy			
						Sold Quantity		Quantity uncontributed for Production	
				Consumption	Heat GJ	Quantity	Heat GJ	Quantity	Heat GJ
Fuel & Heat	Crude Oil (excl. NGL)		kl						
	Ntural Gas Liquid (NGL)		kl						
	Gasoline		kl	96	3,322				
	Naphtha		kl						
	Kerosene		kl						
	DieselOil		kl	75	2,865				
	Fuel Oil (A)		kl	503	19,667				
	Fuel Oil (B/C)		kl						
	Petroleum Asphalt		t						
	Petro Coke		t						
	Petroleum Gas	LPG	t						
		LPG Gas	km3	35	1,572				
	Combustible Natural Gas	LNG	t						
		Other Combustible Gas	km3						
	Coal	Bituminus	t						
		Subbituminus	t						
		Anthracite	t						
	Coal Cokes		t						
	Coal Thare		t						
	Coke Oven Gas		km3						
	Blast Furnace Gas		km3						
	Oxygen Furnace Gas		km3						
	Other Fuel	Town Gas OO	km3						
	Industrial Steam		GJ						
	Other Steam than Industrial Use		GJ						
	Heated Water		GJ						
	Chilled Water		GJ						
	Sub-total		GJ		27,426				
Electricity	General Electricity Utility	Day Time Purchase	MWh	4,097	40,847				
		Night Time Purchase	MWh						
	Others	Other Purchase	MWh						
		Captive Power	MWh						
	Sub-total		MWh or GJ	4,097	40,847				
Total of Energy Consumtion GJ					68,273				
Conversion to Crude Oil kl					ⓐ 1,761		ⓑ		ⓒ
Change from the Preceding Year (%)					0				
Preceding Year Consumption converted to Crude Oil kl									

Town Gas Type (or LPG) Conversion Factor GJ/km³(or GJ/t)

A: For Calculation of 1st Table Energy Consumption and Quantity of Sold By-product Energy, etc.

Type of Fuel & Energy			Unit	2009 Fiscal Year						Heat Conversion Factor	
				Consumption		Quantity of Sold By-product Energy					
						Sold Quantity		for Production			
				Consumption	Heat GJ	Quantity (Note 1)	Heat GJ	Quantity (Note 1)	Heat GJ		
Fuel & Heat	Crude Oil (excl. NGL)		kl		0		0		0	38.2	
	Natural Gas Liquid (NLG)		kl		0		0		0	35.3	
	Gasoline		kl	96	3,322		0		0	34.6	
	Naphtha		kl		0		0		0	34.1	
	Kerosene		kl		0		0		0	36.7	
	Diesel Oil		kl	75	2,865		0		0	38.2	
	Fuel Oil (A)		kl	503	19,667		0		0	39.1	
	Fuel Oil (B/C)		kl		0		0		0	41.7	
	Petroleum Asphalt		t		0		0		0	41.9	
	Petro Coke		t		0		0		0	35.6	
	Petroleum Gas	LPG	t		0		0		0	50.2	(Note 2)
		LPG Gas	km3	35	1,572		0		0	44.9	
	Combustible Natural Gas	LNG	t		0		0		0	54.5	
		Other Combustible Gas	km3		0		0		0	40.9	
	Coal	Bituminous	t		0		0		0	28.9	
		Subbituminous	t		0		0		0	26.6	
		Anthracite	t		0		0		0	27.2	
	Coal Cokes		t		0		0		0	30.1	
	Coal Thare		t		0		0		0	37.3	
	Coke Oven Gas		km3		0		0		0	21.1	
	Blast Furnace Gas		km3		0		0		0	3.41	
	Oxygen Furnace Gas		km3		0		0		0	8.41	
	Other Fuel	Town Gas consumption	km3		0		0		0	46.1	(Note 2)
					0		0		0		
	Industrial Steam		GJ		0		0		0	1.02	
	Other Steam than Industrial Use		GJ		0		0		0	1.36	
	Heated Water		GJ		0		0		0	1.36	
	Chilled Water		GJ		0		0		0	1.36	
	Su-total		GJ		27,426		0		0		
Electricity	General Electricity Utility	Day Time Purchase	MWh	4,097	40,847				0	9.97	
		Night Time Purchase	MWh		0				0	9.28	
	Others	Other Purchase	MWh		0				0	9.76	
		Captive Power	MWh				0		0		(Note 3)
	Sub-total		MWh or GJ	4,097	40,847	0	0		0		(Note 4)
Total of Energy Consumption GJ					68,273		0		0		
Conversion to Crude Oil kl					1,761		0		0	0.0258	(Note 5)
Change from the Preceding Year (%)					0						
Preceding Year Consumption converted to Crude Oil kl											
								(Note 6)			

B: For 3rd Table Calculation Production Quantity etc.

	Preceding Year	Current Year	C-Year/P-Year
Value closely relating to Production Quantity, Floor Area or Other Energy Consumption ⓓ			#DIV/0!

C: For 4th Table Calculation Unit for Energy Consumption

Total of No. 1Table ⓐ (Crude Oil Conversion kl)	Sold Quantity ⓑ (Crude Oil Conversion kill)	Quantity uncontributed for Production ⓒ (Crude Conversion kl)	Crude Oil Conversion for calculating Unit Quantity kl ⓐ-(ⓑ+ⓒ)
1,761	0	0	1,761

	Preceding Year	Current Year	C-Year/P-Year
Unit Quantity		#DIV/0!	#DIV/0!

4 digits effective, confirm figures.

D:For 5th Table Change of Unit Quantity for Energy Consumption for Last 5 Years

	2005 F-Year	2006 F-Year	### F-Year	2008 F-Year	2009 F-Year
Unit Quantity for Energy Consumption	#VALUE!			0	#DIV/0!
C-Year/P-Year(%)		#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!

	Change of Average Unit Quantity for past 5 Years
Unit Quantity for Energy Consumption	#DIV/0!

Automatically calculated by input of past 5 years data

(Additional Table)

Table for Calculating Proportional Distribution of Un-listed Electricity in Every Repartition

Division	Consumption	Rate	Proportional Distribution
Day Time Purchase	4,097	1.00	0
Night Time Purcha	0	0.00	0
Other Electricity	0	0.00	0
Captive Power	0	0.00	0
Total	4,097	Total Electricity used to Production	

: Cell to value input

: Cell automatically calculated or posted value

(Note 1) Round the digit at the tenths decimal places and enter it by the integer.
(Note 2) As for "Town Gas" and "LPG", use a actual value with confirming the type and the calorific value of gas to the gas supply business. Also specify the calorific value in the margin. The values of LPG=50.2GJ/t and Town Gas=46.1GJ/km3 are temporarily entered in the table. Incidentally, these values are linked to the CO2 automatic calculation table.
(Note 3) As for "Captive Power Generation", calculate with the fuel to have used for power generation. Also, when a part of the captive power is sold, enter the sold electricity and the conversion factor (calculate from power generating efficiency).
(Note 4) When the electricity quantity which does not contribute to production is not managed for every use repartition, calculate from the attached list (the proportional division calculating table).
(Note 5) To convert to the crude oil conversion kl, use the conversion factor 0.0258kl/GJ.
(Note 6) When there is quantity which doesn't contribute to production, enter places or purposes (facilities and/or use and so on).

A: For Calculation of 1st Table Energy Consumption and Quantity of Sold By-product Energy, etc.

Type of Fuel & Energy			Unit	2009 Fiscal Year Consumption: Consumption	Consumption: Heat GJ	Quantity of Sold By-product Energy: Sold Quantity: Quantity (Note 1)	Sold Quantity: Heat GJ	for Production: Quantity (Note 1)	for Production: Heat GJ	Heat Conversion Factor	
Fuel & Heat	Crude Oil (excl. NGL)		kl		0		0		0	38.2	
	Natural Gas Liquid (NLG)		kl		0		0		0	35.3	
	Gasoline		kl	96	3,322		0		0	34.6	
	Naphtha		kl		0		0		0	34.1	
	Kerosene		kl		0		0		0	36.7	
	Diesel Oil		kl	75	2,865		0		0	38.2	
	Fuel Oil (A)		kl	503	19,667		0		0	39.1	
	Fuel Oil (B/C)		kl		0		0		0	41.7	
	Petroleum Asphalt		t		0		0		0	41.9	
	Petro Coke		t		0		0		0	35.6	
	Petroleum Gas	LPG	t		0		0		0	50.2	(Note 2)
		LPG Gas	km3	35	1,572		0		0	44.9	
	Combustible Natural Gas	LNG	t		0		0		0	54.5	
		Other Combustible Gas	km3		0		0		0	40.9	
	Coal	Bituminous	t		0		0		0	28.9	
		Subbituminous	t		0		0		0	26.6	
		Anthracite	t		0		0		0	27.2	
	Coal Cokes		t		0		0		0	30.1	
	Coal Thare		t		0		0		0	37.3	
	Coke Oven Gas		km3		0		0		0	21.1	
	Blast Furnace Gas		km3		0		0		0	3.41	
	Oxygen Furnace Gas		km3		0		0		0	8.41	
	Other Fuel	Town Gas consumption	km3		0		0		0	46.1	(Note 2)
					0		0		0		
	Industrial Steam		GJ		0		0		0	1.02	
	Other Steam than Industrial Use		GJ		0		0		0	1.36	
	Heated Water		GJ		0		0		0	1.36	
	Chilled Water		GJ		0		0		0	1.36	
	Su-total		GJ		27,426		0		0		
Electricity	General Electricity Utility	Day Time Purchase	MWh	4,097	40,847				0	9.97	
		Night Time Purchase	MWh		0				0	9.28	
	Others	Other Purchase	MWh		0				0	9.76	
		Captive Power	MWh				0		0		(Note 3)
	Sub-total		MWh or GJ	4,097	40,847	0	0		0		(Note 4)
Total of Energy Consumption GJ					68,273		0		0		
Conversion to Crude Oil kl					1,761		0		0	0.0258	(Note 5)
Change from the Preceding Year (%)					0						
Preceding Year Consumption converted to Crude Oil kl											

(Note 6)

(Note 1) Round the digit at the tenths decimal places and enter it by the integer.
(Note 2) As for "Town Gas" and "LPG", use a actual value with confirming the type and the calorific value of gas to the gas supply business. Also specify the calorific value in the margin. The values of LPG=50.2GJ/t and Town Gas=46.1GJ/km3 are temporarily entered in the table. Incidentally, these values are linked to the CO2 automatic calculation table.
(Note 3) As for "Captive Power Generation", calculate with the fuel to have used for power generation. Also, when a part of the captive power is sold, enter the sold electricity and the conversion factor (calculate from power generating efficiency).
(Note 4) When the electricity quantity which does not contribute to production is not managed for every use repartition, calculate from the attached list (the proportional division calculating table).
(Note 5) To convert to the crude oil conversion kl, use the conversion factor 0.0258kl/GJ.
(Note 6) When there is quantity which doesn't contribute to production, enter places or purposes (facilities and/or use and so on).

B: For 3rd Table Calculation Production Quantity etc.

	Preceding Year	Current Year	C-Year/P-Year
Value closely relating to Production Quantity, Floor Area or Other Energy Consumption ⓓ			#DIV/0!

C: For 4th Table Calculation Unit for Energy Consumption

Total of No. 1 Table ⓐ (Crude Oil Conversion kl)	Sold Quantity ⓑ (Crude Oil Conversion kill)	Quantity uncontributed for Production ⓒ (Crude Conversion kl)	Crude Oil Conversion for calculating Unit Quantity kl ⓐ-(ⓑ+ⓒ)
1,761	0	0	1,761

	Preceding Year	Current Year	C-Year/P-Year
Unit Quantity		#DIV/0!	#DIV/0!

4 digits effective, confirm figures.

D:For 5th Table Change of Unit Quantity for Energy Consumption for Last 5 Years

	2005 F-Year	2006 F-Year	### F-Year	2008 F-Year	2009 F-Year
Unit Quantity for Energy Consumption	#VALUE!			0	#DIV/0!
C-Year/P-Year(%)		#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!

Unit Quantity for Energy Consumption	Change of Average Unit Quantity for past 5 Years
	#DIV/0!

Automatically calculated by input of past 5 years data

(Additional Table)

Table for Calculating Proportional Distribution of Un-listed Electricity in Every Repartition

Division	Consumption	Rate	Proportional Distribution
Day Time Purchase	4,097	1.00	0
Night Time Purcha	0	0.00	0
Other Electricity	0	0.00	0
Captive Power	0	0.00	0
Total	4,097	Total Electricity used to Production	0

: Cell to value input

: Cell automatically calculated or posted value

Appendix 10: TECHNICAL APRAISAL FORMAT

Technical Appraisal Format

(Iron & Steel Sector)

1. General information of applicants

- **Company name / factory name:**_____
- **Sector:** **Steel**
- **Main Products :** _____
- **Location:**_____
- **Capacity of Production / year:** _____
- **Planning Project Profile[2]:**_____
- **Expected date of funding required:** _____
- **Contact person :** _____
- **Phone:** _____
- **e-mail:** _____
- **Phone:** _____
- **Entire amount of financial requirement (Project cost*) (mVND) :**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, installation cost, trial and operation, and other services to be needed to the smooth operation for the installed facility")_____
- **Expected date of loan disbursed:**_____
- **Expected implementation schedule:** (Expected Date of Commercial Operation of New facility / equipment must be specified):_____

_____

[2] "Planning Project Profile" must be specified following items;
- [General info of existing facility of factory(Type of furnace, Mounting location of burner(pre-heating area, heating area, soaking area), Ability of heating, Type of used fuel, Amount of heat per unit used fuel(kcal / tons),Insert temperature of steel, Extraction temperature, Furnace temperature (pre-heating area, heating area, soaking area) ,Temperature of exhaust gas and combustion air)],
- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

2. Technical information of candidate end user

- **Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No)),**

The list of EE/RE equipments

【Applicable technology】

	1	Iron & Steel sector	Yes	No
	1.1	Coke oven: Dry quenching equipment(CDQ)		
	1.2	Blast furnace : Hot stove waste heat recovery equipment		
	1.3	Blast furnace : Top pressure recovery turbine generator(TRT)		
	1.4	Pre-Heating Furnace: High Efficiency Combustion Control System		
	1.5	Sintering Plant: Cooler waste heat recovery equipment		
	1.6	Rolling mill : Steel billet & slab reheating furnace waste heat recovery equipment		
	1.7	Steel-making plant Oxygen converter exhaust gas recovery equipment		
	1.8	Rolling mill : Steel reheating & annealing furnace : High performance furnace with regenerative burner		
	1.9	Coal Moisture Control		
	1.10	Other technology(Please identify _____) -Motor -Fan		

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)): _____**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)) : _____**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%):_____**
- **Estimated Reduced GHG (t-CO2 / Y):_____**

Technical Appraisal Format

(Cement)

1. General information of applicants

- **Company name / factory name:**_____
- **Sector: Cement**
- **Main Products:**_____
- **Location:**_____
- **Capacity of Production / year :** _____
- **Planning Project Profile[3]:**_____
- **Expected date of funding required :** _____
- **Contact person :** _____
- **Phone:** _____
- **e-mail:** _____
- **Phone:** _____
- **Entire amount of financial requirement (Project cost*) (mVND):**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, installation cost, trial and operation, and other services to be needed to the smooth operation for the installed facility")_____
- **Expected date of loan disbursed:**_____
- **Expected implementation schedule:**(Expected Date of Commercial Operation of New facility / equipment must be specified):_____

  _____

[3] "Planning Project Profile" must be specified following items;

- [General info of existing facility of factory(Specification (for kiln(type(dry or wet),diameter, length), SP heater (type (slcs, slci/ilc), AQC cooler (type (grate),Number of steps, Auxiliary of pre-heat equipment), Method of cooling (controlled flow, air beam), Condition of exhaust gas; (sp gas, aqc gas (flow volume of gas(nm3/h), Utilizable gas flow volume, Gas temperature, Composition of gas (dust (g/nm3/h),N2,O2,H2O,dust), Contained water of material(Limestone, clay, slag, coal, silica),
- [Generating electricity capacity by utilizing waste energy],
- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

2. Technical information of candidate end user

- **Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No)),**

The list of EE/RE equipments

【Applicable technology】

	1.	Cement sector	Yes	No
	1.1	Application of Pre-Grinder		
	1.2	Waste Heat Recovery Power Generation from Kiln Exhaust gas		
	1.3	Reduction of Electric Power Consumption utilized from Kiln Exhaust gas		
	1.4	Utilization of Waste Heat (NSP)		
	1.5	Other technology(Please identify _____) -Motor -Fan		

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)): _____**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)): _____**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%):_____**
- **Estimated Reduced GHG (t-CO2 / Y):_____**

Technical Appraisal Format
(Food Processing)

1. General information of applicants

- **Company name / factory name:**_____
- **Sector:** _____
- **Main Products:** _____
- **Location:**_____
- **Capacity of Production / year:** _____
- **Planning Project Profile[4]:**_____
- **Expected date of funding required:** _____
- **Contact person:** _____
- **Phone:** _____
- **e-mail:** _____
- **Phone:** _____
- **Entire amount of financial requirement (Project cost*) (mVND):**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, installation cost, trial and operation, and other services to be needed to the smooth operation for the installed facility")_____
- **Expected date of loan disbursed:**_____
- **Expected implementation schedule** :(Expected Date of Commercial Operation of New facility / equipment must be specified):_____

_____

[4] "Planning Project Profile" must be specified following items;

- [General info of existing facility of factory(Capacity of preparation facility for brewing(kL/Brew),Capacity of ferment and reservation tank (kL x number of units),Capacity of filtration, Capacity of bottling, Canning system(bottle/h), Type of boiler (e.g. what fuel be used?(heavy oil ,coal….),Amount of used fuel (tons/h),Type of chiller systems (capacity of motor),Air compressor, Liquefied CO2 system, Electric generator, Treatment waste water system))

- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

2. Technical information of candidate end user

- **Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No)),**

The list of EE/RE equipments

【Applicable technology】

	1	Food processing sector	Yes	No
	1.1	Vapor Re-Compression system		
	1.2	Energy efficient Chiller system(Cascade heat pump chiller, Dynamic ice heat system, Discharge Nh3 gas sensitive heat utilization system)		
	1.3	Heat pump boiler system		
	1.4	Reuse of waste biogas system		
	1.5	Optimization of sterilization system		
	1.6	Other technology(Please identify _____)		

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)): _____**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)): _____**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%):_____**
- **Estimated Reduced GHG (t-CO2 / Y):_____**

Technical Appraisal Format
(Other Sectors in the Eligible list)

1. General information of applicants

- **Company name / factory name:** _____
- **Sector:** _____
- **Main Products:** _____
- **Location:** _____
- **Capacity of Production / year:** _____
- **Planning Project Profile** _____
- **Expected date of funding required:** _____
- **Contact person:** _____
- **Phone:** _____
- **e-mail:** _____
- **Phone:** _____
- **Entire amount of financial requirement (Project cost*) (mVND):**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, installation cost, trial and operation, and other services to be needed to the smooth operation for the installed facility") _____
- **Expected date of loan disbursed:** _____
- **Expected implementation schedule:** (Expected Date of Commercial Operation of New facility / equipment must be specified): _____

2. Technical information of candidate end user

・Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No))

The list of EE/RE equipments

【Applicable technology】

	1	**Power Generation**	Yes	No
	1.1	- Soot Blower		
	1.2	- Variable Speed Clutch for IDF and FDF		
	1.3	- Improvement of Boiler and Turbine Efficiency		
	1.4	- High Efficiency Gas Turbine Technology		
	2	**Environmental Protection**		
	2.1	- Utilization of Waste Heat of Refuse Incineration		
	2.2	- Utilization of Waste Heat from Incineration of Industrial Waste		
	3	**Pulp and Paper**		
	3.1	- Utilization of Paper Sludge and Solid Waste		
	3.2	- Heat Recovery Equipment of Waste Combustion		
	3.3	- Waste Treatment of Paper Sludge and Utilization of Waste Heat from Paper Sludge Combustion		
	4	**Textile**		
	4.1	- Energy and Water Saving in Textile Dyeing and Finishing Industry		
	5	**Petroleum Refinery**		
	5.1	- FCC Power Recovery		
	5.2	- Flare gas and Hydrogen recovery from off-gas		
	6	**Petrochemicals**		
	6.1	- Energy Recovery from Waste Gas and Water in Acrylonitrile Plant		
	7	**Fertilizer**		
	7.1	- Waste Heat Recovery of Primary Reformer in Ammonia Plant		
	7.2	- Energy Conservation of Ammonia /Urea Fertilizer Plant		
	8	**Metal Industry**		
	8.1	- Energy Conservation of Electric Furnace in Ferro-Alloy Refining		

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)):** _____
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)):** _____
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%):** _____
- **Estimated Reduced GHG (t-CO2 / Y):** _____

Technical Appraisal Format

(Other Sectors / equipments outside of the Eligible List)

1. General information of applicants

- **Company name / factory name:** _____
- **Sector:** _____
- **Main Products:** _____
- **Location:** _____
  Viet Nam
- **Capacity of Production / year:** _____
- **Planning Project Profile** _____
- **Expected date of funding required:** _____
- **Contact person:** _____
- **Phone:** _____
- **e-mail:** _____
- **Phone:** _____
- **Entire amount of financial requirement (Project cost*) (mVND):**
  (Project cost shall be included “detailed design, CIF value, applicable tax and charge on installed facility, installation cost, trial and operation, and other services to be needed to the smooth operation for the installed facility”)_____
- **Expected date of loan disbursed:** _____
- **Expected implementation schedule:** (Expected Date of Commercial Operation of New facility / equipment must be specified):_____

2. Technical information of candidate end user

- **Applicable technology to be installed (Please identify specific technology and check the result of judgment on its eligibility by technical consultant (Eligible ("E") or No Eligible ("NE")),**

【The result of eligibility for of Applicable technology】

		Name of Sector	"E"	"NE"
		Specification of technology to be installed		
		- AAA equipment for energy saving		
		- BBB equipment for Renewable energy		

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)):** _____
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)):** _____
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%):** _____
- **Estimated Reduced GHG (t-CO2 / Y):** _____
-

NOTE: For the additional EE facility which is not included in the eligible EE&RE list, the EE equipment shall be listed by referring the list of Japanese Energy Saving Equipments for common usage.

Appendix 11: TECHNICAL APRAISAL RESULTS OF SELECTED PROJECTS

Technical Appraisal Format

(Cement)

1. General information of applicants

- **Company name / factory name: Thanh Cong Joint-Stock Production and Construction Material Company No.3**
- **Sector: Cement**
- **Main Products : Portland cement**
- **Location : Hiep Son Industrial Zone, Hiep Son Commune, Kinh Mon District, Hai Duong Province**
- **Capacity of Production / year : 1,000,000ton-cement(750,000ton-clinker)**
- **Planning Project Profile[5]: Refer to Attachment – 1.**
- **Expected date of funding required : as soon as possible**
- **Contact person : Le Van Dinh, Chairman－General Director**
- **Phone : 0320.389.5973**
- **e-mail: dinhxm@gmail.com**
- **Phone : Mobile: 090 555 1961**
- **Entire amount of financial requirement (Project cost*) (mVND) :**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, Installation cost, Trial and operation, and other services to be needed to the smooth operation for the installed facility")
  127,000 (Refer to Attachment – 2)

[5] "Planning Project Profile" must be specified following items;

- [General info of existing facility of factory(Specification (for kiln(type(dry or wet),diameter, length),SP heater(type(slcs, slci/ilc),AQC cooler (type(grate),Number of steps, Auxiliary of pre-heat equipment), Method of cooling(controlled flow, air beam),Condition of exhaust gas;(sp gas ,aqc gas(flow volume of gas(nm3/h),Utilizable gas flow volume, Gas temperature, Composition of gas (dust (g/nm3/h),N2,O2,H2O,dust), Contained water of material(Limestone, clay, slag, coal, silica),
- [Generating electricity capacity by utilizing waste energy],
- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

- **Expected date of loan disbursed: June 2011**
- **Expected implementation schedule** :(Expected Date of Commercial Operation of New facility / equipment must be specified): **December, 2012**

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)) : 527,250 (9,500,000) ＊1**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)) : 144,300 (2,600,000) ＊1**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%) : 27%**
- **Estimated Reduced GHG (t-CO2 / Y): 15,581 ＊2**

＊1

（1）Electricity Unit Rate (From Tariff Table of Electricity of Vietnam)

For Under 110kV: 921.25VND/kWh = 0.0555USD/kWh
(1USD=16,600VND)

Tariff Table of Electricity of Vietnam;
Normal Hour 870 VND/kWh
Peak Hour 1,755VND/kWh
Off-peak Hour 475 VND/kWh

From Monday to Saturday

Normal hours	Peak hours	Off peak hours
from 4 AM to 9.30 AM 11.30 AM to 5 PM 8 PM to 10 PM	from 9.30 AM to 11.30 AM 5 PM to 8 PM	8 PM to 4 AM

Sunday from4AM to 8PM No peak hours

（2）Calculation

Plant Availability : 300days(10m)（750,000t-cl/y /2,500t-cl/d=300day）

Unit Quantity of Electricity Consumption : 95kWh/t-cement(according to FSR)

Energy Consumption:
=95kWh/t-cement x 1,000,000t-cement/10m = 95,000,000kWh/10m
= 9,500,000 kWh/m

Improvement Rate of Energy Consumption:
= 2,600,000 / 9,500,000 x 100 = 27%

＊2

Estimated Displaced Electricity:
= 3.6MW x 24h x 30 d/m x 10 m/y = 26,000 MWh/y

Estimated Reduced GHG:
= 26,000 x 0.5993(*) = 15,581 t-CO2/y

Note (*) CDM PDD “15MW Hiep Son Coke Ovens Waste Heat Power Project Version: 1.0 Date: 10/10/2008, $EF_{grid,CM,y}$ = 0.5993 tCO2/MWh

Attachment – 1

Specification:

Kiln

Type	**Dry**
Diameter	**3.8 m**
Length	**50 m**

SP Heater

Type	**4 stages with calciner**

AQC Cooler

Type	**Grate type with 3 fans**
Number of Steps	**Not applicable**
Auxiliary of Pre-heater Equipment	**Not applicable**
Method of Cooling(control flow, air beam)	**Not applicable**

Condition of Exhaust Gas

SPH gas flow	**150,000 Nm^3/h**
SPH gas temperature	**350^oC**
SPH gas composition	
Dust content	**xxx g/Nm3**
N2	**xxx %**
O2	**xxx %**
H2O	**xxx %**
SPH boiler outlet	**250^oC**
AQC air flow	**65,500 Nm^3/h**
AQC air temperature	**350 ^oC**
AQC air composition	**not applicable**
AQC boiler outlet temperature	**100 ^oC**

Contained Water of Material **Not applicable**

Generating Electricity Capacity by utilizing Waste Energy

Installed Capacity (Rated)	**4.5 MW**
Gross Generated Electricity (at Generator Terminal)	**4.0 MW**
Net Generated Electricity	**3.6MW**

Floor Layout of Plant

Refer to the attached drawing.

Attachment – 2

Project Cost (Total Investment Cost)	**mVND**	**127,000**
Equipment	**mVND**	**105,000**
Imported equipment (incl. tax, duty & others)	mVND	95,000
Domestic purchasing equipment	mVND	10,000
Civil Works	**mVND**	**10,000**
Construction works incl. foundation, concrete.	mVND	5,000
Assembling equipment	mVND	5,000
Contingencies	**mVND**	**12,000**

Remarks: All other costs, fees and charges for such design, trial operation and other necessary works to complete EEC system for smooth operation are included in the above cost.

Check List of Sub-projects selection

The following first and second criteria are required in Sub-projects selection for the energy efficiency projects.

Name of Project: Thanh Cong Cement - Waste Heat Recovery Power Generation -

(First-tier criteria)

(1) Expected energy consumption effect is more than 20%, which means the energy consumption amount (toe/ per year) after the project completion is expected to reduce more than 20% compared to current situation, in order to provide demonstration effect for promoting energy efficient society in Vietnam.

Judgment: Yes

Comment: Approximately 27% electricity reduction is expected.

(2) The Sub-projects, categorized as the energy intensive industries (e.g. Steel, Cement, Food processing, Textile) are prioritized. The definition of the energy intensive in the Project is that the energy consumption of a factory is more than 1000toe per year, or 3,000,000 kWh per year.

Judgment: Yes

Comment: 45,000,000 kWh per year

(3) Sub-project is expected to install the appropriate technology, whose effect has been proven.

Judgment: Yes

Comment: More than 100 plants in the world. One plant in Vietnam

(4) The manufacturing and installation of the equipment of each Sub-project is completed in 2 years maximum from the start of sub-loan disbursement, in order to aim that the disbursement of the Project will be completed in 2012.

Judgment: Yes

Comment: December, 2012

(5) Sub-project has the result of energy audit, including expected GHG reduction amount (CO2/per year).

Judgment: Under preparation.

Comment: IE is preparing it.

(Second-tier criteria)

Eligible EE/RE Sub-project means the project which requires specific technology as listed on the list of the EE/RE equipment. (However, even it is not in the list and is in line with Vietnamese regulation, end-borrower can apply for the loan to the Project, if the Sub-project uses as cost-effective technology as is in the list.)

Judgment: Yes, eligible.

Comment: The technology of this project is listed on the list of EE equipment.

(Attention)

It must be noted that the well-balance of the Sub-projects should be considered in terms of the variety of region, industrial sector and enterprising body.

Judgment:

Comment:

Technical Appraisal Format
(Iron & Steel Sector)

1. General information of applicants

- **Company name / factory name: Hoa Phat Joint-Stock Energy Company**
- **Sector: Steel**
- **Main Products : Coal Cokes**
- **Location : Hiep Son Commune, Kinh Mon District, Hai Duong Province**
- **Capacity of Production / year : 700,000 tons**
- **Planning Project Profile[6]: Refer to Attachment – 1**
- **Expected date of funding required : as soon as possible**
- **Contact person : Do Hong Anh, Project Manager**
- **Phone : 03203.535 079(105) / 03203.838 729**
- **e-mail: dohonganh@hoaphat.com.vn**
- **Phone : (Mobile: 0903 200 663**
- **Entire amount of financial requirement (Project cost*) (mVND) :**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, Installation cost, Trial and operation, and other services to be needed to the smooth operation for the installed facility") **251,380 (Refer to Attachment – 2)**
- **Expected date of loan disbursed: XXXXXX**
- **Expected implementation schedule** :(Expected Date of Commercial Operation of New facility / equipment must be specified): **December, 2012**

[6] "Planning Project Profile" must be specified following items;
- [General info of existing facility of factory(Type of furnace, Mounting location of burner(pre-heating area, heating area, soaking area), Ability of heating, Type of used fuel, Amount of heat per unit used fuel(kcal / tons),Insert temperature of steel, Extraction temperature, Furnace temperature (pre-heating area, heating area, soaking area) ,Temperature of exhaust gas and combustion air)],
- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

2. Technical information of candidate end user

- **Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No)),**
-

The list of EE/RE equipments

【Applicable technology】

	1	Iron & Steel sector	Yes	No
	1.1	Coke oven: Dry quenching equipment(CDQ)		No
	1.2	Blast furnace : Hot stove waste heat recovery equipment		No
	1.3	Blast furnace : Top pressure recovery turbine generator(TRT)		No
	1.4	Pre-Heating Furnace: High Efficiency Combustion Control System		No
	1.5	Sintering Plant: Cooler waste heat recovery equipment		No
	1.6	Rolling mill : Steel billet & slab reheating furnace waste heat recovery equipment		No
	1.7	Steel-making plant Oxygen converter exhaust gas recovery equipment		No
	1.8	Rolling mill : Steel reheating & annealing furnace : High performance furnace with regenerative burner		No
	1.9	Coal Moisture Control		No
	1.10	Other technology(Please identify Waste Heat Recovery Power Generation using High Temperature Exhaust Fume from Coke Oven)	Yes	

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)) : 74,880 (1,440,000) ＊1**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)) : 486,720 (9,360,000) ＊2**
- **Improvement rate of energy consumption (*Improvement of energy**

consumption must be more than 20%) : Not applicable.

- **Estimated Reduced GHG (t-CO2 / Y): 54,584(1st year), 61,703(from 2nd year) ＊3**

＊1

To assume 2MW equivalent for Coal processing plant.
2MW x 24h x 30day/m = 1,440,000kWh/m

＊2

To calculated the remaining electricity after subtracting the in-house consumption 2MW in EEC System.
(15 – 2=13)MW x 24h x 30day/m = 9,360,000kW/m

＊3

Estimated Displaced Electricity:

For 1st year
= (13.5 – 2) MW x 24h x 30 d/m x 11 m/y = 91,080 MWh/y
From 2nd year
= (15 - 2) MW x 24h x 30 d/m x 11 m/y = 102,960 MWh/y

Estimated Reduced GHG:

For 1st year
= 91,080 x 0.5993 = 54,584 t-CO2/y
From 2nd year
= 102,960 x 0.5993(*) = 61,703 t-CO2/y

Note (*) CDM PDD "15MW Hiep Son Coke Ovens Waste Heat Power Project Version: 1.0 Date: 10/10/2008, $EF_{grid,CM,y}$ = 0.5993 tCO2/MWh

Attachment – 1

· General info of existing facility of factory

·

- **Type of furnace** — **Coke Oven**
- **Mounting location of burner** — **Not applicable**
  - ✧ **Pre-heating area**
  - ✧ **Heating area**
  - ✧ **Soaking area**

Ability of heating — **Not applicable**
Type of used fuel — **Not applicable**
Amount of heat per unit used fuel (kcal / tons) — **Not applicable**
Insert temperature of steel — **Not applicable**
Extraction temperature — **Not applicable**
Furnace temperature — **Not applicable**
Pre-heating area
Heating area
Soaking area
Temperature of exhaust gas and combustion air — **Not applicable**

The EEC system is a technology to produce electricity by recovering sensible heat of high temperature fume gathered from the coal processing plant of 40 x 2 coke ovens. The major equipment of the system consists of one steam turbine generator set, two waste heat recovery boilers, two de-sulfurization with electrostatic precipitator sets, one control and electric system and one concrete turbine house.

General Specifications are as below;

Fume Flow	**83,000 m^3/h**
Fume Temperature to Boiler	**950 – 1,050 ^oC**
Fume Temperature leaving Boiler	**180 – 200 ^oC**
Fume Composition	
Dust content	**30 mg/m^3**
SO2	**1,700mg/m^3**
N2	**70.7%**
CO2	**5.56%**
O2	**8%**
H2O	**15.6%**
Waste Heat Recovery Boiler	
Evaporation	**35t/h/boiler**
Steam temperature	**450^oC**
Steam pressure	**3.82MPa**

Steam Turbine Unit

Normal output	**15MW**
Steam inlet pressure	**3.43MP**
Steam inlet temperature	**435^{o}C**
Steam flow	**58t/h**
Exhaust steam pressure	**15KPa**
Revolving speed	**3,000rpm**

Generator

Normal capacity	**15MW**
Revolving speed	**3,000rpm**
Voltage	**6.3kV**
Frequency	**50Hz**
Output power factor	**0.8**
Cooling	**by water**

Production and Consumption Plan

- Providing for Coal Processing Plant: 2MW
- Self-using in EEC System 2MW
- Remaining 11MW will be sold to Hoa Phat Joint-Stock Steel Co. in Steel Producing Complex at Kinh Mon, Hai Duong
-In the 1st year, average electricity output is 75%, i.e., 13.5MW.
-From 2nd year, the out put will be 100%, i.e., 15MW.

Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified) Refer to the attached drawing.

Attachment – 2

The total investment estimated for the whole Coal Processing Plant – Stage II is VND 815 bill. In which the portion for generating electricity by using surplus temperature is VND 251 bill., detail as follows;

Order No.	Work Items	Cost Estimation
I	**Civil Works**	**63,402,748,189**
1	Concrete pile works 400x400	2,112,580,000
2	Building cool-tower	4,688,628,000
	-concrete piles 250 x 250mm	531,360,000
	-press concrete piles 250 x 250mm	116,640,000
3	Dust filter-compressor and desulfurize room	1,436,011,000
4	Water sample and qualitative room	203,760,000
5	Transmission line 6KV	4,500,000,000
6	Purchasing electrical test equipment	1,000,000,000
7	Purchasing and installing grill quicklime	1,500,000,000
8	Building turbine house	3,014,927,104
9	Foundation for turbine house	217,653,975
10	Infrastructure works	1,500,000,000
11	Foundation for ventilation device and shelf of chimney	436,868,000
12	Foundation for steam boiler equipment	1,542,318,110
13	Foundation for desulfurize equipment and ESP	1,743,331,000
14	Foundation for turbine, generator	2,310,772,000
15	Brackets for pipes in the factory	3,472,876,000
16	Foundation for additional equipment of main workshop	1,075,023,000
17	Assembling electric equipment, mechanical equipment for power plant	28,000,000,000
18	Fire alarm equipment	1,500,000,000

Order No.	Work Items	Cost Estimation
19	Main water pipe assembling for the whole factory	2,500,000,000
II	**Purchasing domestic material**	**2,500,000,000**
III	**Import equipment**	**177,242,567,329**
1	Main production line	163,549,800,000
2	Examination fee for import goods	179,904,780
3	Transport equipment for power plant	2,626,446,196
4	Insurance for transportation	152,000,000
5	Turnover tax of foreign contractor	1,977,591,356
6	VAT of foreign contractor	448,012,687
7	VAT of import goods	8,308,812.310
IV	**Profit**	**2,252,521,534**
V	**Contingencies**	**6,000,000,000**
	Total	**251,379,837,052**

Check List of Sub-projects selection

The following first and second criteria are required in Sub-projects selection for the energy efficiency projects.

Name of Project: Hoa Phat Energy

(First-tier criteria)

(5) Expected energy consumption effect is more than 20%, which means the energy consumption amount (toe/ per year) after the project completion is expected to reduce more than 20% compared to current situation, in order to provide demonstration effect for promoting energy efficient society in Vietnam.

Judgment: Not applicable.

Comment: 11MW among 15MW generated electricity will be sold to the adjacent Hoa Phat Joint Stock Steel Co.

The Sub-projects, categorized as the energy intensive industries (e.g. Steel, Cement, Food processing, Textile) are prioritized. The definition of the energy intensive in the Project is that the energy consumption of a factory is more than 1000 toe per year, or 3,000,000 kWh per year.

Judgment: Yes

Comment: 15,840,000 kWh per year

(6) Sub-project is expected to install the appropriate technology, whose effect has been proven.

Judgment: Yes

Comment: Several plants in USA, Europe, Brazil and China are in commercial operation. Stage-I of the same technology have been installed and ready for operation.

(7) The manufacturing and installation of the equipment of each Sub-project is completed in 2 years maximum from the start of sub-loan disbursement, in order to aim that the disbursement of the Project will be completed in 2012.

Judgment: Yes

Comment: December, 2012

(5) Sub-project has the result of energy audit, including expected GHG reduction amount (CO2/per year).

Judgment: EA is not ready because the Coal Processing Plant itself is a new one

and not operated yet.

Comment: CDM-PDD for the stage-I plant is under validation of DOE.

(Second-tier criteria)

Eligible EE/RE Sub-project means the project which requires specific technology as listed on the list of the EE/RE equipment. (However, even it is not in the list and is in line with Vietnamese regulation, end-borrower can apply for the loan to the Project, if the Sub-project uses as cost-effective technology as it's in the list.)

Judgment: Questionable as EE equipment, because of too big power generation (13MW) in comparison of the factory's consumption (2MW).

Comment: The technology of this project is not listed on the list of EE/RE equipment, because of rather new technology. The category of RE equipment may be applicable to this project.

(Attention)

It must be noted that the well-balance of the Sub-projects should be considered in terms of the variety of region, industrial sector and enterprising body.

Judgment:

Comment:

Technical Appraisal Format
(Food Processing)

1. General information of applicants

- **Company name / factory name: Bentre Sugar Joint Stock Company**
- **Sector: Sugar**
- **Main Products: Sugar**
- **Location : Thuuan Dien Hamlet, An Hiep Village, Chau Thanh Distrcit-Ben Tre Province**
- **Capacity of Production / year : 2,000 ton (sugar cane)/day or 22,000 – 28,000 tons/year (sugar)**
- **Planning Project Profile[7]: Install a 10 tons/hr boiler and a 1.5 MW Turbine/Generator unit, to generate power with use of excess bagasse from the sugar manufacturing process.**
- **Expected date of funding required: as soon as possible**
- **Contact person: Nguen Thanh Son, Chairman**
- **Phone: 075-866253**
- **e-mail: thanhsonbtre@yahoo.com**
- **Entire amount of financial requirement (Project cost*) (mVND) :**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, Installation cost, Trial and operation, and other services to be needed to the smooth operation for the installed facility") 18 billion (US$ 1 million)
- **Expected date of loan disbursed:**
- **Expected implementation schedule** :(Expected Date of Commercial Operation of New facility / equipment must be specified):
- **Expected date of loan disbursed:**

2. Technical information of candidate end user

- **Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No)),**

[7] "Planning Project Profile" must be specified following items;

- [General info of existing facility of factory(Capacity of preparation facility for brewing(kL/Brew),Capacity of ferment and reservation tank (kL x number of units),Capacity of filtration, Capacity of bottling, Canning system(bottle/h), Type of boiler (e.g. what fuel be used?(heavy oil ,coal….),Amount of used fuel (tons/h),Type of chiller systems (capacity of motor),Air compressor, Liquefied CO2 system, Electric generator, Treatment waste water system))
- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

The list of EE/RE equipments

【Applicable technology】

	1	Food processing sector		
	1.1	Vapor Re-Compression system		
	1.2	Energy efficient Chiller system(Cascade heat pump chiller, Dynamic ice heat system, Discharge Nh3 gas sensitive heat utilization system)		
	1.3	Heat pump boiler system		
	1.4	Reuse of waste biogas system		
	1.5	Optimization of sterilization system		
	1.6	Other technology(Please identify Refuse Incineration and Power Generation)	YES	

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)): 2.5 MW/h (all self generation with use of bagasse)**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month) : NA**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%) : NA**
- **Estimated Reduced GHG (t-CO2 / Y): 7,424**
- **Current facility list**

  Boiler: 25 tons/hr (25 kg/cm^{2}g) x 2 units

  Turbine/Generator: 1.5 MW/h x 2 units
- **Bagasse data**

  Daily generation: 500 tons/day (2,000 tons/day (cane) x 25%)

  Daily consumption: 400 tons/day

  Balance : 100 tons/day (currently stacked in open space around the factory for over 10 years)、which will be used up after the new boiler installation
- **Specification of new equipment:**

  Boiler: 10 tons/hr at 25 kg/cm^{2}g

  Turbine/Generator: 1.5 MW/ h

・Steam and electricity balance

	Current process requirement	Current net capacity	After the installation	Balance	Usage of excess capacity
Steam tons/hr	37.5	42 (21 x 2)	52	+4.5	To be sold*
Electricity MW/h	2.5	2.8	3.85-4.3	+1.35	To be sold*

***: Utility sale plan**

Utility	Expected buyer	Expected price
Steam	Adjacent plant	150,000 VND/ton
Electricity	Adjacent plant	700 VND/kWh

Check List of Sub-projects selection

The following first and second criteria are required in Sub-projects selection for the energy efficiency projects.

Name of Project: Ben Tre Sugar Project

(First-tier criteria)

(8) Expected energy consumption effect is more than 20%, which means the energy consumption amount (toe/ per year) after the project completion is expected to reduce more than 20% compared to current situation, in order to provide demonstration effect for promoting energy efficient society in Vietnam.

Judgment: Not Applicable.

Comment: This project is to construct a new Boiler and a Turbine/Generator unit to sell generated electricity and steam to adjacent factories, therefore, is not an energy-saving project.

(9) The Sub-projects, categorized as the energy intensive industries (e.g. Steel, Cement, Food processing, Textile) are prioritized. The definition of the energy intensive in the Project is that the energy consumption of a factory is more than 1000toe per year, or 3,000,000 kWh per year.

Judgment: Yes.

Comment: The annual electricity consumption is estimated at 7,650 MWh/year. (=2.5MW/h x 24 h x 30 days x 5 months* x 0.85)

*: The plant is operated usually for 5 months/year.

(10) Sub-project is expected to install the appropriate technology, whose effect has been proven.

Judgment: Yes.

Comment: The new Boiler and Turbine/Generator are expected to be purchased from the same supplier who supplied existing two sets of Boiler and Turbine/Generator unit around 10 years ago when the plant started operation. The technology to be introduced is basically the same as that of the current equipment.

(11) The manufacturing and installation of the equipment of each Sub-project is completed in 2 years maximum from the start of sub-loan disbursement, in order to aim that the disbursement of the Project will be completed in 2012.

Judgment: Yes

Comment:

(5) Sub-project has the result of energy audit, including expected GHG reduction amount (CO2/per year).

Judgment: Yes.

Comment: The audit was conducted and the reduction is estimated at 1,742 tons/year.

(Second-tier criteria)

Eligible EE/RE Sub-project means the project which requires specific technology as listed on the list of the EE/RE equipment. (However, even it is not in the list and is in line with Vietnamese regulation, end-borrower can apply for the loan to the Project, if the Sub-project uses as cost-effective technology as it's in the list.)

Judgment: Yes.

Comment: The technology incorporated in the project is listed as "Biomass power generation" of "The list of the RE."

(Attention)

It must be noted that the well-balance of the Sub-projects should be considered in terms of the variety of region, industrial sector and enterprising body.

Judgment: Yes.

Comment: The aim of the project is to use up excess bagasse unused and stacked in open space around the plant. Currently 75,000 tons of bagasse is generated per season (5 months/year), while only 60,600 tons is used as fuel. This means every year 14,400 tons of bagasse is leftover unused. With this project, it is expected to use up all the generated bagasse as fuel and also to prevent expansion of environment pollution issues around the plant.

It is anticipated that there would be many sugar plants, where excess bagasse are stacked unused. The project, therefore, can be a good demonstration to those plants.

Technical Appraisal Format

(Other Sectors in the Eligible list)

1. General information of applicants

- **Company name / factory name: Kontum Factory, Duc Nhan Corporation**
- **Sector: Wood Processing**
- **Main Products: Wood Furniture**
- **Location : Group 1, Ngo May Ward, Kontum City, Kontum Province, Vietnam**
- **Capacity of Production / year: 45 Containers/Month**
- **Planning Project Profile Construct a power plant with an install capacity of 30MW (6MW x 5 units), and generate power with use of biomass fuel of waste wood chips and sell most of generated electricity to a Grid**
- **Expected date of funding required : as soon as possible**
- **Contact person : Nguyen Thanh Nhon, Chairman**
- **Phone: +84 (0) 60 385 6004**
- **e-mail: nhon@ducnham.com**
- **Entire amount of financial requirement (Project cost*) (mVND) :**
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, installation cost, trial and operation, and other services to be needed to the smooth operation for the installed facility")**770 billion VND (US$ 41 million)**
- **Expected date of loan disbursed: Next March**
- **Expected implementation schedule:**(Expected Date of Commercial Operation of New facility / equipment must be specified):

2. Technical information of candidate end user

・Applicable technology to be installed (Please identify specific technology from the list of EE/RE equipments (YES or No)),

The list of EE/RE equipments

【Applicable technology】

	1	**Power Generation**		
		-Soot Blower	Yes	
		- Variable Speed Clutch for IDF and FDF		No
		- Improvement of Boiler and Turbine Efficiency		No
		- High Efficiency Gas Turbine Technology		No
	2	**Environmental Protection**		
		-Utilization of Waste Heat of Refuse Incineration		No
		-Utilization of Waste Heat from Incineration of Industrial Waste (Waste wood chip)	Yes	
	3	**Pulp and Paper**		
		- Utilization of Paper Sludge and Solid Waste		
		-Heat Recovery Equipment of Waste Combustion		
		- Waste Treatment of Paper Sludge and Utilization of Waste Heat from Paper Sludge Combustion		
	4	**Textile**		
		- Energy and Water Saving in Textile Dyeing and Finishing Industry		
	5	**Petroleum Refinery**		
		-FCC Power Recovery		
		-Flare gas and Hydrogen recovery from off-gas		
	6	**Petrochemicals**		
		- Energy Recovery from Waste Gas and Water in Acrylonitrile Plant		
	7	**Fertilizer**		
		- Waste Heat Recovery of Primary Reformer in Ammonia Plant		
		- Energy Conservation of Ammonia /Urea Fertilizer		

		Plant		
	8	**Metal Industry**		
		- Energy Conservation of Electric Furnace in Ferro-Alloy Refining		

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)) : US$ 6,700/month, or 1,000kW/h**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)) : NA**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 30%) : NA**
- **Estimated Reduced GHG (t-CO2 / Y): 105,840**
- **Equipment specifications:**
  Turbine/Generator: 6 MW x 5 units (China)
  Boiler: 55 Bar, 20.5t/h x 6 units, (China)
  Service Condenser: Air cools (China or Sweden)
- **Annual operation : 6,5000 hours/year**
- **Planned power generation: 195 GWh/year**
- **Estimated tariff: US$ 0.05/kWh**
- **Estimated amount of waste wood chip: 500,000 tons/year**
  (Includes in-house waste chip: 25,000 tons/year)
- **Total project cost: US$ 41,000,000**

Breakdown: Infrastructure* 11,600,000
Equipment 22,100,000
Project Management 500,000
Consulting/Eng. 2,100,000
Others 700,000
Contingency 4,000,000

Check List of Sub-projects selection

The following first and second criteria are required in Sub-projects selection for the energy efficiency projects.

Name of Project: Duc Nhan Wooden Project

(First-tier criteria)

(12) Expected energy consumption effect is more than 20%, which means the energy consumption amount (toe/ per year) after the project completion is expected to reduce more than 20% compared to current situation, in order to provide demonstration effect for promoting energy efficient society in Vietnam.

Judgment: Not Applicable

Comment: This project is to construct new Boilers and Turbine/Generator units to sell generated electricity to a Grid and, therefore, is not an energy-saving project.

(13) The Sub-projects, categorized as the energy intensive industries (e.g. Steel, Cement, Food processing, Textile) are prioritized. The definition of the energy intensive in the Project is that the energy consumption of a factory is more than 1000 toe per year, or 3,000,000 kWh per year.

Judgment: Not OK.

Comment: Though the electricity consumption of the plant is below 3,000 MWh, electricity generation by the project is estimated at 195GWh/year by a 30 MW/h power plant.

(14) Sub-project is expected to install the appropriate technology, whose effect has been proven.

Judgment: Yes.

Comment: The technology to be incorporated is conventional one and is a proven technology.

(15) The manufacturing and installation of the equipment of each Sub-project is completed in 2 years maximum from the start of sub-loan disbursement, in order to aim that the disbursement of the Project will be completed in 2012.

Judgment: Yes.

Comment:

(5) Sub-project has the result of energy audit, including expected GHG reduction amount (CO2/per year).

Judgment: Yes. 105,840 tons of CO_2 reductions are estimated.

Comment:

(Second-tier criteria)

Eligible EE/RE Sub-project means the project which requires specific technology as listed on the list of the EE/RE equipment. (However, even it is not in the list and is in line with Vietnamese regulation, end-borrower can apply for the loan to the Project, if the Sub-project uses as cost-effective technology as it's in the list.)

Judgment: Yes.

Comment: The technology incorporated in the project is listed as "Biomass power generation" of "The list of the RE."

(Attention)

It must be noted that the well-balance of the Sub-projects should be considered in terms of the variety of region, industrial sector and enterprising body.

Judgment: Yes.

Comment: The aim of the project is to construct a 30MW power plant beside the plant and all the generated electricity other than in-house use (1MW/h) will be sold to a Grid.

As the fuel for the Boilers, waste wooden chip is collected from Binh Duong Province in addition to in-house waste chip. Approx 1/3 of waste wooden chip generated in the Province is expected to be collected and used, which amounts to 500,000 tons/year.

Technical Appraisal Format
(Cement)

1. General information of applicants

- Company name / factory name: An Phuong Investment and Trading JSC/ Thai Nguyen Cement Factory
- Sector: Cement
- Main Products : Portland cement
- Location : Quangson Commune, Donghy District, Thai Nguyen Province
- Capacity of Production / year :
  1,400,000ton-cement/year(4,000ton-clinker/day)
- Planning Project Profile[8]: Refer to Attachment – 1.
- Expected date of funding required : as soon as possible
- Contact person : Dr. Nguyen Ba Phuong, Project Manager
- Phone : 0903434545; (04) 3 5537599
- e-mail: baphuongvcn@yahoo.com
- Phone :
- Entire amount of financial requirement (Project cost*) (mVND) :
  (Project cost shall be included "detailed design, CIF value, applicable tax and charge on installed facility, Installation cost, Trial and operation, and other services to be needed to the smooth operation for the installed facility") 152,624.
- Expected date of loan disbursed: June 1, 2010

[8] "Planning Project Profile" must be specified following items;

- [General info of existing facility of factory(Specification (for kiln(type(dry or wet),diameter, length),SP heater(type(slcs, slci/ilc),AQC cooler (type(grate),Number of steps, Auxiliary of pre-heat equipment), Method of cooling(controlled flow, air beam),Condition of exhaust gas;(sp gas ,aqc gas(flow volume of gas(nm3/h),Utilizable gas flow volume, Gas temperature, Composition of gas (dust (g/nm3/h),N2,O2,H2O,dust), Contained water of material(Limestone, clay, slag, coal, silica),
- [Generating electricity capacity by utilizing waste energy],
- [Floor layout of the plant (Margin of space for replacement of facility to be introduced must be specified)

- **Expected implementation schedule** :(Expected Date of Commercial Operation of New facility / equipment must be specified): **December, 2012**

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)) : 416,250 (7,500,000) ＊1**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)) : 104,895 (1,890,000) ＊1**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%) : 25.2% ＊1**
- **Estimated Reduced GHG (t-CO2 / Y): 13,592 ＊2**

＊1

（1） Electricity Unit Quantity tariff table of Electricity of Vietnam

For Under 110kV: 921.25VND/kWh = 0.0555USD/kWh

(1USD=16,600VND)

According to Tariff Table of Electricity of Vietnam

Normal Hour 870

Peak Hour 1,755

Off-peak Hour 475

From Monday to Saturday

Normal hours	Peak hours	Off peak hours
From 4 AM to 9.30 AM	from 9.30 AM to 11.30 AM	8 PM to 4 AM
11.30 AM to 5 PM	5 PM to 8 PM	8 PM to 10 PM

（2） Electricity Consumption and Estimated Reduced Energy

Plant Availability : 300days x 90% = 270days(according to FSR)

Electricity Consumption:

= 90,000,000 kWh/12m (according to FSR)

= 7,500,000kWh/m

Estimated Reduced Energy:

= 3.500kW x 24h x 300 days x 90% /12m

= 1,890,000kWh/m

Improvement Rate of Energy Consumption:

= 1,890,000 / 7,500,000 x 100

= 25.2%

＊2

Estimated Displaced Electricity:

= 3.500kW x 24h x 300 d/y x 90% = 22,680 MWh/y

Estimated Reduced GHG:

= 22,680 x 0.5993(*) = 13,592 t-CO2/y

Note (*) CDM PDD "15MW Hiep Son Coke Ovens Waste Heat Power Project Version: 1.0 Date: 10/10/2008, $EF_{grid,CM,y}$ = 0.5993 tCO2/MWh

Attachment – 1

Specification:

Kiln	
Type	Dry
Diameter	4.5 m
Length	70 m
SP Heater	
Type	5 stages with calciner
AQC Cooler	
Type	Coolax Grate Cooler with 10 fans
Number of Steps	Not applicable
Auxiliary of Pre-heater Equipment	Not applicable
Method of Cooling (control flow, air beam)	Not applicable
Condition of Exhaust Gas	
SPH gas flow	307,865 Nm^3/h
SPH gas temperature	350°C
SPH gas composition	
Dust content	41 g/Nm3
N2	62.9 %
O2	3.5 %
H2O	6.0 %
SPH heat exchanger outlet	230°C
AQC air flow	122,188 Nm^3/h
AQC air temperature	255 °C
AQC air composition	

Dust content	13 g/Nm3
N2	77.6 %
O2	20.4 %
H2O	2.0 %
AQC heat exchanger outlet temperature	90 °C

Contained Water of Material Not applicable

Generating Electricity Capacity by utilizing Waste Energy

Installed Capacity (*at Terminal*)	5 MW
Average Generated Electricity (*Net*)	3.5 MW

Floor Layout of Plant

To be submit later on.

Check List of Sub-projects selection

The following first and second criteria are required in Sub-projects selection for the energy efficiency projects.

Name of Project: Thai Nguyen Cement

(First-tier criteria)

(16) Expected energy consumption effect is more than 20%, which means the energy consumption amount (toe/ per year) after the project completion is expected to reduce more than 20% compared to current situation, in order to provide demonstration effect for promoting energy efficient society in Vietnam.

Judgment: Yes

Comment: Approximately 25%

The Sub-projects, categorized as the energy intensive industries (e.g. Steel, Cement, Food processing, Textile) are prioritized. The definition of the energy intensive in the Project is that the energy consumption of a factory is more than 1000 toe per year, or 3,000,000 kWh per year.

Judgment: Yes

Comment: 90,000,000 kWh per year

(17) Sub-project is expected to install the appropriate technology, whose effect has been proven.

Judgment: Yes

Comment: The sub-project is to install an organic Rankine cycle which is a new technology though there are several plants in operation and quietly different from the conventional water-steam Rankine cycle. Special pre-caution might be required for actual application.

(18) The manufacturing and installation of the equipment of each Sub-project is completed in 2 years maximum from the start of sub-loan disbursement, in order to aim that the disbursement of the Project will be completed in 2012.

Judgment: Yes

Comment: December, 2012

(19) Sub-project has the result of energy audit, including expected GHG reduction amount (CO2/per year).

Judgment: Not available.

Comment: EA is not ready because the Cement Plant itself is a new one and not operated yet.

(Second-tier criteria)

Eligible EE/RE Sub-project means the project which requires specific technology as listed on the list of the EE/RE equipment. (However, even it is not in the list and is in line with Vietnamese regulation, end-borrower can apply for the loan to the Project, if the Sub-project uses as cost-effective technology as it's in the list.)

Judgment: Yes, eligible.

Comment: The technology of this project is listed on the list of EE equipment.

(Attention)

It must be noted that the well-balance of the Sub-projects should be considered in terms of the variety of region, industrial sector and enterprising body.

Judgment:

Comment:

Technical Appraisal Format
(Other Sectors / equipments outside of the Eligible list)
(Shipbuilding)

1. General information of applicants

- **Company name / factory name: Nam Trieu Shipbuilding Corporation**
- **Sector: Machinery & Metal**
- **Main Products : New transportation and oil storage, Retrofitting ship, Mechanical products**
- **Location : Tam Hung, Thuy Nguyen, Hai Phong, Viet Nam.**
- **Capacity of Production / year : 16 ship/year (up to 70,000 ton)**
- **Planning Project Profile investing energy saving equipment and systems (Replacing plated line, inverter, retrofit the air pressure system….)**
- **Expected date of funding required : in 2010**
- **Contact person : Nguyen Van Toan, Vice General Director**
- **Phone : +84-31-3775533**
- **e-mail: nguyentoan@nasico.com.vn**
- **Phone :**
- **Entire amount of financial requirement (Project cost*) (mVND) :**
  (Project cost shall be included “detailed design, CIF value, applicable tax and charge on installed facility, Installation cost, Trial and operation, and other services to be needed to the smooth operation for the installed facility”) FSR is not yet, Total amount by EA: 27,117 Mil. VND
- **Expected date of loan disbursed: in 2010**
- **Expected implementation schedule** :(Expected Date of Commercial Operation of New facility / equipment must be specified):

2. Technical information of candidate end user

・Applicable technology to be installed (Please identify specific technology and check the result of judgment on its eligibility by technical consultant (Eligible (“E”) or No Eligible (“ NE”)),

【The result of eligibility for of Applicable technology】

	1.	**Shipbuilding sector**	“E”	“NE”
	1.1	-Inverter (VVVF Controller)	E	
	1.2	-High Efficiency Motor		NE
	1.3	-High Efficiency Transformer	E	
	1.4	-High Efficiency Lighting System	E	
	1.5	-Capacitor	E	
	1.6	-High Efficiency Boiler		NE
	1.7	-Steam drain recovery		NE
		Other Energy Efficiency Measures (Proposed by Energy Auditor)		
		-Energy saving model	E	
		- Pipeline improvement and leak management	E	
		- Add a pressure receiver in workshops, construction area	E	
		- Install the second line for circuit at transformer station	E	
		- Install the Power boss for DC Welding machine	E	
		- Replace zinc line 6m by 12m line		NE

- **Current energy consumption by existing facilities(US$/per Month (kWh/per Month)) : XXXXXXX toe/year (By IE)**
- **Estimated Reduced Energy Consumption by installing new EE facilities/equipments(US$/per Month (kWh/per Month)) : 1,002 toe/year**
- **Improvement rate of energy consumption (*Improvement of energy consumption must be more than 20%) : XXXXX(By IE)**
- **Estimated Reduced GHG (t-CO2 / Y): 2,500**

Appendix 12: AWARENESS CAMPAIGN

Appendix 12-1: AGENDA FOR SEMINARS

Agenda for seminars
JICA-VDB two-step loan program

- Date: **Friday, Jan 8th, 2010 in Hanoi** and **Tuesday, Jan 12nd , 2010 in HCM City**
- Venue: **Melia Hotel, Hanoi, Rex Hotel in HCM city**
- Participant: Government/international agencies, EE Centers, consulting firms, enterprises and media. .

Agenda for seminar in Ho Chi Minh City

Venue: Thang Long Ballroom, Melia Hotel, 44 Ly Thuong Kiet st, Hanoi, Vietnam

08:00	**Registration**
08:30	**Opening remark**
	Mr. Nguyen Chi Trang, Deputy General Director, Vietnam Development Bank (VDB)
	Mr. Murooka Naomichi, JICA representative
08:40	**Draft law on Energy conservation and Energy use**
	Mr. Dang Hai Dung, Energy Conservation Country office, MOIT
09:10	**Credit program for Energy efficiency & Conservation and Renewable energy**
	Nguyen Hoang Trung, Vice Director of Foreign Capital Management Dept, VDB
09:30	**Industrial energy efficiency and CDM in Vietnam**
	Mr. Tran Manh Hung, Institute of Energy
10:10	Tea break
10:30	**Appraisal process for investment loan**
	Mr. Nguyen Dinh Thanh, Vice Director of Appraisal Dept, VDB
11:00	**Energy Environment Profit Program**
	Mr. Daniel Loh, Regional Sales Manager, TLV Pte Ltd
11:15	**Total life cycle and solution for Energy Saving in typical industries**
	Mr. Do Thanh Thang, Account Manager, Schneider Electric co.,
11:30	**Q&A with discussions**
	Chaired by speakers
11:50	**Summary & Conclusion**
	Nguyen Hoang Trung, Vice Director of Foreign Capital Management Dept, VDB
12:15	**End of workshop**
12:30	Buffet lunch
14:00	**Free technical consultations**

Venue: Sunflower Ballroom, Rex Hotel, 141 Nguyen Hue st, District 1,
Hochiminh city

08:00	**Registration**
08:30	**Opening remark**
	Mr. Nguyen Chi Trang, Deputy General Director, Vietnam Development Bank (VDB)
	Mr. Murooka Naomichi, JICA representative
08:40	**Draft law on Energy conservation and Energy use**
	Mr. Tran Manh Hung, Institute of Energy, Ministry of Industry and Trade
09:10	**Credit program for Energy efficiency & Conservation and Renewable energy**
	Nguyen Hoang Trung, Vice Director of Foreign Capital Management Dept, VDB
09:30	**Current status of energy consumption and some popular energy saving measures in industry sector**
	Mr. Huynh Kim Tuoc, Director of Energy Conservation center HCM city
10:10	Tea break
10:30	**Appraisal process for investment loan**
	Mr. Nguyen Dinh Thanh, Vice Director of Appraisal Dept, VDB
11:00	**Energy Environment Profit Program**
	Mr. Daniel Loh, Regional Sales Manager, TLV Pte Ltd
11:15	**Total life cycle and solution for Energy Saving in typical industries**
	Mr. Vu Phu Huu, Product Application Engineer, Schneider Electric co.,
11:30	**Q&A with discussions**
	Chaired by speakers
11:50	**Summary & Conclusion**
	Nguyen Hoang Trung, Vice Director of Foreign Capital Management Dept, VDB
12:15	**End of workshop**
12:30	Buffet lunch

14:00 Free technical consultations

Appendix 12-2 List of Organization/Agency participants at Hanoi seminar

No	Agency	Name	Position
1	Agence Francaise de Developpement	Alain Henry	Directeur Vietnam
2	TLV Pre Ltd	Daniel Loh	Regional Sale Manager
3	Asian Development Bank	Edvard Baardsen	Senior Infrastructure Specialist
4	Schneider Electric co.,	Do Thanh Thang	Engineer
5	New Energy and Industrial Technology Development Organization	HIRONORI KAWAMURA	Director of Asian Representative Office
6	New Energy and Industrial Technology Development Organization	DUONG PHUOC HUNG	Consultant, NEDO Hanoi Liaison Office
7	Japan International Cooperation Agency Vietnam Office	Murooka Naomichi	Representative
8	Japan International Cooperation Agency Vietnam Office	Nguyễn Thị Thu Hương	Senior Program Officer
9	SAPI expert	Yoshiyuki OBA	Expert
10	SAPI expert	Moritaka KATO,	Expert
11	SAPI expert	Toshiaki TAKEDA	Expert
12	SAPI expert	Yukio FUJII	Expert
13	PESME headoffice	Nguyễn Bá Vinh	Director
14	PESME headoffice	Phạm Thị Nga	Expert
15	Independent Adviser	Nguyễn Kinh Luân	Adviser
16	Electricity Regulatory Authority of Vietnam	Dương Mạnh Cường	Expert
17	Vietnam Enviroment Protection Fund	Lê Đức Tuấn	
18	Economic news	Kiều Nga	Reporter
19	Vinashin Business Group	Lê Minh Đức	Assistant Director
20	Vinashin Business Group	Ngô Đức Dũng	Officer
21	Vinashin Business Group	Nguyễn Thanh Tùng	Officer
22	Vietnam Paper General Company	Trần ngọc Hưng	Deputy Director
23	Energy Conservation Center Hanoi	Hoàng Lâm	Expert
24	Energy Conservation Center Hanoi	Hoàng Quân	Expert
25	Energy Conservation Center Hai Phong	Bao Quang Quynh	Expert

No	Agency	Name	Position
26	Energy Conservation Center Phu Tho	Nguyễn Ngọc Mộng Quân	Expert
27	Energy Conservation Center Phu Tho	Nguyễn Chí Anh Đức	Expert
28	Energy Conservation Country Office, MOIT	Đặng Hải Dũng	Expert
29	Institute of Energy	Trần Mạnh Hùng	
30	Institute of Energy	Đinh thị Thanh Lan	Researcher
31	Institute of Energy	Nguyễn Đức Song	Researcher
32	Institute of Energy	Trần Xuân Chi Hương	Researcher
33	Institute of Energy	Nguyễn Hoàng Anh	Researcher
34	Institute of Energy	Nguyễn Văn Thông	Interpreter
35	Institute of Energy		Interpreter
36	Vietnam Development Bank	Nguyễn Chí Trang	Deputy Director
37	Vietnam Development Bank	Nguyễn Hoàng Trung	Vice Director
38	Vietnam Development Bank	Nguyễn Đình Thành	Vice Director
39	Vietnam Development Bank	Nguyễn Thúy Hà	Coordinator
40	Vietnam Development Bank	Bùi thị Hiền Thư	Officer
41	Vietnam Development Bank	Trần Việt Hải	Officer
42	Vietnam Development Bank	Hoàng thị Thu Hằng	Officer
43	Vietnam Development Bank	Đặng thị Huyền	Officer
44	Vietnam Development Bank	Vũ thị Mai Hương	Officer
45	Vietnam Development Bank - Hà Nam Branch	Nguyeễn Trung Dũng	Deputy head
46	Vietnam Development Bank - Hà Nam Branch	Phạm đức Thuận	Officer
47	Vietnam Development Bank - Hải Dương Branch	Phạm kì Sơn	Officer
48	Vietnam Development Bank - Hải Dương Branch	Nguyễn Văn Chương	Officer
49	Vietnam Development Bank - Hải Phòng Branch	Nguyễn Việt Anh	
50	Vietnam Development Bank - Hải Phòng Branch	Nguyễn Đình Thi	
51	Vietnam Development Bank - Ninh Bình Branch	Nghiêm Quang Trung	
52	Vietnam Development Bank - Ninh Bình Branch	Hoàng Duy	
53	Vietnam Development	Ngô Quốc Hội	

No	Agency	Name	Position
	Bank - Thái Nguyên Branch		
54	Vietnam Development Bank - Vĩnh Phúc Branch	Nguyễn Văn Thư	
55	Vietnam Development Bank - Vĩnh Phúc Branch	Nguyễn Mạnh Bắc	
56	VCTV caple	Nguyễn Minh Sơn	Reporter
57	VCTV caple	Nguyễn Tường Sinh	Reporter
58	VCTV caple	Nguyễn Quang Huy	Reporter
59	Invest TV	Nguyễn Quang Huy	Reporter
60	Ba ria Vung tau Newspaper	Nguyễn Việt	Reporter
61	VTC 8	Minh Tiến	Reporter
62	VTC 9	Thu Hoài	Reporter
63	Industry Mazagine	Phạm Hương Giang	Reporter
64	Vietnam Television	Đặng Mai	Reporter
65	Vietnam Television	Hoàng Linh	Reporter
66	Vietnam Television	Văn Tú	Reporter
67	Debt administration and oversea finance bureau, MOF	Đỗ Thanh Thủy	Expert
68	Vietnam News Agency	Trần Ngọc Quỳnh	Reporter

Appendix 12-3 List of industrial participants at Hanoi seminar

No	Company	Participant	Position	Address
1	Hanoi-Kim Bai beer co.,	Tạ Thị Vịnh	Technical officer	40 thị trấn Kim Bài huyện Thanh Oai, Hà Nội
2	Hanoi Beer co.,	Phạm Trung Kiên	Head of technical dept.,	183 Hoàng Hoa Thám
3	Dai Mo rubber co.,	Nguyễn Bá Hưng		Đại Mỗ, Từ Liêm
4	Sao Vang rubber.,	Vũ Huy Dũng		231 Nguyễn Trãi
5	Ngo Gia Tu mechanical co.,	Nguyễn Quang Vinh	Deputy Director	16 Phan Chu trinh, Hoàn Kiếm
6	10/10 Textile co.,	Nguyễn Mạnh Thắng		9/253 Minh Khai - Hai Bà Trưng
7	Hanoi textile co.,	Trần Hai Trang		Xuân Đỉnh
8	Dong Xuan textile co.,	Trần Đại Nghĩa		524 Minh Khai, quận Hai Bà Trưng, Hà Nội
9	Y Viet textile co.,			A02-N30, Huyền quang,TP Bắc Ninh
10	Thong Nhat motor co.,	Trần Mạnh Hùng		164 Nguyễn Đức Cảnh, quận Hoàng Mai, Hà nội
11	Pha Rung shipbuilding co.,	Trần Quý Côi	Deputy Director	Minh Đức, Huyện Thủy Nguyên
12	Ben Kien shipbuilding co.,	Phạm Minh Tuấn	General Director	
13	Ben Kien shipbuilding co.,	Cao Văn Trí	Head of mantenance dept.,	
14	Thuong Dinh Shoe co.,	Nguyễn Chiến Thắng		277 Nguyễn Trãi – Thanh Xuân – Hà Nội
15	Tay Do paper co.,	Phạm Bá Thảo		Liên cơ - Đại mỗ - Từ liêm
16	Truc Bach paper co.,	Trần Văn Ổn		128 Thụy Khê, Tây Hồ
17	Bat Trang ceramic co.,	Lê Đức Trọng		Xóm 2, Bát Tràng, Gia Lâm, Hà nội
18	Son Ha mechanical co.,	Lê Hoàng Hà	Excutive Deputy Director	Lô số 2, CN1 - Khu CN vừa và nhỏ Minh Khai, Từ Liêm, Hà nội

No	Company	Participant	Position	Address
19	Chien Trang Garment co.,	Lê Bá Long		22 Thành Công, Ba Đình
20	Garment 10 co.,	Lê Báo Hào		Sài Đồng, Long Biên, Hà nội
21	19/5 Garment co.,	Trần Trọng Thủy		203 Nguyễn Huy Tưởng
22	Hung Long garment co.,	Nguyễn Mạnh Thắng		Mỹ Hào
23	Hoa Phat energy co.,	Đỗ Hồng Ánh		Tầng 10, Tòa nhà Hòa Phát, 34 Đại Cồ Việt, Hai Bà Trưng, Hà nội
24	Hoa Phat energy co.,	Nguyễn Thị Thủy		
25	Tia sang batterry co.,	Trần Thu Hoài		Tôn Đức Thắng, Hải Phòng
26	Vinamilk	Nguyễn Thiện Bút		Dương Xá, Gia Lâm
27	Thanh Long paper	Lê Văn Lượng	Assistan Director	Thanh Long, Yên Mỹ
28	Vinausteel	Nguyễn Quốc Hiền		Quán Toan, Hồng Bàng
29	Duc Giang chemical co	Nguyễn Mạnh Kim		18/44 Đức Giang, Long Biên
30	An Phuong investment and trade co.,	Nguyễn Bá Phương		P107-A13 Thanh Xuân Bắc, Thanh Xuân, Hà nội
31	An Phuong investment and trade co.,	Nguyễn Thị Hoa		
32	Phu Tho cement co.,	Triệu Quang Thuận	General Director	Thị trấn Thanh Ba, Huyện Thanh Ba, Phú Thọ
33	Binh Son cement co.,	Nguyễn Công Hòa		Phường Ba Đình, thị xã Bỉm Sơn, tỉnh Thanh Hóa
34	But Son cement co.,	Nguyễn Huy QUẾ		Xã Thanh Sơn - Huyện Kim Bảng - Tỉnh Hà Nam
35	Hoang Mai cement co.,	Nguyễn Công Hoàng	Deputy Director	Thị trấn Hoàng Mai - Huyện Quỳnh Lưu - Tỉnh Nghệ An
36	Tam Diep cement co.,	Phạm Văn Phương	Header	Số 27, đường Chi Lăng, xã

No	Company	Participant	Position	Address
				Quang sơn - Thị xã Tam Điệp - tỉnh Ninh Bình
37	Thanh Cong cement co.,	Bùi Quang Vĩnh		Cụm Công nghiệp tây Ngô Quyền, TP Hải Dương
38	Hanoi alcohol co.,	Hồ Việt Hưng		
39	Hanoi biologicals co.,	Nguyễn Đức Toàn		
40	Thong Nhat salt co.,	Nguyễn Cảnh Toàn		
41	ITOCHU Corporation	Phan Huyen Trang		
42	ITOCHU Corporation	Ryutaro Mashiko		
43	Mitsui Engineering & Shipbuilding Co., Ltd.	Koichi Takahara		
44	Sumitomo Corp	Yoichi MATSUBARA		
45	Sumitomo Corp	Soichiro KUNIHIRO		
46	Mitsubishi Corp	TOMO HIRAYAMA		

Appendix12- 4 List of Organization/ agency participants at HCM city seminar

No	Organization/Company EN	Contact person	Position	Address
1	Consulate General of Japan in HCMC	Mr. Kikuchi Tadashi	Economic Attache	
2	International Finance Corporation-World Bank	Ms. Nguyễn Thục Quyên		21- 23 Đường Nguyễn thị Minh Khai, Q1, TP HCM
3	TLV Pre Ltd.,	Mr. Daniel Loh	Regional Sale Manager	
4	Schneider Electric Vietnam Ltd	Mr. Đỗ Mạnh Dũng	Team leader	P 2.10, Tầng 2, Tòa nhà E-Town, 364 Đường Cộng hòa, Tân Bình, TP HCM
5	Schneider Electric Vietnam Ltd	Mr. Vũ Phú Hữu	Engineer	P 2.10, Tầng 2, Tòa nhà E-Town, 364 Đường Cộng hòa, Tân Bình, TP HCM
6	Schneider Electric Vietnam Ltd	Lê Quý Nam	Team leader	P 2.10, Tầng 2, Tòa nhà E-Town, 364 Đường Cộng hòa, Tân Bình, TP HCM
7	JICA Liaison in HCMc	Mr. Nakajima Yukio	Head of JICA HCMc Liaison Office	P905 Tòa nhà Riverside Office Center, 2A-4A Tôn Đức Thắng, Q1, TP HCM
8	Bình Dương Industry –Trade department	Nguyễn Văn Quang		
9	Đồng Nai Industry –Trade department	Trần Minh Đạt		Số 2 Nguyễn Văn Trị, Biên Hoà, Đồng Nai
10	Đồng Nai Science and Technology department	PHẠM GIA HẢI	Director	
11	Đồng Nai Science and Technology department	LÊ PHÁT HIỂN	Deputy Director	
12	Đồng Nai Science and Technology department	TRẦN CHÂU LỘC	Deputy Director	
13	Đồng Nai Science and Technology department	ĐẶNG BÁ MẠNH	Vice Director	
14	Cần Thơ Industry –Trade department	DƯƠNG NGHĨA HIỆP	Deputy Director	
15	Cần Thơ Industry –Trade department	NGÔ NGỌC NHÂN	Deputy Director	
16	Cần Thơ Industry –Trade department	TRẦN QUỐC HƯNG	Deputy Director	

No	Organization/Company EN	Contact person	Position	Address
17	Cần Thơ Industry –Trade department	VÕ QUỐC HÙNG	Vice Director	
18	Tiền Giang Industry –Trade department	ĐỖ VĂN PHƯỚC	Deputy Director	
19	Tiền Giang Industry –Trade department	PHẠM LÝ NGÂN	Officer	
20	Đồng Tháp Industry –Trade department	LÊ HỮU DƯ	Deputy Director	
21	Đồng Tháp Industry –Trade department	NGUYỄN VĂN LUẬN		
22	Đồng Tháp Industry –Trade department	MAI VĂN ĐỐI	Deputy Director	
23	The center for application of science-Technology of Binh Duong province	Trần Đình Hợp	Deputy Director	số 26 Huỳnh Văn Nghệ, phường Phú Lợi, thị xã Thủ Dầu Một, tỉnh Bình Dương
24	The center for application of science-Technology of Binh Duong province	Vũ Tiến Sỹ	Deputy Director	số 26 Huỳnh Văn Nghệ, phường Phú Lợi, thị xã Thủ Dầu Một, tỉnh Bình Dương
25	The center for application of science-Technology of Binh Duong province	Ngô huy Hoàng	Expert	
26	The center for application of science-Technology of Binh Duong province	Phạm Ngân	Expert	
27	Energy Conservation Research and Development Center (Enerteam)	Ms. Vu Thu Giang	Deputy Director	274 Điện Biên Phủ, Q3, TP HCM
28	Energy Conservation Research and Development Center (Enerteam)	Lê Văn Biền	Expert	275 Điện Biên Phủ, Q3, TP HCM
29	The Energy Conservation Center, HCMC-VN	Mr. Huỳnh Kim Tước	Director	244 Điện Biên Phủ, Quận 3, TPHCM
30	The Energy Conservation Center, HCMC-VN	Nguyễn Thanh Toàn	Expert	245 Điện Biên Phủ, Quận 3, TPHCM
31	The Energy Conservation Center, HCMC-VN	Nguyễn Mạnh Tuân	Expert	246 Điện Biên Phủ, Quận 3, TPHCM
32	Vietnam Development Bank - Hậu Giang Branch	Lê văn Lâm		
33	Vietnam Development Bank - Hậu Giang Branch	Hoàng Anh Khoa		
34	Vietnam Development Bank - Bến Tre Branch	Lê văn Bảo		

No	Organization/Company EN	Contact person	Position	Address
35	Vietnam Development Bank - Bến Tre Branch	Trần Hoàng yến		
36	Vietnam Development Bank - Bình Dương Branch	Phạm Thành Gương		
37	Vietnam Development Bank - Bình Dương Branch	Nguyễn Thanh Phước		
38	Vietnam Development Bank - Transaction department No 2	Thân Thanh Thanh		
39	Vietnam Development Bank - Transaction department No 2	Lê thị Đinh Hương		
40	Institute of Energy	Tran Manh Hung	Head of dept.,	
41	Institute of Energy	Nguyen Hoang Anh	Researcher	
42	Institute of Energy	Vu Ha Giang	Researcher	
43	SAPI Expert	Mr. Yoshiyuki OBA	Expert	
44	SAPI Expert	Mr. Moritaka KATO,	Expert	
45	SAPI Expert	Mr.Toshiaki TAKEDA	Expert	
46	SAPI Expert	Mr.Yukio FUJII	Expert	
47	Japan International Cooperation Agency Vietnam Office	Mr.Murooka Naomichi	Representative	
48	Japan International Cooperation Agency Vietnam Office	Ms. Nguyễn Thị Thu Hương	Senior Program Officer	
49	Vietnam Chamber of Commerce and Industry	Nguyễn Đức Bình	Director	
50	Saigon Times	Mr. Trương Tấn Đức	Reporter	Số 35 Nam Kỳ Khởi Nghĩa, Quận 1, TP HCM
51	Saigon Times	Dương Phạm Thái Hằng	Reporter	Số 35 Nam Kỳ Khởi Nghĩa, Quận 1, TP HCM
52	Vietnam News (English Language only)	Phạm Hoàng Nam	Reporter	120 Nguyễn Thị Minh Khai, TP HCM
53	Vietnam Investment Review	Trần Văn Hải	Reporter	178 Nguyễn Đình Chiểu, Quận 3. Tp HCM
54	Labor and Society Magazine	Phương Mai	Reporter	
55	Interpreter	Hoang Thien Kim		
56	Interpreter	Vo Khanh Nha		

No	Organization/Company EN	Contact person	Position	Address
57	Animex	Do Hong Trang	Interpreter	

Appendix 12-5 List of industrial participants at HCM city seminar

No	Company EN	Contact Name	Position	Address
1	OPV Pharmaceutical JSC	Hoàng ĐÌnh Giáp		Số 27 đường 3A - KCN Biên hoà 2, Đồng Nai
2	A Dong Paint JSC	Ms. Thu		1387 Bến Bình Đông, P15, Q8, TP HCM
3	Sai Gon Battery Enterprise	Nguyễn Minh lâm	Director	KCN Tân Tạo, Bình Tân, TP HCM
4	Binh Hoa electronics co.,	Lai Thành Lộc	Technical Head	204 Nơ Trang Long, F.12, Q. Bình Thạnh, TP.HCM
5	Thong Nhat Milk Factory	Nguyễn Trường Tộ		12 Đặng văn Bi, Q.Thủ Đức, TP HCM
6	Binh An Wheat Flour JSC	Trần Văn Hanh		2623 Phạm Thế Hiển, P.7, Q 8, TP HCM
7	Khanh Hoi Tobacco Factory	Hoàng Kỳ Loan		Lô 26 đường 3 KCN Tân Tạo, Bình tân, TP HCM
8	Dielac Milk Factory	Trần Minh Chân	Technical Director	Đường số 1, KCN Biên Hoà 1, Đồng Nai
9	Trung Son Food JSC	Vũ Tiến Thành		18A Ngô Văn Năm, P.Bến Nghé, Q1, TP HCM
10	Ben Thanh Tobacco Factory	Mạnh Toán		KCN Tân Tạo, Bình Tân, TP HCM
11	Vietnam Food JSC	Thái Mạnh Phát	Deputy General Director	913 Trường Chinh, Tân Thanh, Tân Phú, TP HCM
12	Tan Binh Cooking Oil Company	Nguyễn Thị Cầm Sa	Engineer	889 Trường Chinh, Tân Thanh, Tân Phú, TP HCM
13	Cau Tre Aquiculture Export Company	Bùi Tiến Dũng	Head of Technical Department	125/208 Lương Thế Vinh, Tân Thời, Tân Phú, TP HCM
14	Sai Gon Milk Factory	Lê Xuân Ngọ		Khu CN Tân Hiệp Thời, Quận 12, TP HCM
15	Can Tho Sugar Cane JSC	Nguyễn Thành Long	President	1284 Trần Hưng Đạo, Quốc lộ 61, Khu vực I, Phường 7,Thị xã Vị Thanh, Tỉnh Hậu Giang
16	AVA Food Industries Co., Ltd.	Trương Khắc Yến		Lô 13 KCN Hòa Phước, Long Thành, Đồng Nai

No	Company EN	Contact Name	Position	Address
17	AVA Food Industries Co., Ltd.	Phạm Mỹ Hưng		Lô 13, KCN Tam Phước, Long Thành, Đồng Nai
18	Sai gon beer co.,	Nguyễn Văn Hùng		187 Nguyễn Chí Thanh, phường 12, Quận 5, TP.HCM
19	Sai Gon seafood co.,	Trần Mạnh Hảo		Lô 4-6-8, Đường 1A, KCN Tân Tạo, Q. Bình Tân, TP.HCM
20	Hai Thanh Co.,	Nguyễn Hoài Nhân		79C Đông Hồ, P.8, Q.Tân Bình, Tp.HCM
21	Ben tre sugar co.,	Nguyễn Thanh Sơn	President	Ấp Thuận Điển, Xã An Hiệp, Châu Thành, Bến Tre
22	Vinh Hue Paper JSC	Nguyễn Mạnh Thắng		66/5 Quốc lộ 1k, P.Linh Xuân, Q.Thủ Đức, TP HCM
23	Linh Xuan Paper JSC	Trần Hải Thành		34 Đường 9, Khu 5, P.Linh Xuân, Q.Thủ Đức, TP HCM
24	Tan Mai Paper JSC	Mr. Mạnh		KP1 Phường Thống Nhất, TP Biên Hoà, Đồng Nai
25	Tan Mai Paper JSC	Nguyễn Văn Tuấn	Officer	KP1 Phường Thống Nhất, TP Biên Hoà, Đồng Nai
26	Tan Thanh Paper Manufacturing Factory	Nguyễn Khánh Sinh		288 Hòa Bình, Q6, TP HCM
27	Tan Thanh Paper Manufacturing Factory	La Hoài Thu		288 Hòa Bình, Q6, TP HCM
28	Vinh Hue Paper JSC	Nguyễn Vấn Toan		66/5 Quốc lộ 1k, Phường Linh Xuân, Quận Thủ Đức, TP Hồ Chí Minh, Việt Nam
29	An Binh Paper co.,	La Hoàng Trung		27/5A Kha Vạn Cân -An Bình -DA, Bình Dương
30	Binh Loi Rubber Factory	Lê Đại Thành		2/3 Kha Vạn cân, P.Hiệp Bình Chánh, Q. Thủ đức, TP HCM
31	Dong Nai Rubber Company	Nguyễn Thị Hoàng Yến		Xã Xuân Lập, thị xã Long Khánh, Đồng Nai
32	Hoc Mon Rubber Company	Trần Văn Hòa		87/1, Tân Thời Hiệp, Quận 12, TP HCM
33	Thu Duc Steel JSC	Vũ Đại Nghĩa		km 9, xa lộ Hà Nội,

No	Company EN	Contact Name	Position	Address
				P. Trường Thọ, Q.Thủ đức, TP HCM
34	Nha Be Steel Factory	Đoàn Hảo Thắng		25 Nguyễn Văn Quy, Phú Nhuận, Quận 7
35	Thinh Phat Real Estate and Electric Cable JSC	Bùi Phước Hòa	Assitant Director	144 Hồ Ngọc Lãm, Bình Tân, HCM
36	Vietnam Electric Cable JSC	Dương Liễu Mai Khanh	Finnacial director	70-72, Nam kỳ Khởi Nghĩa, Quận 1, HCM
37	Southern Mechanical and Metallurgy Company	Vũ Văn Hiến	Deputy General Director	Đường số 2, KCN Biên Hòa 1, Đồng Nai
38	Kim Chung Mechanical Company	Trịnh thị hồng Châu	General Director	217 Lê Văn Chí, Linh Trung, Thủ Đức, Tp Hồ Chí Minh
39	Binh An textile & Garment material co.,	Phạm Trần Côn		Khu phố 1 P. Linh Trung, Thủ Đức, TP HCM
40	The Hoa Textile Co., Ltd.	Hoàng Văn Tảo		Phước Tân, Long Thành, Đồng Nai
41	Thai Tuan Textile JSC	Phạm Văn Phong	Technical Director	B38, 39, 40/II, Đường 5, KCN Vĩnh Lộc, Bình Tân, TP HCM
42	Thang Loi Textile JSC	Trần La Thắng		2 Trường Chinh, Tây Thanh, Tân Phú
43	Millinium Textile JSC	Phạm Mạnh Hải	Technical Officer	KCN Củ Chi, Củ Chi, TP HCM
44	X28 Textile Company (Agtex)	Lý Tuấn Anh		3 Nguyễn Oanh,P10, Gò Vấp, TP HCM
45	Savimex wood plant	Nguyễn Huynh Tấn Hùng	Head of Technical Department	162 Đường HT17, Phường Hiệp Thành, Quận 12, Tp. HCM.
46	Đức Nhân Sai gon co.,	Nguyễn thị Bích Uyên	Assitant Director	117-119 Phan Xích Long, Phường 7, Phú Nhuận, TP HCM
47	Casumina Binh Duong	Phan Đình Bình	Technical engineer	Kp 4TT Uyên Hưng huyện Tân Uyên , Bình Dương
48	Eco fuel co.,	Nguyễn Lê thiếu Lăng	General Director	
49	Eco fuel co.,	Nguyễn Ngọc Nhất	Deputy General Director	
50	Tứ Linh Limited co.,	Trần Anh Tứ	Deputy General Director	

No	Company EN	Contact Name	Position	Address
51	Tan Binh co.,	Dương Nguyễn Cường	Engineer	
52	Tan Binh co.,	Vũ Thúy Hữu		
53	TAISEI Corporation, Vietnam office	Mr. Ikuo MATSUDA		
54	Saigon Sky Garden Co.,Ltd	Mr. Akisue Yoshiro	General Director	
55	Saigon Sky Garden Co.,Ltd	Hoàng Sự	Deputy General Director	
56	Saigon Sky Garden Co.,Ltd	Mr. Hoang Su	Deputy General Director	
57	Saigon Sky Garden Co.,Ltd	Mr. Trần Khắc Trung	Head of Technical Department	
58	Mitsui & Co. Vietnam Ltd.	Mr. Le Quoc Thanh	Infrastructure Projects Dept, Ho Chi Minh Head Office Dept	
59	Sumitomo Corp. Vietnam LLC	Mr. Atsushi SAWADA	General Manager Power Project	
60	Hitachi Plant Technologies, Ltd.	Mr. Dan OGURA		
61	Itochu corp.,	Mr. Yutaka Minemura		

Appendix 12-6 Brochure of Two Step Loan

Goals

- To promote projects related to technology and equipment renovation in energy efficiency and conservation (EE & C) as well as renewable energy through long-term, low-interest rate loans.
- To raise awareness of the profitability of EE & C investments.
- To establish a specific investment segment for EE & C and renewable energy

Two Step Loan Program

- Implementation period: 3 years (from 2010 to 2013)
- Total fund: 40 million USD, of which 30 million UDS for Energy saving programs, 10 million USD for renewable energy projects
- Eligible area: all provinces in Vietnam

Stakeholders

- JICA: ODA sponsor, providing concessional loans and technical assistance
- VDB: implementing agency in charge of the ODA on-lending; the bank bears the credit risk as well as cooperates with JICA on the implementation of technical assistance projects.
- MOIT, IE, EEC–Hanoi and HCMC (members of EEREP Advisory Committee): Local consultant in charge of sector management, technical review, project consultation, supervision and technical assistance.
- Investors (including ESCOs).

Terms and Conditions

- Amount: maximal 85% of total investment cost; minimum Appx. 1 million USD
- maturity: maximum 20 years,
- grace period: maximum 5 years
- Currency: VND or USD
- Interest rate: maximum at State Investment Credit Rate (6.9%/ year in VND, 5.4%/ year in USD as of January 2010)
- Collateral: In principle, the assets formed from loan can be pledged as collateral; but if VDB recognizes the necessity, other assets of project owner will have to be pledged as additional collateral. (Maximum 15% of total project cost will be covered by the additional collateral.)
- VDB support project owner 50 % of consultant cost for preparation of feasibility report (The repayment of 50 % of the F/S cost will be made by VDB, when VDB disburses the applied loan.)

Credit Program for EE&C and Renewable Energy Promotion (EEREP)

Contact address:

- Foreign Capital Management Department, VDB.
  25 A Cát Linh, Hà Nội.
  Tel: 04 3 7365659, ext. 3456, 6336.
- Branches of VDB in provinces.

www.vdb.gov.vn

Criteria for Selection of Projects

- General criteria:
  - Project is able to payback loans according to the approved credit conditions
  - Project implementation time is not excessive 2 years (from 2010)

- For energy saving projects:
  - Saving 20% of annual energy consumption
  - Giving priority to designed industrial enterprises (annual energy consumption over 3 million kWh or 1000 TOE) belonged to sub sector steel, cement, food processing, textile… (TOE: Ton of Oil Equivalent)
  - Implementation period: within 2 years (since 2010)
  - Enterprises have energy audit report

- For renewable energy development projects:
  - Small hydropower (30 MW under)
  - Wind power;
  - Solar power;
  - Geothermal;
  - Bio mass

Procedure for Loan Getting

- Application form for loan:
  - **Enterprise record:**
    - Legal documents of enterprise;
    - The latest audited financial statement;
    - Credit relation report…
  - **Project documents:**
    - Feasibility report and attached documents;
    - Energy audit report (for energy saving projects)

- Procedures for approving loan:
  - Branch of VDB accept application forms, doing review step 1.
  - VDB (Main headquarter) review step 2:
    - The appraisal committee appraises effectiveness of the projects;
    - State budget management board appraises financial capability of the Project owner;
    - President of VDB issues decision on agreement on or rejection of loan.

Loan Release

- Process of loan release :
  - Project owner will submit documents for payments to the branch of VDB for controlling expenses.
  - Branch of VDB requests VDB (Headquarter) for making payment for the projects.
  - VDB (Headquarter) makes payments in accordance with the procedures of internal electronic payment system of VDB.

- Application for drawing money :
  - Documents submitted at one time:
    - F/S report, documents for selection of contractor economic contracts, decisions of approval…
  - Documents submitted each time:
    - Vouchers, receipts, invoices, money transfer documents…

Typical EE&C Project

- Coke dry quenching
- Waste heat recovery power generation from cement kiln exhaust gas
- Improvement of boiler and turbine efficiency for power generation
- Utilization of waste heat of refuse incineration
- Energy and water saving in textile dyeing and finishing industry
- Renovation to increase efficient energy use of brewery factory

Appendix 12-7 Construction of Web page

Draft idea for web page on VDB Scheme introduction
(Design and layout is to be made by Dan Phong Software Solutions)

INTRODUCTION OF THE PROJECT ON ENERGY EFFICIENCY AND RENEWWABLE ENERGY PROMOTING

- Credit Program for EE&C and Renewable Energy (EEREP) (VDB) *1
- Appraisal Process of Investment Credit Loan (VDB)
- Draft Law on Energy Conservation and Effective Energy Use (MOIT)
- Industrial Energy Efficiency and Clean Development Mechanism (IE)
- Current Status of Energy Consumption and Some Popular Energy Saving Measures in Industry Sector (ECC-HCM)
- Energy Environment Profit Program (TLV)
- Total life cycle and solutions for Energy Saving in typical enterprises (Schneider Electric)

*Contents of the above are submitted by SAPI team by PDF format or MS Power Point format.
*Contents are to be linked (uploaded to VDB server), and viewers can download the documents. (Same contents for Vietnamese and English)

*1 Note seminar documents, but compact introduction pamphlet.

Appendix 13 : Other Energy Efficiency Parameters

Appendix 13-1 Standard and Target Waste Gas Temperature for Boilers

Category		Load Ratio (%)	Standard Waste Gas Temperature (deg. C)					Target Waste Gas Temperature (deg. C)				
			Solid Fuel		Liquid Fuel	Gas Fuel	BFG and Other By-product Gas	Solid Fuel		Liquid Fuel	Gas Fuel	BFG and Other By-product Gas
			Fixed Bed Combustion	Fluidized Bed Combustion				Fixed Bed Combustion	Fluidized Bed Combustion			
Utility Boiler (*1)		75 - 100	- (150)(*4)	-	145	110	200	- (140)(*4)	-	135	110	190
General Industrial Boiler (*2)	30t/h≦Evap.	50 - 100	200 (200)(*4)	200	200	170	200	180 (160)(*4)	170	160	140	190
	10t/h≦Evap.<30t/h	50 - 100	250 (200)(*4)	200	200	170	-	180 (160)(*4)	170	160	140	-
	5t/h≦Evap.<10t/h	50 - 100	-	-	250	200	-	-	300	180	160	-
	Evap.<5t/h	50 - 100	-	-	250	220	-	-	320	200	180	-
Small Once-through Boiler(*3)		100	-	-	250	220	-	-	-	200	180	-

Source : March 31,2009 METI "Judgment standards for business owners on the rational use of energy at factories"

(*1) Boilers for public utility power stations.
(*2)(*3) Small boilers defined by other specifications are to be excluded.
(*4) For a pulverized coal combustion

<Remarks>
1: The waste gas temperatures shown in these table are to be those measured at the outlet of boiler or the outlet of flue gas treatment equipment during 100% full boiler load operation (100% steam turbine load in case of electricity power generating plant) at 20 degree C air temperature at boiler draft fan suction after periodical maintenance and inspection.
2: For the boiler which a black liquor is used, the target waste gas temperature is to be 180 degree C..
3: The waste gas temperatures in these tables are not to be applied to the following boilers.
(1) The boilers modified for fuel conversion after once putting into commercial operation.
(2) The boilers to burn composite fuel with wood chips, wood skins, sludge and other industrial wastes.
(3) The boilers to burn wasted tires.
(4) The boilers to use other heat flux than water.
(5) The boilers to burn out a poisonous gas.
(6) The boilers to recover waste heat.
(7) The boilers under periodical inspection, unstable operation or research and experimental purposes.

Appendix 13-2 Standard and Target Air Ratio for Furnaces

Category	Standard Air Ratio				Target Air Ratio				Remarks
	Type of Furnace				Type of Furnace				
	Gas Fuel		Liquid Fuel		Gas Fuel		Liquid Fuel		
	Continuous Type	Intermittent Type	Continuous Type	Intermittent Type	Continuous Type	Intermittent Type	Continuous Type	Intermittent Type	
Smelting Furnace for Metal Casting	1.25	1.35	1.3	1.4	1.05 – 1.20	1.05 – 1.25	1.05 – 1.25	1.05 – 1.30	
Continuous Heating Furnace for Steel Ingot	1.2	–	1.25	–	1.05 – 1.15	–	1.05 – 1.20	–	
Other Metal Heating Furnaces	1.25	1.35	1.25	1.35	1.05 – 1.20	1.05 – 1.30	1.05 – 1.20	1.05 – 1.30	
Metal Heat Treatment Furnaces	1.2	1.25	1.25	1.3	1.05 – 1.15	1.05 – 1.25	1.05 – 1.20	1.05 – 1.30	
Petroleum Oil Heating Furnace	1.2	–	1.25	–	1.05 – 1.20	–	1.05 – 1.25	–	
Thermal Cracking Furnace and Reformer	1.2	–	1.25	–	1.05 – 1.20	–	1.05 – 1.25	–	
Cement Calcining Kiln	1.3	–	1.3	–	1.05 – 1.25	–	1.05 – 1.25	–	Apply same air ration for liquid fuel in case of pulverized coal firing.
Lime Stone Calcining Furnace	1.3	1.35	1.3	1.35	1.05 – 1.25	1.05 – 1.35	1.05 – 1.25	1.05 – 1.35	Ditto
Drying Furnace	1.25	1.45	1.3	1.5	1.05 – 1.25	1.05 – 1.45	1.05 – 1.30	1.05 – 1.5	Only around burner.

Source : March 31,2009 METI "Judgment standards for business owners on the rational use of energy at factories"

<Remarks>

1. The target air ratios are to be those measured at a furnace outlet on the rated load combustion after completion of periodical maintenance and inspection.
2. In case BF gas and other byproduct gas are used, the air ratio for liquid fuel is to be applied.
3. The air ratio shown in this table is no to be applied to the following furnaces;
   (1) The furnaces to burn solid fuels except a pulverized coal.
   (2) The furnaces of which the rated capacity by the burner combustion capacity is below 20liter/h.
   (3) The furnaces which require an oxidation or deoxidation combustion reaction.
   (4) The furnaces which any dilution air is required for keeping heat pattern and/or maintaining furnace temperature.
   (5) The furnace to burn a lower heat byproduct gas of 3,800kJ/Nm3 and below.
   (6) The furnaces under periodical inspection, unstable operation or research and experimental purposes.
   (7) The furnaces which require dilution air to avoid any damage of furnace materials due to high temperature.
   (8) The furnaces to burn combustible wasted materials.

Appendix 13-3 Standard and Target Rates of Waste Heat Recovery for Industrial Furnaces

Waste Gas Temperature (℃) (*1)	Heat Capacity (*2)	Standard Waste Heat Recovery Rate (%)	Target Waste Heat Recovery Rate (%)	(Reference) Waste Gas Temperature (℃)	(Reference) Pre-heated Air Temperature (℃)
Below 500	A, B	25	35	275	190
500 and above, below 600	A, B	25	35	335	230
600 and above, below 700	A	35	40	365	305
	B	30	35	400	270
	C	25	30	435	230
700 and above, below 800	A	35	40	420	350
	B	30	35	460	310
	C	25	30	505	265
800 and above , below 900	A	40	45	435	440
	B	30	40	480	395
	C	25	35	525	345
900 and above, below 1,000	A	45	55	385	595
	B	35	45	485	490
	C	30	40	535	440
1,000 and above	A	45	55	–	–
	B	35	45		
	C	30	40		

Source : March 31,2009 METI "Judgment standards for business owners on the rational use of energy at factories"

(*1) The waste gas temperatures are to be those measured at a furnace outlet or recuperator inlet.
(*2) The furnace heat capacities A, B and C are as below;
A: The rated capacity is 84,000MJ/h and above.
B: The rated capacity is 21,000MJ/h and above and below 84,000MJ/h
C: The rated capacity is 840MJ/h and above and below 21,000MJ/h.

<Remarks>

1. The target waste heat recovery rates show the recovery rate of latent heat of waste gas exhausted from the furnace at the furnace rated load operation.
2. The target waste heat recovery rates shown in this table are not to be applied to the following furnaces.
   (1) The furnaces of which the rated capacity is below 840MJ/h.
   (2) The furnaces which require an oxidation or deoxidation combustion reaction.
   (3) The furnace to burn a lower heat byproduct gas of 3,800kJ/Nm3 and below.
   (4) The furnaces under periodical inspection, unstable operation or research and experimental purposes.
3. The referenced waste gas temperatures and pre-heated air temperatures are those calculated under the conditions shown below;
   (1) The radiation heat loss from the heat exchanger is to be 5%.
   (2) The fuel is to be liquid fuel equivalent to heavy oil.
   (3) Atmosphere temperature is to be 20 ℃.
   (4) The combustion air ratio is to be 1: 2.

Appendix 13-4 Standard and Target Furnace Wall Outer Surface Temperatures

Furnace Temperature (oC)	Standard Furnace Wall Outer Surface Temperature (oC)			Target Furnace Wall Outer Surface Temperature (oC)		
	Roof	Side Wall	Bottom exposed to Atomosphare	Roof	Side Wall	Bottom exposed to Atomosphare
1,300 and above	140	120	180	120	110	160
1,100 and above, below 1,300	125	110	145	110	100	135
900 and above, below 1,100	110	95	120	100	90	110
Below 900	90	80	100	80	70	90

Source : March 31,2009 METI "Judgment standards for business owners on the rational use of energy at factories"

<Remarks>

1. The furnace wall outer surface temperatures in this table are to be the average temperature of the surfaces at the rated furnace operation under atmosphere temperature 20 degree C..
2. The furnace wall outer surface temperatures in this table are not to be applied to the following furnaces;
   (1) The furnaces of which the rated capacity by the burner combustion capacity is below 20liter/h.
   (2) The furnaces which are the type of forced cooling down.
   (3) Rotary kiln.
   (4) The furnaces for research and experimental purposes or prototype.

Appendix 13-5 Standard and Target Value of Power Factor

Standard

The standard value of power factor at the power receiving end is 95 % or more.

Target

The standard value of power factor at the power receiving end is 98 % or more
and it is applied to the equipment listed below and electric power substation facilities.

Cage-type induction motor	More than 75
Coil-Type induction motor	More than 100
Induction furnace	More than 50
Vacuum melting furnace	More than 50
Induction heater	More than 50
Arc furnace	-
Flush but welder (excluding portable type)	More than 10
Arc welder (excluding portable type)	More than 10
Rectifier	More than 10,000

Source : March 31,2009 METI "Judgment standards for business owners on the rational use of energy at factories"

Appendix 13-6 Target Efficiencies of High Efficiency Motors (50Hz)

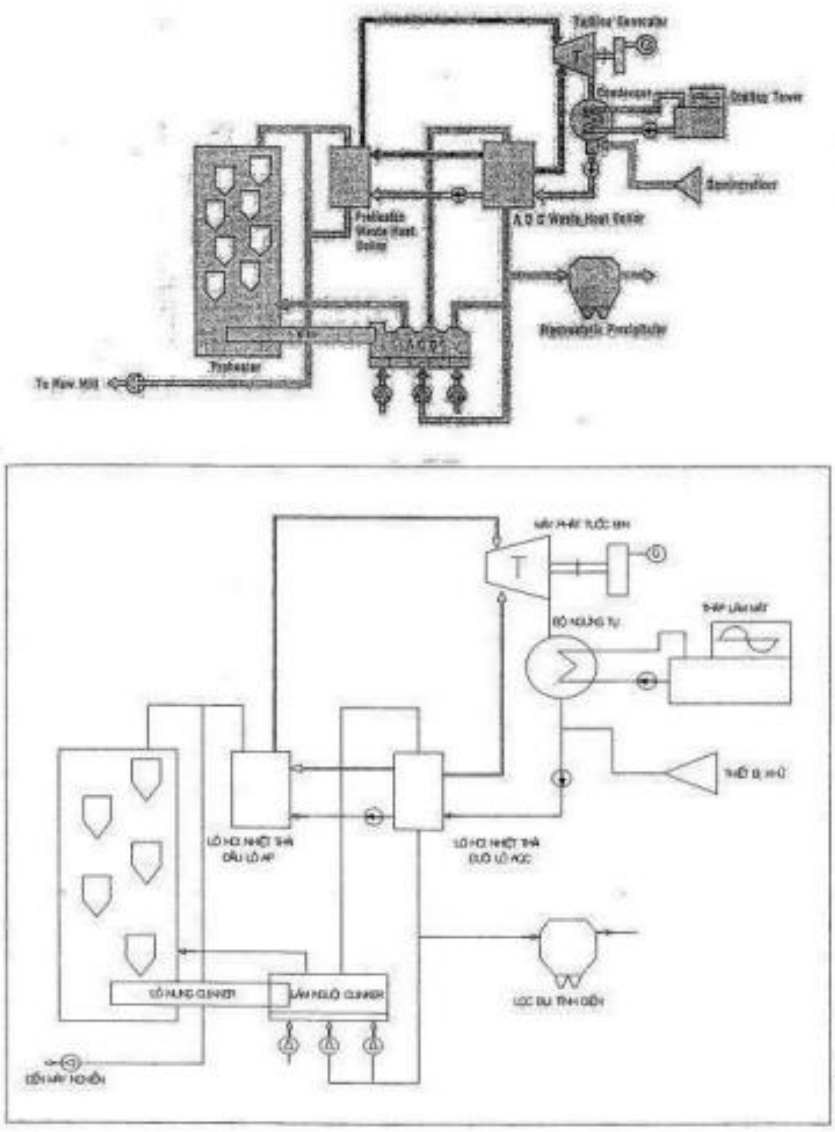
Output	High Efficiency Total Enclosed Type Motors Target Efficiency Value (%)			High Efficiency Protect Type Motors Target Efficiency Value (%)		
	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole
	200V or 400V	200V or 400V	200V or 400V	200V or 400V	200V or 400V	200V or 400V
0.2	70.0	72.0	–	–	–	–
0.4	76.0	76.0	73.0	–	–	–
0.8	77.5	80.5	78.5	–	–	–
1.5	83.0	82.5	83.0	83.0	82.0	82.0
2.2	84.5	85.5	84.5	83.0	85.0	84.0
3.7	87.0	86.0	86.0	85.0	86.0	85.5
5.5	88.0	88.5	88.0	87.0	87.5	87.0
7.5	88.5	88.5	88.5	88.0	88.5	88.0
11.0	90.0	90.2	89.5	89.0	90.0	89.0
15.0	90.0	90.6	89.5	89.5	90.2	89.5
18.5	90.6	91.7	91.0	90.6	90.6	90.6
22.0	91.0	91.7	91.0	90.6	91.4	91.0
30.0	91.4	92.4	91.7	91.0	91.7	91.4
37.0	92.1	92.4	91.7	91.4	92.1	91.7
45.0	92.4	92.7	92.4	91.7	92.1	92.1
55.0	92.7	93.3	93.3	92.1	92.4	92.4
75.0	92.7	94.1	93.6	92.4	92.7	92.4
90.0	94.3	94.1	93.9	92.7	93.0	92.7
110.0	94.3	94.1	94.5	93.0	93.3	93.0
132.0	94.8	95.0	94.5	93.3	93.3	93.3
160.0	94.8	95.8	94.5	93.9	93.6	93.6

Source : March 31,2009 METI "Judgment standards for business owners on the rational use of energy at factories"

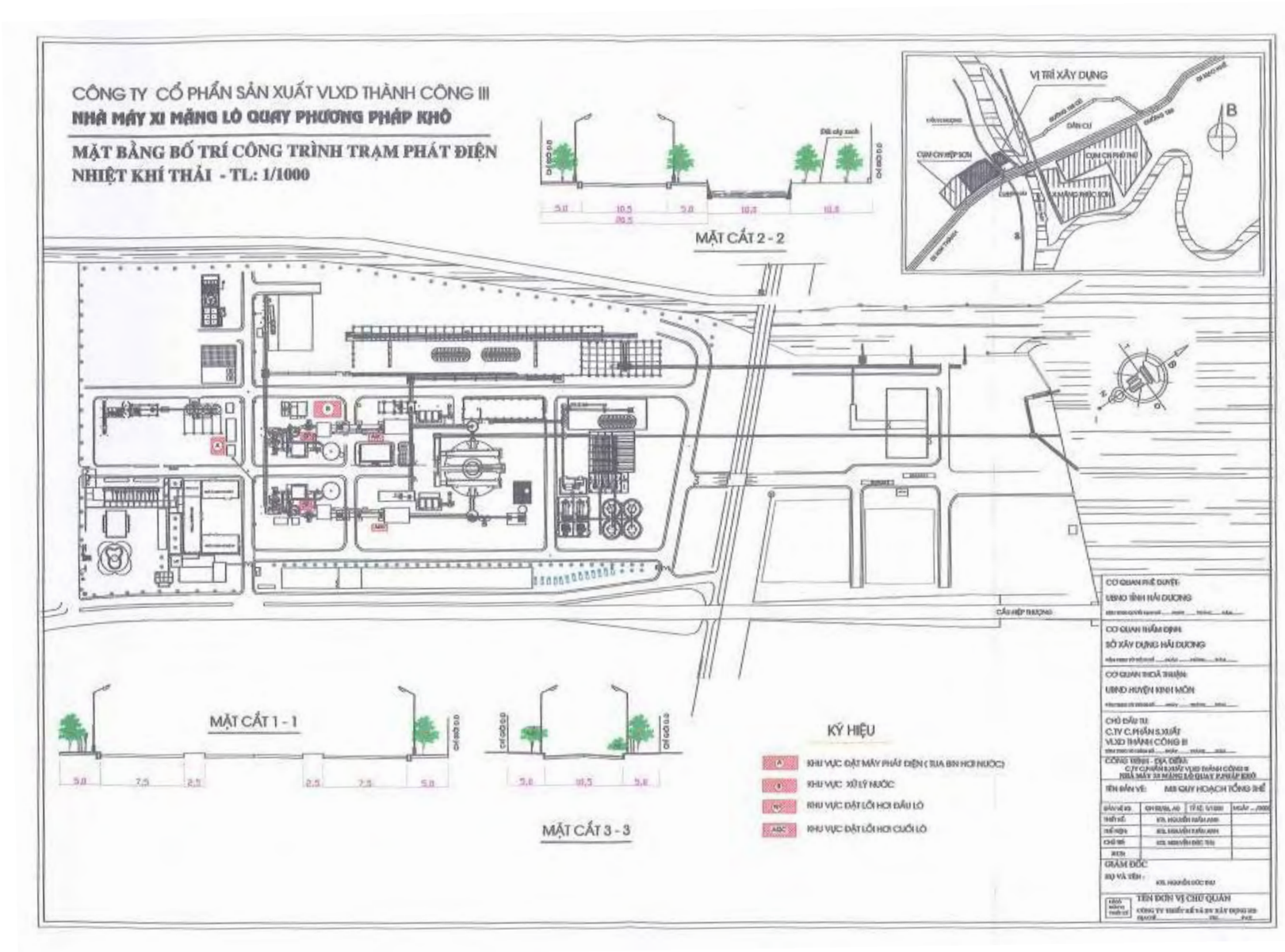
Note: Efficiency values shall be measured per the procedure in Section 7.3 -"Efficiency Test" of JIS C 4212 by applying the tolerance values provided in its Section 4.2-"Application Tolerances".

Appendix 14:Flow Sheet and Plot plan of sub projects

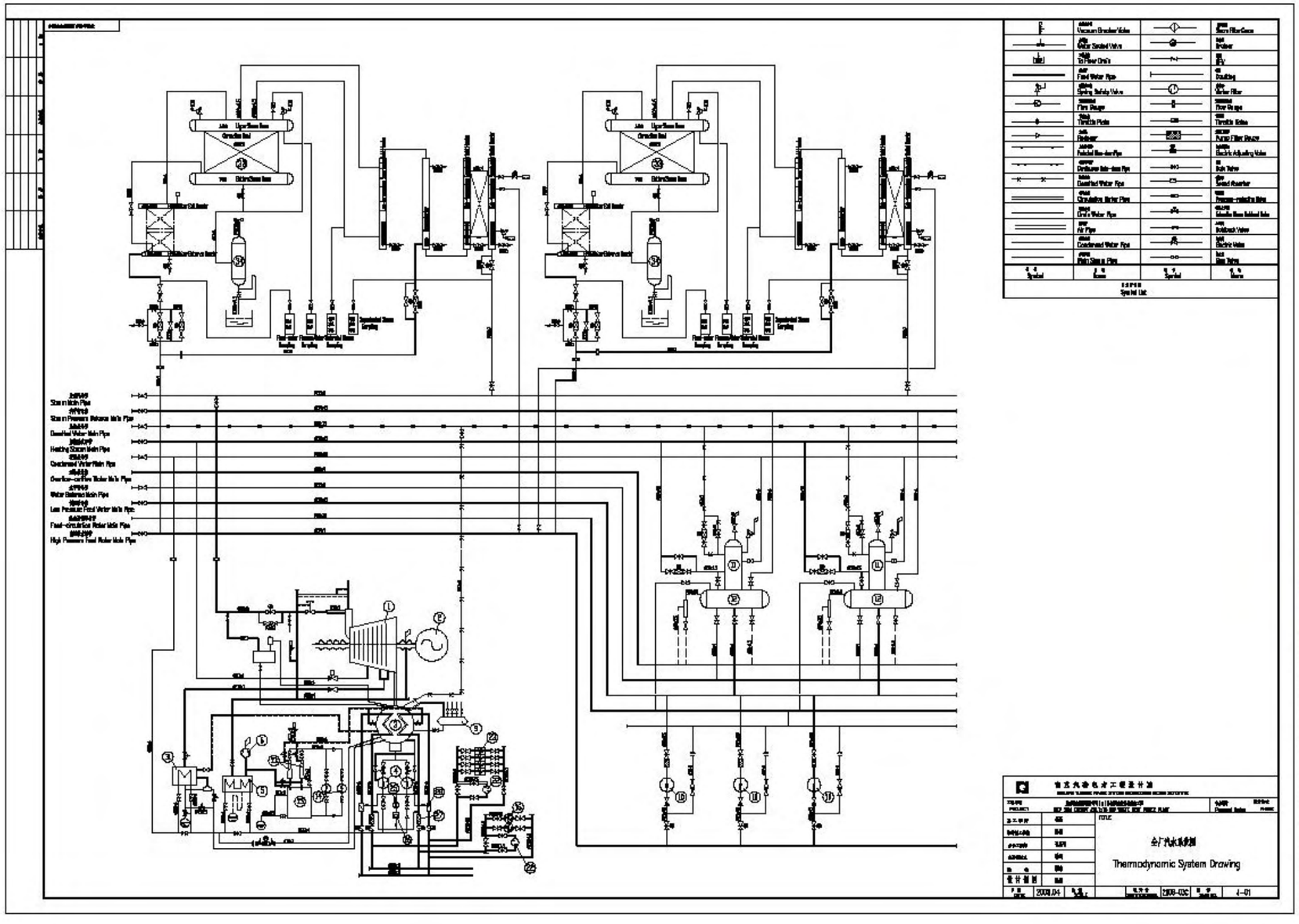
Appendix 14-1 Thanh Cong Cement (Flow Sheet)



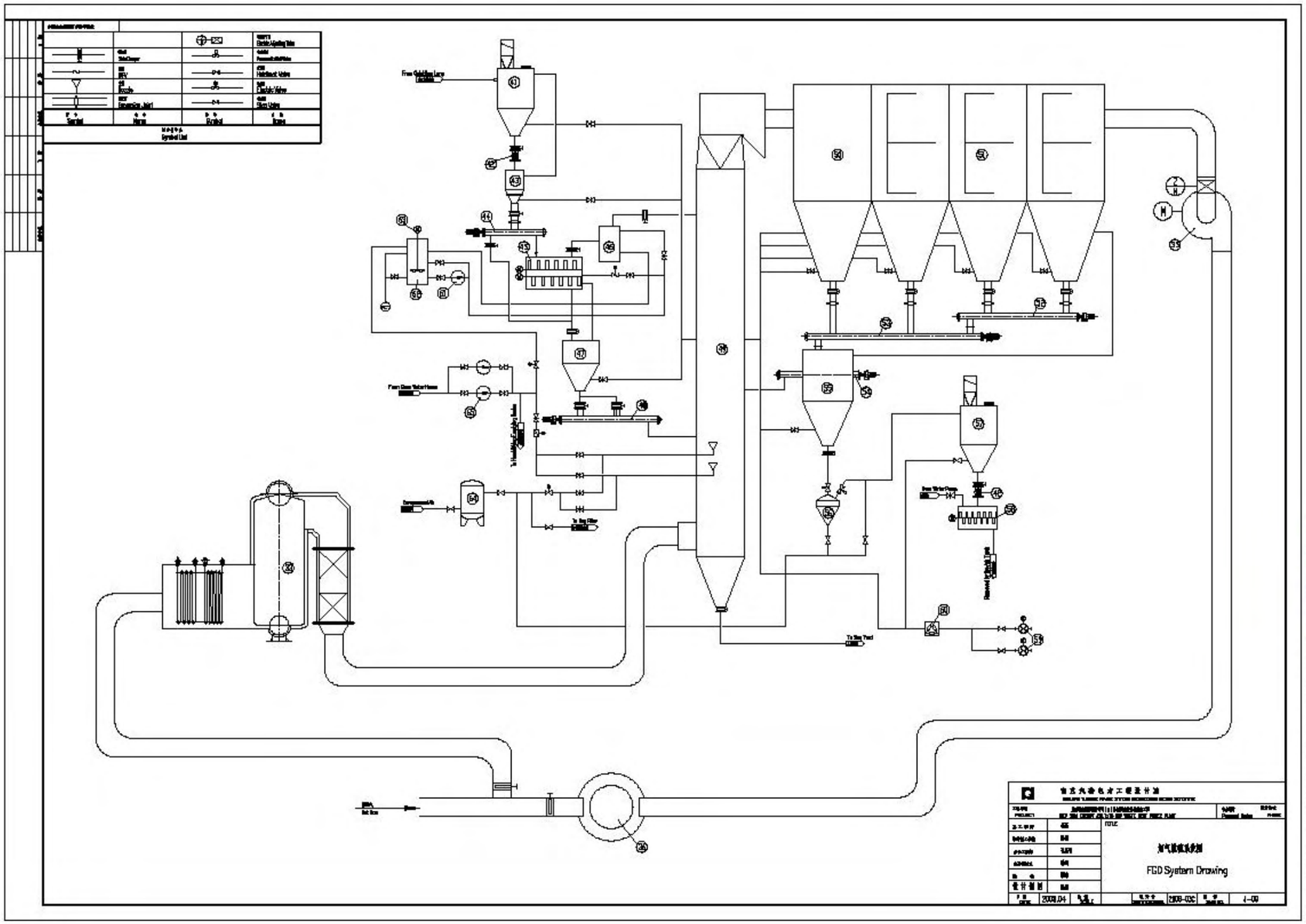
Appendix 14-2 Thanh Cong Cement (Plot Plan)



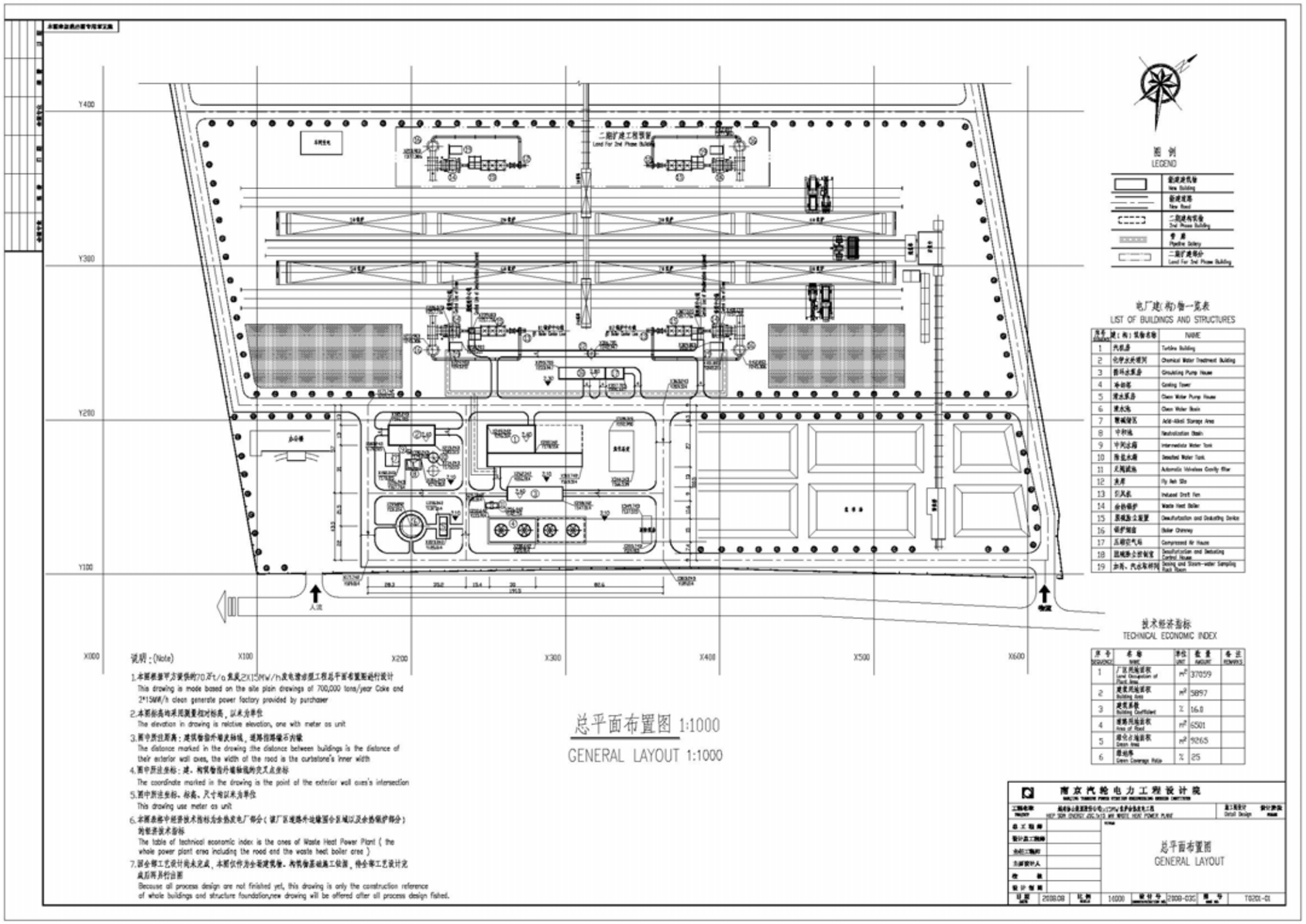
Appendix14-3 Hoa Phat Energy (Flow Sheet of Steam System)



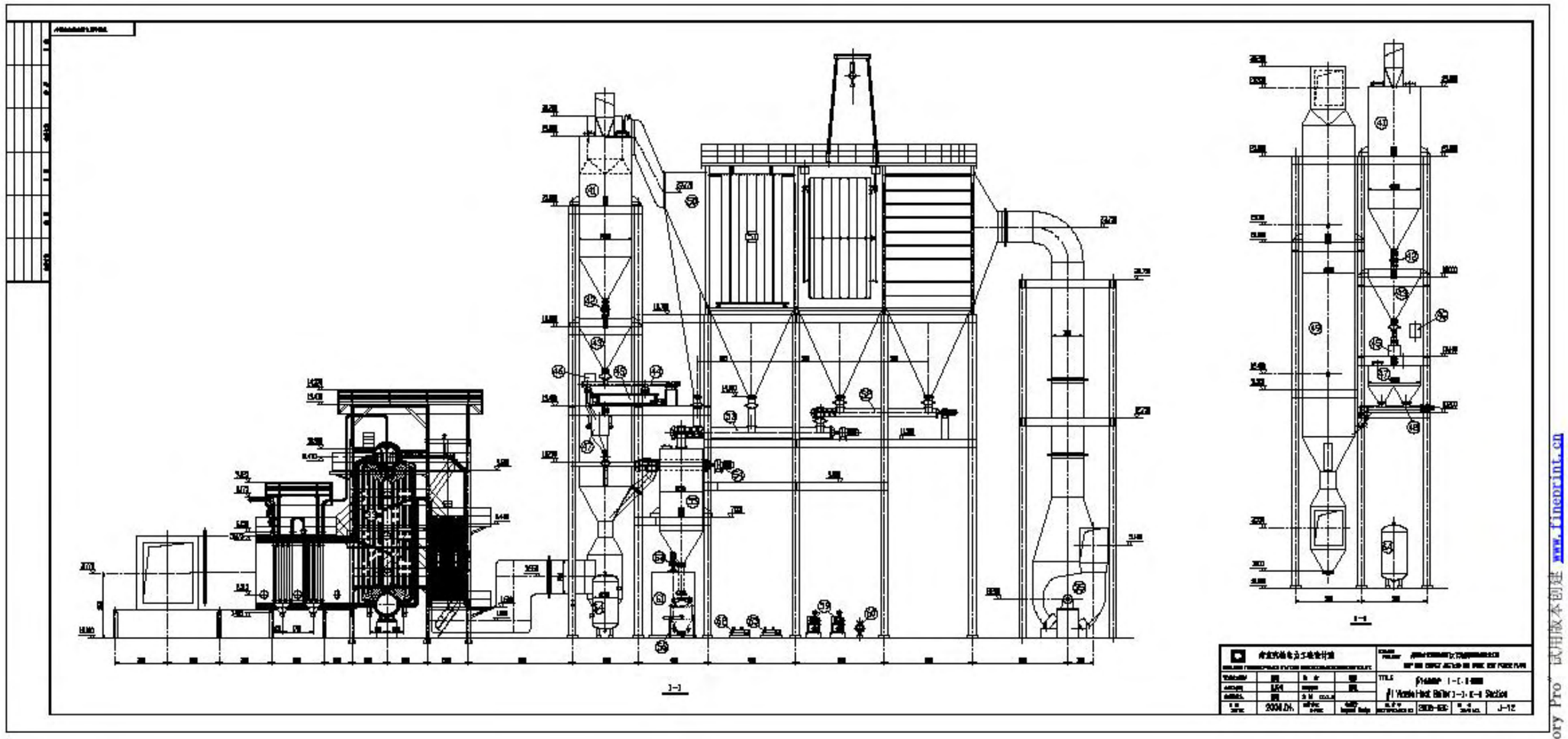
Appendix14-4 Hoa Phat Energy (Flow Sheet of Flue Gas System)



Appendix14-5 Hoa Phat Energy (Plot Plan)



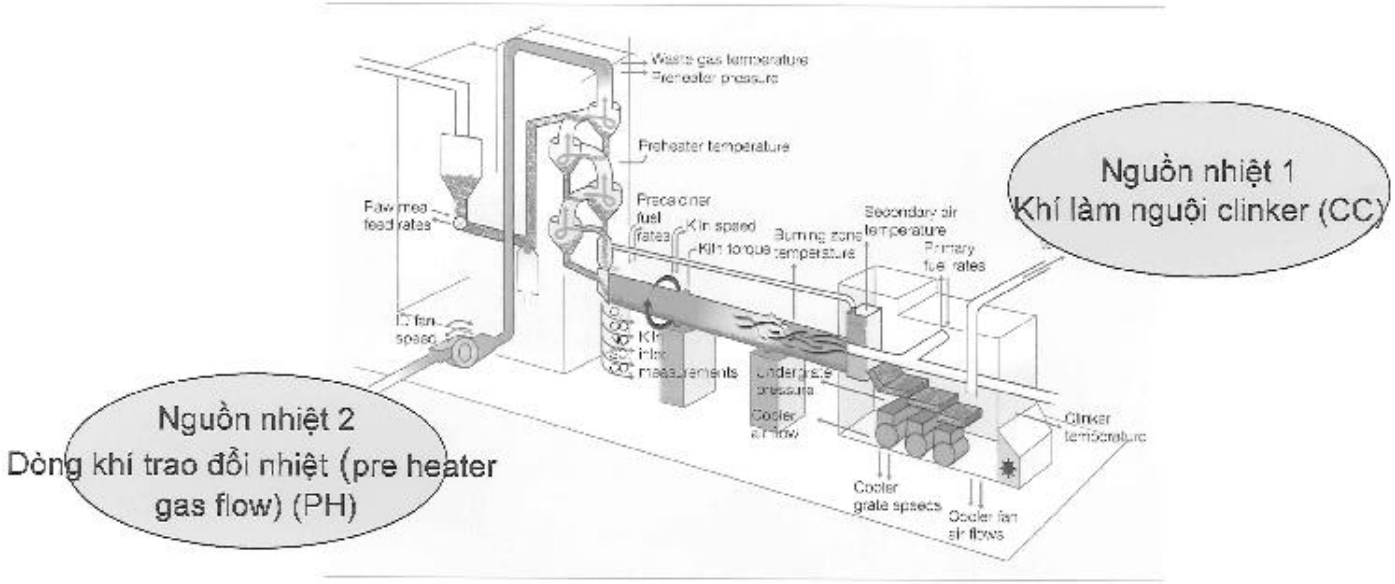
Appendix 14-6 Hoa Phat Energy (WHR System Side View)



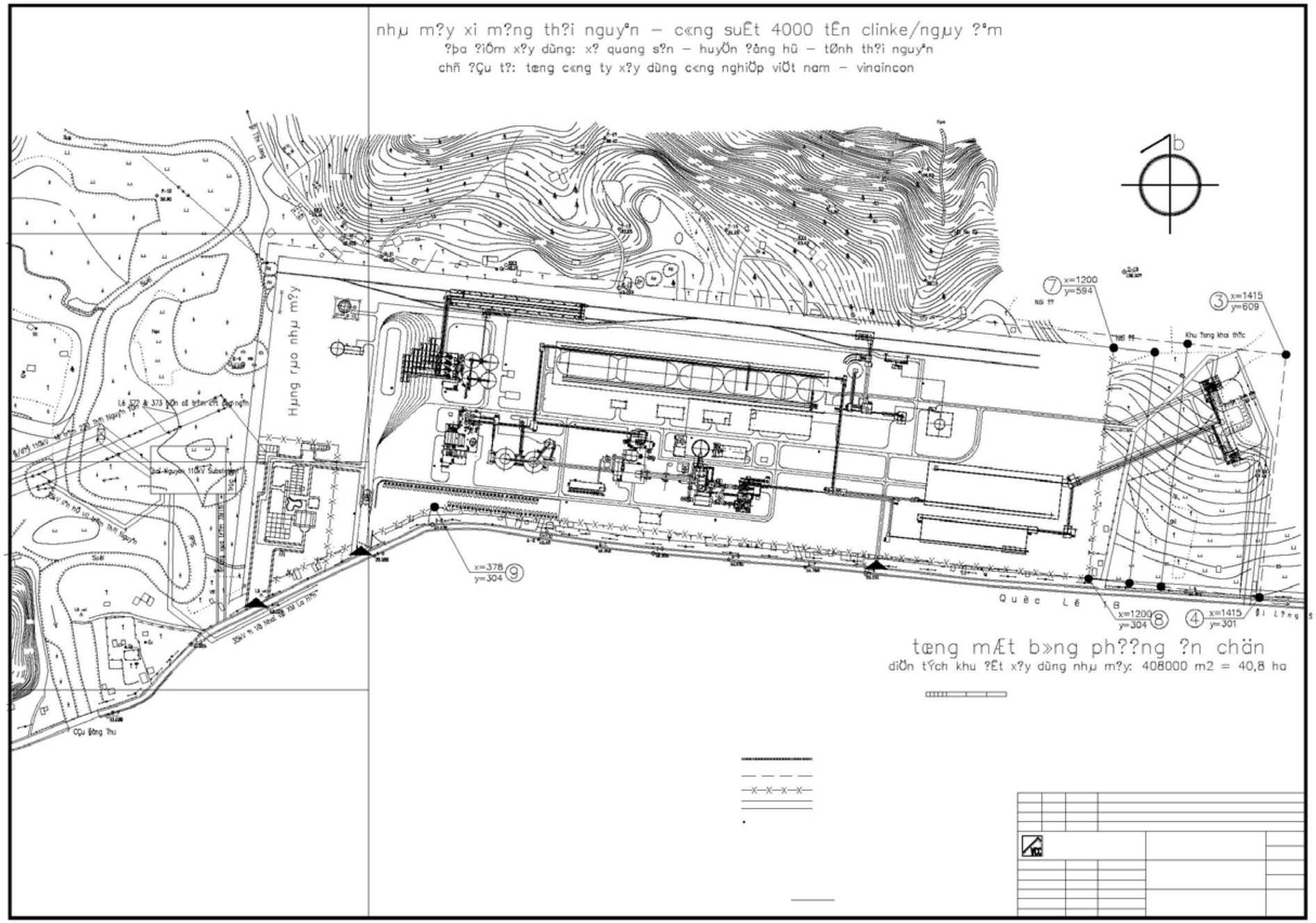
Appendix 14-7 Thai Nguyen Cement (Conceptual Flow)

Nhà máy – Các khu vực ứng dụng
Các nguồn nhiệt tại nhà máy ximăng

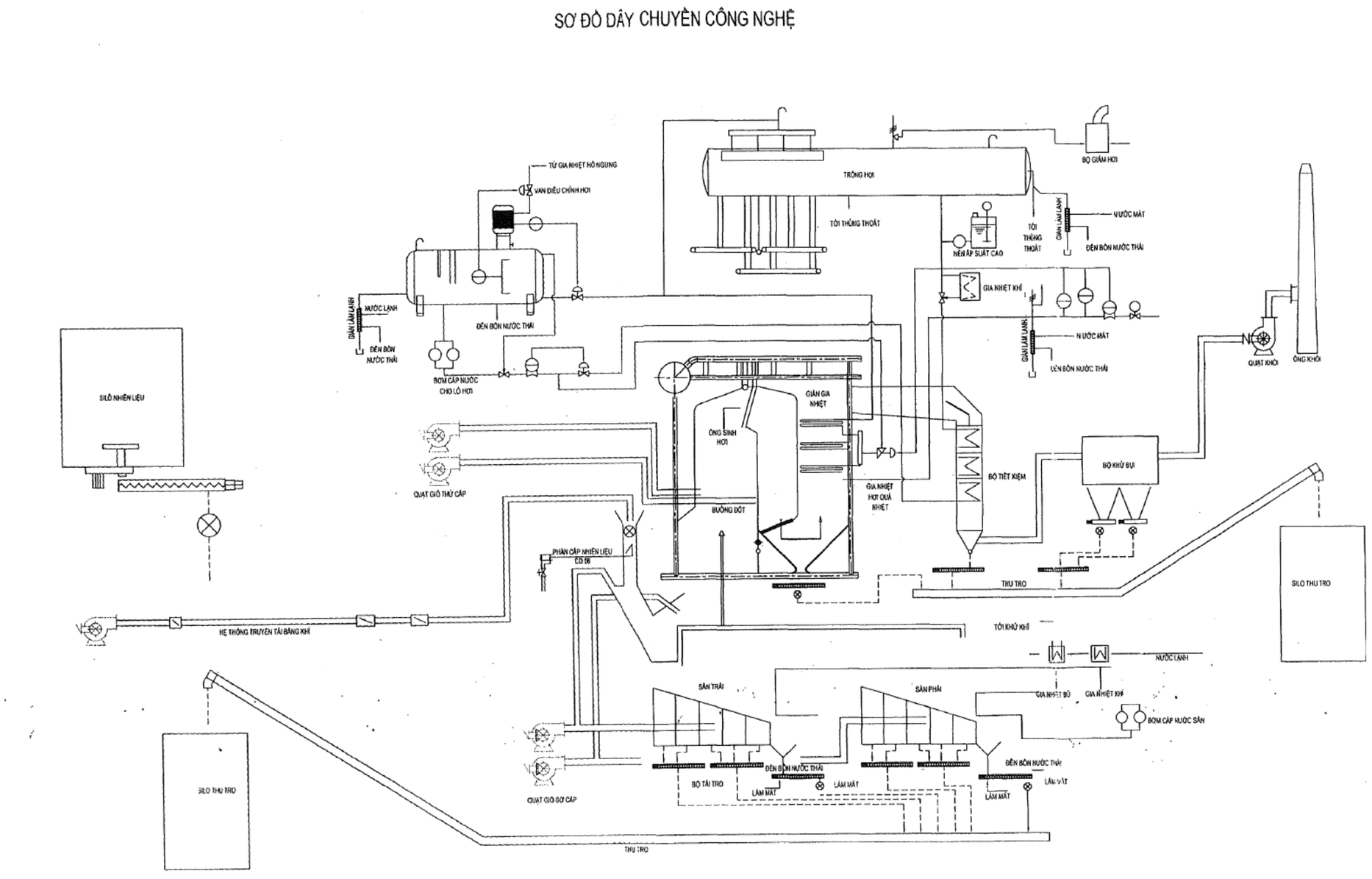
Nguồn nhiệt thải điển hình tại nhà máy xi măng



Appendix 14-7 Thai Nguyen Cement (Plot Plan)

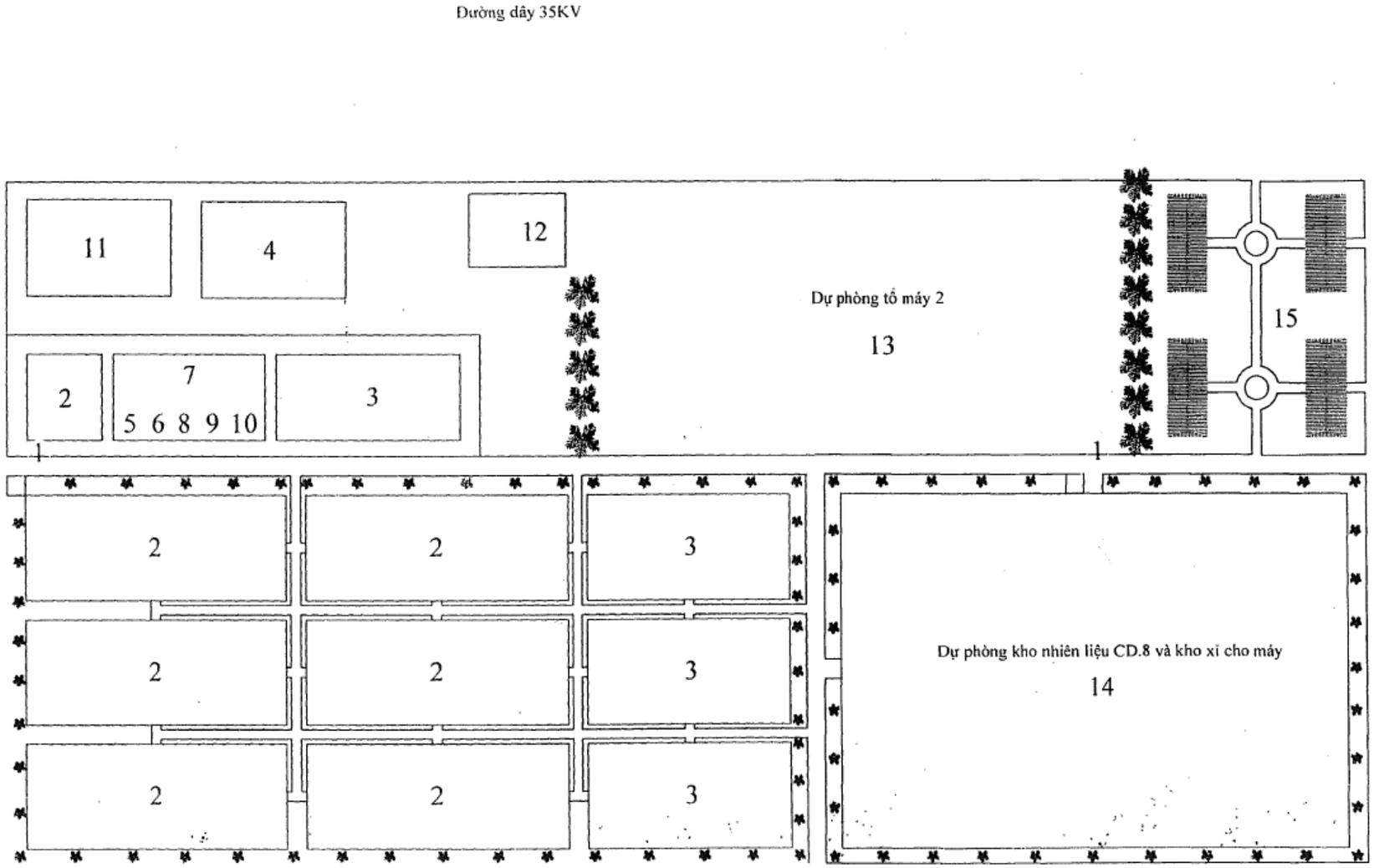


Appendix 14-8 Duc Nhan Wood-Refuse Power Generation (Flow Sheet)



Appendix 14-9 Duc Nhan Wood-Refuse Power Generation (Plot Plan)

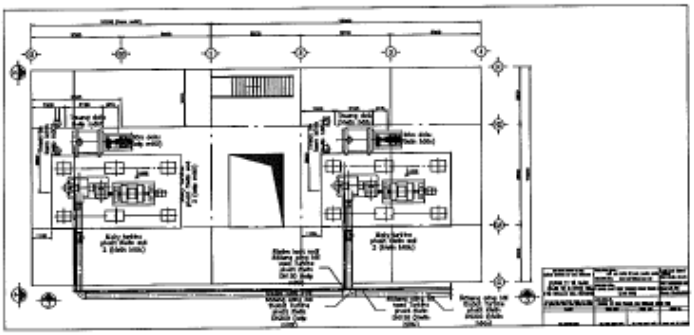
TỔNG MẶT BẰNG BỐ TRÍ CÔNG TRÌNH

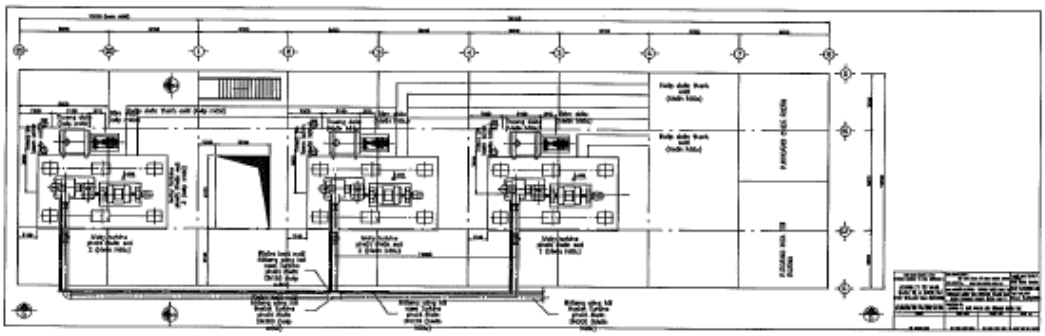


1. Nhà bảo vệ
2. Kho nhiên liệu CD.08
3. Kho xỉ
4. Nhà quản lý vận hành
5. Silo nhiên liệu
6. Gian lò
7. Gian tuabin, máy phát
8. Bộ tiết kiệm nhiên liệu
9. Bộ khử bụi
10. Ống khói
11. Nhà trạm bơm và bể phân ly
12. Máy biến áp
13. Khu dự phòng tổ máy số 2
14. Khu dự phòng kho nhiên liệu và kho xỉ tổ
15. Khu nhà ở CBCNV và khu chuyên gia

Appendix 14-10 Bentre Sugar Refuse Power Generation

(Plot Plan-Generator House)





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