

**Socialist Republic of Viet Nam
Ministry of Industry and Trade**

**"The Project Implementation Contract
for the Establishment of
Energy Management Training Center
in Vietnam (Stage 2)"**

"Project Completion Report"

April, 2016

Japan International Cooperation Agency

The Energy Conservation Center, Japan

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**Japan International Cooperation
Agency**

**Project for Supporting Establishment
of the Energy Management Training
Center in Vietnam (Stage 2)**

**"Completion Report of Project
Work"**

April, 2016

The Energy Conservation Center, Japan

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- ⑥ Technology evaluation sheet (Draft)
- ⑦ Report on examination and qualification system

Referential Abbreviations:

Abbreviation	Original
MOIT	Ministry of Industry and Trade
EMTC	Energy Management Training Center
JICA	Japan International Cooperation Agency
DOIT	Department of Industry and Trade
PRET	Plastic-Rubber Technology and Energy Conservation Training Center
MOU	Memorandum of Understanding
PDM	Project Design Matrix
PO	Plan of Operation
SPRCC	Support Program to Respond to Climate Change
EEREPP	Energy Efficiency and Renewable Energy Promoting Project
C/P	Counter Part
ECCJ	Energy Conservation Center, Japan
METI	Ministry of Economy, Trade and Industry
HCMC	Ho Chi Minh City
NSSMC	Nippon Steel Sumikin Management Co.
NSST	Nippon Steel Sumikin Technology
EPU	Electric Power University
JASE-W	Japanese Business Alliance for Smart Energy worldwide
ECC-HCMC	Energy Conservation Center-HCMC
ECC-HN	Energy Conservation Center-Hanoi
HUST	Hanoi University of Science and Technology
HCMUT	Ho Chi Minh University of Technology
JCC	Joint Coordinating Committee
IE	Institute of Energy
WG	Working Group

1. Project summary

1.1 Project background

While the recent economic growth of the Socialist Republic of Vietnam (hereinafter called Vietnam) has been rapidly increasing by an annual rate of six to seven percent, the increase rate of energy consumption exceeds that of economic growth, by ten percent or more annually. It is a concern that Vietnam may be forced to transform from a net exporter of energy into an importer in 2015.

Meanwhile, the Vietnamese government implemented the Law on Economical and Efficient Use of Energy (Energy Conservation Law) in January 2011 in order to establish rules for energy conservation, including a system for energy management and a system for energy audit, which would help control and improve energy consumption efficiency of designated business operators. Accordingly, the Ministry of Industry and Trade (hereinafter called MOIT) has issued ministerial ordinances to provide rules for consideration of organizations and a site, training and the qualification system needed for establishment of the Energy Management Training Center (hereinafter called EMTC) to develop human resources to train qualified persons for energy management and energy audit.

1.2 Project development

As a prerequisite for this project, importance should be attached to legal conditions for the use of the Energy Management Training Center as well as selection of its site. With the purpose of facilitating such consideration, the Japan International Cooperation Agency (hereinafter called JICA) separated the project into two stages, and implemented the Project for Supporting Establishment of the Energy Management Training Center (Stage 1) from September 2011 to September 2012, as a preparation up to selection of a site for the training center. The qualification standards of the training center, including practical training, were reflected in ministerial ordinances through cooperation carried out during stage 1. As a result, the Plastic-Rubber Technology and Energy Conservation Training Center (hereinafter called PRET) that is under the Department of Industry and Trade, Ho Chi Minh City (hereinafter called DOIT-HCMC) was selected for the site in July 2012. With necessary conditions secured in this way, it has been decided to implement the Project for Supporting Establishment of the Energy Management Training Center (Stage 2) to prepare the training curriculums, training textbooks and practice equipment for training of qualified persons for energy management and energy audit, as well as for the training of instructors.

1.3 Project purpose

The purpose of this project is to implement activities based on the MEMORANDUM OF

UNDERSTANDING BETWEEN JAPAN INTERNATIONAL COOPERATION AGENCY AND THE MINISTRY OF INDUSTRY AND TRADE ON THE PROJECT FOR THE ESTABLISHMENT ENERGY MANAGEMENT TRAINING CENTER (hereinafter called MOU), the basic agreement for this project concluded between JICA and MOIT on February 28, 2013.

This MOU comprises the Project Design Matrix (hereinafter called PDM, see Appendix-1) which describes the project in detail, the Plan of Operation (hereinafter called the PO), and other matters.

Among the activities expected, preparation of training curriculums, textbooks, and examination and qualification system for training qualified persons in energy management and energy audit is under the jurisdiction of MOIT as the national government, and thus shall be undertaken in Hanoi as support for developing a national qualification system. Practical training using practice equipment is under the jurisdiction of DOIT-HCMC, a local government agency, and thus shall be conducted in Ho Chi Minh as support for foundation of the Energy Management Training Center.

Establishment of an energy management system, which will be supported by this project, is regarded as a policy action of the ODA Loans on Support Program to Respond to Climate Change (hereinafter called the SRPCC), and draws the attention of the Vietnamese government, etc. With the introduction of an energy management system, preferential taxation, a subsidy system, low-interest loans, etc., for energy management devices and equipment are sought. Consequently, cooperation with this project is expected in the form of a two-step loan, discovery of matters appropriating for a revolving fund, and energy diagnosis in the ODA Loans on Energy Efficiency and Renewable Energy Promoting Project (hereinafter called EEREPP).

1.4 Project period

This project was supposed to be carried out from July 2013 to the end of December 2015 according to an agreement between JICA and the Vietnam side, however, taking into account the delay of the installation of equipment, etc., the period is extended three months on the basis of the agreement in writing, thus it shall last to the end of March, 2016.

For this consultant contract, as it seemed to be relatively long term, project period was divided into two terms, including the first year and the second year. The first year term was from July 2013 to March 31, 2015, and the second term of this project was contracted as from April 28, 2015 to April 30, 2016. The end date of the project is set in consideration of the extension of the project period and the period of project summary, report, settlement, etc.

1.5 Project objectives

A higher objective, a project objective and expected results of this project are as follows:

① Higher objective

To promote energy conservation activities by designated business operators under the Energy Conservation Law.

② Project objectives

To found and manage a training center with a capability to train qualified persons for energy management and energy audit.

③ Expected outputs

Output 1: Training curricula, textbooks and practice equipment required for training qualified persons for energy management and energy audit will be prepared.

Output 2: Counterparts (appropriate departments of the Vietnamese government located in Hanoi and relevant organizations, hereinafter called C/Ps) will be able to implement practical training to develop qualified persons for energy management.

Output 3: C/Ps will be able to implement practical training to train energy audit.

Output 4: C/Ps will be able to promote dissemination and enlightenment among companies concerned with energy conservation activities.

2. Activities

2.1 Basic policy for implementation of work

Two staff members of the international cooperation division of the Energy Conservation Center, Japan (hereinafter called ECCJ), who are familiar with the legal system of energy conservation, designated business operators, and a system for qualified persons for energy management and energy audit in Vietnam, are assigned as work chief and deputy work chief, so that a system to implement operations will be fully supported by international cooperation headquarters and the aforementioned relevant divisions of ECCJ. In addition, a cooperative system for the headquarters of JICA, its Vietnam office, local C/Ps and relevant institutions, and procurement of equipment, shall be established. The policy is based on this implementation system to cooperate with relevant organizations and share them information, provide them technical information, to accomplish the business implementation such as delivering training equipment and confirming the acceptance as well as training and confirming of instructors who use those equipment.

2.2 Outline of activity plans

Following the business implementation of the first year, ECCJ planned the activities of the second year as listed below, which should play a role of supporting development of a national qualification system in Vietnam through this project by making use of its experience in implementing an aide project for development of an energy conservation legal system of MOIT, entrusted by the Ministry of Economy, Trade and Industry, Japan (hereinafter called METI), as well as its experience for many years as "the designated institution for administration of examinations for qualified persons for energy management in Japan, but items (15) to (17) as shown below are added associated with the performance of the project.

- (1) Preparation and submission of the second year work plan (Japanese version)
- (2) Preparation and submission of the second year work plan (English version)
- (3) Preparation of Completion Report of Project Work
- (4) Support for assignment of full-time instructors in heat/electricity and management staff at the training center
- (5) Support for establishment of a working group in charge of curriculums, textbooks and qualification and examination system
- (6) Support for assignment of instructors for the training course in energy management at the energy management training center (EMTC) in HCM city
- (7) Support for assignment of instructors for the training course in energy audit at the EMTC in HCM city

- (8) Implementation of onsite trial EA training at factory and building
- (9) Development of a system for examination/qualification
- (10) Required reflection in laws and regulations
- (11) Implementation of a workshop on a system and technologies for energy conservation (Support)
- (12) Development of a network among relevant energy conservation institutions (Support)
- (13) Association with Japanese Yen loan projects (Support)
- (14) Information-sharing concerning contractor on equipment procurement (provision of equipment procurement and technical transfer)
- (15) Support for regular meetings of the Joint Coordinating Committee (JCC)
- (16) Support for Project Terminal Evaluation
- (17) Following issues before finishing the project

It has been decided that the activities to develop a national qualification system would be undertaken with MOIT and major counterparts (C/Ps), appropriate departments of the Vietnamese government located in Hanoi, and its relevant organizations, in substantial collaboration with the activity to support establishment of the EMTC in Ho Chi Minh City.

2.3 Specific actions

2.3.1 Preparation and submission of the second year work plan (Japanese version)

Based on the work plan, project work progress report and record of the first year, we prepared and submitted the work plan, work flow chart and work process plan of the second year. And it has been decided that this project was carried out and managed based on the work plan.

2.3.2 Preparation and submission of the second year work plan (English version)

Based on the second year work plan, we prepared and submitted the work plan (in English) and work flow chart, work breakdown structure (WBS) and activity plan sheet in May 2015. Based on this, we explained and exchanged opinions, and shared the overall picture of the project with counterparts of Vietnam such as MOIT, DOIT - HCMC, PRET, etc., at the time of the first-order dispatch in May 2015.

2.3.3 Support for assignment of full-time instructors in heat/electricity and management staff at the training center

In DOIT-HCMC and PRET, they had already prepared and presented the plan of instructors and staffs for operating and training of the training center in December 2014, but in the second year, considering about the correspondence by the agency that can supply instructor human resources, such as energy consultants from Ho Chi Minh City University of Technology, Energy Conservation Center in Ho Chi Minh City, Ho Chi Minh City Electric Power University, ENERTEAM, etc.,

when necessary, to promote the proper securing and enhancement of instructors, and they also continue the activities of giving advices and suggestions to PRET about the enhancement such as part-time instructors.

Besides, in addition to the above activities, they utilized the advantage of the local staff to collect information and necessary compilation activities such as management situation, etc., in order to perform the whole of compiled business smoothly, including the preparation of assessment activities, implementation preparation of JCC, etc. They fully implemented the work management by utilizing the local staff.

The EMTC operations are carried out by Mr. Long, director of PRET, issuing a document (Decision No.63 QD/PRET.2014) by December 1, 2014, and deciding the following operations personnel affairs.

1. Mr. Dang Tan Tai: Deputy Director of the Center/ Direct instruction
2. Mr. Phan Tan Phong: In charge of Energy Conservation Workshop and electric maintenance
3. Mr. Dang Quang Truong: Member/ Leader of mechanic maintenance group
4. Mr. Huynh Van Hung: Member/ Group of mechanic maintenance
5. Mr. Vu Dinh Hiep: Member/ In charge of IT

A system that has to carry out the activities in accordance with the annual plan and report regularly by these staff was established.

Also, the training on operation and maintenance of training facilities was conducted by Nippon Steel Sumikin Management Co. (hereinafter called NSSMC) which delivered the training equipment from April to May 2015 to the above five (5) persons.

As for the instructors, the following nine (9) persons were specified.

1. Dr. Nguyen Van Tuyen: HCM Polytechnic University (in charge of heat)
2. Dr. Nguyen Nhat Tan: HCM Electricity College (in charge of electricity)
3. Dr. (Ms) Nguyen Thi Minh Trinh: HCM Polytechnic University (in charge of heat)
4. Mr. Ma Khai Hien: ENERTEAM (in charge of heat)
5. Mr. Tran Van Hung: HCM Polytechnic University (in charge of heat)
6. Dr. Ha Anh Tung: HCM Polytechnic University (in charge of heat)
7. Mr. Tiet Vinh Phuc: ENERTEAM (in charge of electricity)
8. Dr. Dang Tan Tai: PRET (in charge of heat)
9. Mr. Phan Tan Phong: PRET (in charge of electricity)

The above persons are not full time member of PRET except No. 8 and No. 9, but they are the members who are capable of supporting at the time of the training in PRET, and all live in Ho Chi Minh City

2.3.4 Support for establishment of a working group in charge of curriculums, textbooks and qualification and examination system

Members of the Working Group (WG) consist of one person from MOIT as organizer, two (2) deans and two (2) professors of Energy management department of EPU (Electric Power

University) and four (4) experts from ECCJ.

The activity period was from January 2015 until October of the same year, although the start was delayed, but eight (8) meetings were carried out in total. As the second year, five (5) meetings were held since the fourth time in May 2015, but mainly, they carried the face to face meeting once a month, meanwhile, they could exchange the revision review of text by e-mail frequently with each other efficiently.

WG was established in order to review the contents of curriculums, textbooks and qualification and examination systems for training of qualified persons for energy management and energy audit at the training center, and review the revised text of the Circular which provides those contents, but they also carried out discussions about technology and management contents to provide the revised draft and technical materials, the exam questions cases from Japan concerning the problems of curriculums, textbooks and qualification test, co-created a revised version as well as prepared and submitted the revised draft reflecting the intention of MOIT in Circular No.39.

2.3.5 Support for assignment of instructors for the training course in energy management at the training center in HCM city

The trainer's training for instructors of energy management with training equipment was carried out in June 2015 in PRET. Instructors and leaders of this training were carried out by NSSMC as a part of the supply contract of training equipment (technology transfer work). ECCJ carried out a discussion with MOIT, DOIT-HCMC, and PRET to fix the implementation methods and contents of these trainings and realized the participation of the future instructors of the EMTC in Hanoi that is requested on the purpose of this project. This training received the participation of sixteen (16) persons in total, in which, nine (9) persons from HCMC who are teachers of Ho Chi Minh City University of Technology, Ho Chi Minh City Electric Power University, experts of ENERTEAM, an energy conservation audit company and PRET, and seven (7) persons in Hanoi who are from the Energy Conservation Center in Hanoi and Electric Power University.

The training participants have completed successfully the training over a period of three weeks and passed the test evaluation by instructors, and received a completion certificate issued by a joint name of the Vietnamese side, PRET, and the Japanese side, ECCJ.

2.3.6 Support for assignment of instructors for the training course in energy audit at the training center in HCM city

Trainer's training for instructors for energy audit with training equipment was carried out by NSSMC in June 2015 in parallel with the training for qualified person for energy management in PRET. Participants were sixteen (16) people as the same with the previous section.

Instructor for energy audit, as from the contents of the lecture, can also serve as an instructor for energy management, so that it has been made to be same as in the above-mentioned 2.3.5. Also, on

June 26, 2015 when these trainer's trainings were completed, an unveiling opening ceremony by the EMTC of PRET was celebrated in grand rumored with the main participants from MOIT and executives of the People's Committee of Ho Chi Minh City as well as the affiliate of the nearby Ministry. In the cerebration, the demonstration of training equipment was made by NSSMC as well as training instructors.

2.3.7 Implementation of onsite trial EA training at factory and building

After the trainer's training in PRET training facilities by NSSMC, the object onsite trial energy audit companies were selected by DOIT-HCMC, then a trial energy audit training by ECCJ was carried out at Hung Vuong Plaza building in October, and Saigon Tobacco Company in November for less than one week each duration with the targets of thirteen (13) people that are consisted of nine (9) instructors of PRET and other four (4) people of energy audit company. A total of five (5) people from ENERTEAM, an energy audit company as a small part of the instructors to participate, and play a central role in preparing pre-written questions and analysis, study, measurement and summarization at the time of energy audit, so that the effect on the teacher of the university with less external audit experience education was also effective. From ECCJ, based on the answers to the questionnaire, etc., the thinking and approach about what kind of discussion and survey should be considered was presented and considered carefully in advance, the comments at the time of energy audit survey and analysis and summary method of the audit result, the points of report preparation, etc. were instructed. Besides, the monthly energy consumption data of the recent years were additionally required and obtained, the technique of analyzing and visualizing from the aspects of energy management were shown and became the reference at the time of energy audit.

2.3.8 Development of a system for examination/qualification

The training of qualified persons for energy management and energy audit that the EMTC of this project executes is closely related to Energy Conservation Act that was implemented in January 2011 and government decree for the enforcement of it. These qualifications are the ones that are associated with the completion of the training. Therefore, the activities of the established EMTC and WG related to the examination system (see the previous section "2.3.4") in order to reflect the training contents of that EMTC (curriculums, textbooks, practical training) to the examination/qualification system and the higher policy are supported, moreover, the information that would help in the development of qualification system by the Vietnamese government was provided.

Provisions for the examination/qualification system has already been institutionalized by "The provisions for training and qualification of qualified persons for energy management and energy audit" (MOIT Circular: enforcement in 2011 December, MOIT Circular No.39/2011/TT-BCT), but creating the result of consideration by the WG activities as a revised draft of this Circular and submitting to MOIT became the final goal at the present.

2.3.9 Required reflection in laws and regulations

Reflection in the laws and regulations will be valid only when the revised draft of the above-mentioned comes into force, but the status of the revised legislation of the Circular No.39 at the moment is submitted to the council inside MOIT in March 2016, and is planned to be approved by the Minister of MOIT in November 2016.

The comparison of the contents of the old and the revised Circular No.39 is shown in Appendix 7.

2.3.10 Implementation of a workshop on a system and technologies for energy conservation (Support)

Since the workshop held by ECCJ itself, the way to carry out in cooperation with Japanese Business Alliance for Smart Energy Worldwide (hereinafter called JASE-W) was thought to be more effective, so that in July 2014, though it was scheduled to participate in the joint ENERTEC EXPO 2014 that was held in Ho Chi Minh City by MOIT and DOIT-HCMC, but due to the reason that it was not the stage of training equipment of PRET to be delivered, so that JASE-W failed to join, and ECCJ had no choice but to send off.

ENERTEC EXPO was also supposed to be carried out in Ho Chi Minh City in July 2015, and ECCJ was introduced about this exhibition from DOIT-HCMC again at the time of visiting Ho Chi Minh City in May 2015, so we had the deep participation discussion with JASE-W troops. Since the sub-working member companies of JASE-W became very active on the exhibition and the seminar holding in Ho Chi Minh City recently, as for ECCJ, it finished the installation of training equipment of PRET, completed the opening ceremony, thought that greatly PR should be done, supported for setting up the exhibition booth of PRET in conjunction with PRET, carrying out PR of the EMTC and training equipment by video, brochures and photo panels.

2.3.11 Development of a network among relevant energy conservation institutions (Support)

Through working group activities described above, a good network with the people including Deans and Professors, Lecturers of Electric Power University (EPU) who are working member has been formed.

In addition, through the training in Japan, the trainer's training and trial energy audit training, a good network of stakeholders on energy conservation between HCMC University of Technology, HCM Electricity College, Electric Power University (EPU), Hanoi University of Science and Technology, the University of Da Nang University of Technology, ENERTEAM - a consultant company, the Institute of Energy, Energy Conservation Center of Hanoi and Da Nang commencing with MOIT, DOIT-HCMC and PRET has been formed. Especially through above the training in Japan, the trainer's training and trial energy audit training, very tight network among the PRET trainers in HCMC, Hanoi and Da Nang trainer candidates has been established through PRET as a

core role. Furthermore, as for PRET trainers, corporative work through group discussion and group audit activity through twice trial energy audit training, an unification feeling has been created for each other and their network has been also much strengthened.

In assistance, ECCJ was able to take advantage of the network which has been formed by the activities of the energy conservation field that has been carried out in Vietnam so far.

2.3.12 Association with Japanese Yen loan projects (Support)

In this project, collaboration with loan aid "Support Program to Respond to Climate Change (SPRCC)" and "Energy Efficiency and Renewable Energy Promoting Project (EEREPP)" has been expected, and it was planned to share information as well as to support for associated workshop holding.

From the point of view of cooperation with SPRCC, it was decided to share information JICA relevant departments and hold the related workshops in cooperation with the network of the institutions related to the above-mentioned energy conservation.

More specifically, in July 2015, in the seminar in exhibition ENERTEC EXPO 2015 related to energy held in Ho Chi Minh City, SPRCC was introduced by Mr. Yoshida of JICA Vietnam Office, and it was made public to the local affiliate. In this ENERTEC EXPO 2015 exhibition, PRET prepared the booth, and made PR on the EMTC project toward the designated enterprises and others.

In addition, in SPRCC, from the fact that construction of energy management system is positioned as one of the policy action to support for implementation, the issuance of Circular 39 revised version related to energy management system will be watched by the relevant agencies.

2.3.13 Information-sharing concerning contractor on equipment procurement (provision of equipment procurement and technical transfer)

Installation, trial operation, acceptance of training equipment had been completed in mid-February 2015 and then handover to PRET was done. The implementation of training on operation and maintenance of training equipment to the staff of PRET by NSSMC, the equipment procurement contractor, became in April and May 2015, and the trainer's training in energy management and energy audit for instructors of Hanoi and PRET became in June 2015. ECCJ did request and adjusted about this plan and training participants, etc to MOIT and others from March to June 2015, that not only involved Ho Chi Minh City but also Hanoi in the instructor training.

NSSMC (Nippon Steel Sumikin Management) had been changed company structure on October 1st, 2015 after the end of the correspondent business of JICA and became Nippon Steel Sumikin Technology (hereinafter called NSST). In the 2nd JCC in June 2015 and the 3rd JCC in December in the same year, the spare parts suppliers list for the future of equipment maintenance, that was prepared by NSST after that due to demand from affiliate of Ho Chi Minh City, was handed to MOIT, DOIT-HCMC, PRET affiliate when ECCJ visited the site in January 2016 on behalf of

JICA.

In addition, the results of the Terminal Evaluation had been also reported and shared to NSST by ECCJ.

2.3.14 Support of regular meetings of the Joint Coordinating Committee (JCC)

The first meeting of JCC was held on August 8, 2014 of the first year, and the second and third JCC were held in the second year. The participants of JCC composed of representatives of MOIT, DOIT-HCMC, PRET, JICA headquarters, JICA Vietnam Office, ECCJ as same in the first year, but the representatives of EPU that is also a relationship of MOIT WG participated the 2rd JCC and the 3rd JCC, too.

The 2nd JCC was carried out on PRET conference room at Ho Chi Minh City on June 25, 2015, along with the conduct of confirmation of the completion of equipment installation and technology transfer. JCC members also attended the opening ceremony at PRET training center on June 26 and were able to carry out the benefits to the construction affiliate.

The 3rd JCC was held in MOIT of Hanoi on December 23, 2015. The main contents were to receive the results of report of "Project Terminal Evaluation" which was started in November 2015, to confirm the contents as well as to share about the future of the policy by all members.

2.3.15 Support for Project Terminal Evaluation

Project Terminal Evaluation by JICA was carried out in the following steps.

- (1) Field survey activities from December 7 to December 11 (Mr. Minagawa : System Science Research Institute Co. Ltd., Terminal Evaluation Consultant)
- (2) The primary report summarized draft by Mr. Minagawa
- (3) Meeting with MOIT about Terminal Evaluation Report Draft from December 21 to December 23, preparing Final Evaluation Draft, fixing and approving the final evaluation content in JCC

About (1) in the above, ECCJ took the appointment with the field survey destination and accompanied to all local research activities. The survey destination included all major related parties such as Counter Part (C/Ps) and Stakeholder of this project such as MOIT/GDE, DOIT-HCMC, PRET, instructors of PRET, EPU, HUST (Hanoi University of Technology), ECC/Hanoi, interviewing when visiting, observing the training equipment and interviewed at JICA Hanoi Office, also. The necessary survey activities were executed by these enough interviews and obtaining answers to questions, etc.

<Details of Interviews destination: total of 32 people of the following 9 institutions and JICA Hanoi office>

DOIT-HCMC: Mr. Loc and Ms. Nhung

PRET: Mr. Long and Mr. Tai

Instructors of PRET: 8 persons

Visit and inspection of training equipment of PRET (Hiep Phuoc EMTC)

MOIT/GDE: Mr. Linh and Mr. Dung

EPU (Electric Power University): Dr. Kien and others

HUST (Hanoi University of Technology): Dr. Quang

MOIT/GDE: Mr. Vu

ECC/HanoiL Mr. Thai and others

About the (3) above, we set up the conference schedule, participated in each meeting, supported the preparing of final evaluation report by participating in the discussion, explaining project status, providing information, as well as participated in the process of fixing and approving it.

Respecting to the answer to questionnaire of Terminal Evaluation, particularly in MOIT, DOIT-HCMC, PRET and EPU which are the center and have carried a lot of related services, there were the answers that evaluated frankly and positively to a number of questions. In addition, from instructors of PRET and members who participated in the TOT (Training of Trainers) in PRET from Hanoi, there were a lot of constructive opinions and comments such as the request to the implementation matters for the future promotion like early implementation of the revised procedures of Circular No.39 on examination and qualification system for qualified persons for energy management and energy audit, etc. From PRET, it showed the positive response such as preparing 12 times training plan for 2016. Besides, the seriousness and enthusiasm of Japanese experts who carried out training was spread and highly evaluated.

2.3.16 Following issues before finishing the project

Based on Terminal Evaluation and the results of the 3rd JCC which was implemented in December 2015, the following three points were requested from JICA as an additional work as following issues until the end of March 2016 when this project ends, and these points should be implemented.

- (1) Confirm and advise about the status of revised Circular No.39 by the Minister of MOIT.
- (2) Check and organize the latest situation of the total energy consumption of the designated enterprises.
- (3) Finally confirm the post-monitoring method of "Reduction of 5% of energy intensity of the designated enterprises" which is an indicator of higher goal.

Within a limited period of time, we managed to carry out the discussion with MOIT, DOIT-HCMC, PRET and IE (Institute of Energy), etc., preparing the monitoring scheme and sharing, asking the continued follow-up in the future. Besides, it had been decided that we should pay attention to the process in the future, too and check for the revision of Circular No.39 by the Minister of MOIT.

The above work was implemented through studies in Japan and activities from 8th to 19th March in Vietnam. Topic items in this work are as follows.

(1) Based on the latest revision draft of Circular No.39 by the Minister of MOIT to be informed, changed point from the current Circular is listed for reference. Also as for the formal revision procedure, shared targeted time of which is November 2016, it was informed that the working team for revision had been formed and had started its work. Revised content is shown in the appendix No. 7, and details of “Training program” is specified mainly in the article 11, and “Audit of training organization”, “Application procedure” and “Implementation procedure of Qualification and Examination” are also added with the advice of Japanese experts .

(2) The latest formal energy statistic was checked, which is currently the issuance for 2012 energy data. And also the status of submission of annual reports submitted from designated enterprises was checked for Hanoi and HCMC.

As for HCMC, the ratio of submission is not sufficiently high currently, so actions to raise the ratio were recommended to DOIT-HCMC.

Also it was recommended to MOIT that the requested data on the annual report should be enhanced by adding energy intensity.

On the other hand, it was informed that as for the energy intensity in industry area, sector-wise benchmark was implemented for management, where the benchmark for chemical products is already set, in future it will be set for the industries of cement, iron and steel, food, paper and pulp, and plastics. Those data will be useful to evaluate the status of energy management in future.

(3) On the monitoring, it was recommended that the energy performance data in the submitted annual report should be analyzed and the working position of the certified personnel through the trainings of the EMTC should be grasped, which make it possible to grasp the effect of energy management.

The recommendations described above were explained respectively to MOIT, DOIT-HCMC and PRET, and were agreed.

Moreover, recommendations to be considered through the attendance on the training on energy management and the training on energy audit, were explained to MOIT and were agreed. Those recommendations for MOIT include the followings; the earliest formal approval of the texts, official recommendation for the companies especially in the south region to take the EMTC (PRET) trainings with certification and MOIT’s support for the smooth scheduling and management of trainings continuously held by PRET.

3. Issues, creative means and good lessons relating to the implementation and management of the project

3.1 Issues relating to the implementation and management of the project

3.1.1 Key considerations for the project

(1) Ensure the flexibility of the project

This project is a technical cooperation one, which is necessary to change the activities of the project flexibly according to the changes in the performance of C/Ps and project environment. Therefore, we tried to understand the overall progress of the project, the expression status of the outcome, make appropriate recommendations to the JICA headquarters and JICA Vietnam office about the direction of the project as needed, obtain JICA's approval and carry out the necessary revision.

(2) Consistency with existing laws and regulations

This project needs to be performed while having the consistency with the energy conservation policies and legislative system of Vietnamese government, such as the Energy Conservation Law. Personals involved in this project have kept a better communication than before with each member of the energy conservation policy promotion organization of MOIT, and were able to understand the current status of the policy, and the like. In the future, based on the completion of this business, it is presumed that the reflection, etc., to required laws and regulations of the examination and qualification system would be put into effect. Therefore, it is decided to increase the activity frequency of the site, closely do the information collection through MOIT and other stakeholders, take the integrity of the energy conservation policies and legislative system of the Vietnamese government.

(3) Information sharing with equipment procurement contractor

NSSMC (Nippon Steel Sumikin Management), the equipment procurement contractor, was merged into NSST (Nippon Steel Sumitomo Metals Technology) from October 1, 2015 and has been changed the company name, but ECCJ and NSST have built a much closer relationship in the energy conservation activities than previously, and thus, this project has been promoted efficiently.

The installation of training equipment was successfully completed before Tet in February 2015, it is going to be handed over to PRET on February 11 of the same year.

Then, from the local PRET, with respect to machinery and equipment, it has been requested formally for the supplier list of spare parts and consumables in the 3rd JCC (December 23, 2015) for the future of maintenance. In response to this, ECCJ reported the demand contents to NSST, and requested for the preparation. In thanks that the list was created during the New Year holidays, NSST was able to hand it over to PRET on January 28, 2016 at the time of the Eighth dispatch. The reason of that corresponding was thought to be due to the good relationship built such as from the witness from ECCJ at the time of equipment installation work.

(4) Cooperation with implementation system of Vietnam side

Implementation system of the Vietnamese side composes of each institution, including the MOIT, and has the duty to cooperate with each of these institutions for the smooth implementation of this project. It has kept a good communication through the first year activities with each C/Ps member of MOIT, DOIT-HCMC, PRET, etc., who involve in this project, and generally, it is able

to proceed smoothly the cooperation with the implementation system of the Vietnamese side.

(5) Sharing with C/Ps Project Design Matrix (PDM), work plan, etc

In this project, it has been operating a joint work based on PDM and work plan (PO) that is shared with the C/Ps as basic activities. Regarding to the change of these, ECCJ prepared a draft, obtained JICA's approval, piled the presentation and discussions with C/Ps at the time of business trip to the site, and shared with C/Ps. Finally, reported to the JCC and obtained its approval, and made it be the revised version of the basic activities of this project.

3.1.2 Key considerations relating to training for qualified persons for energy management and energy audit

(1) Positioning

The qualified persons for energy management and energy audit are essential human resources in the implementation of the Energy Conservation Law in Vietnam. According to Energy Conservation Law, it is necessary for certain factories and offices (designated enterprises) that have annual energy consumption of certain level or to appoint a person with an energy management qualification as an energy manager, and also to implement the energy audit by a person having the energy audit qualifications every three years. In this way, this project are those closely related to Energy Conservation Law and Energy Conservation policy, and this project is executed with particular attention to the points that training method and training contents of training qualified persons for energy management and energy audit should be based on the needs and trends of the laws and legislative system and that proceeding with taking in mind the matters related to the EMTC to be newly established according to the provisions of the Circular on the qualification system and training institutions.

In addition, for the relationship between qualified persons for energy management and energy audit, both of the business objects are different from the ones that are closely related. For the relationship of both competence and qualifications, the competence that qualified persons for energy audit is higher than the qualified persons for energy management from a technical point of view. We considered about such a point of view or the nature of qualifications of the qualified persons for energy management and energy audit and that study result was summarized in the Report on examination and qualification system of the first year.

(2) Learning items and learning method as qualified persons for energy management and energy audit

<Qualified persons for energy management>

Qualified persons for energy management, as energy managers of factories and workplaces, are core human resources to promote energy management and to meet the legal requirements. Their roles and necessary competence are as follows.

(Roles)

① Execution of energy management (grasping of current situation, organization formation, daily improvement, implementation of such as investment plan)

② Execution of the corresponding legal obligations to the Energy Conservation Law
(Necessary competence)

① The competence of performing energy management

• Grasping and analyzing about the current situation of energy consumption and forming the Energy Conservation organization

• Energy management of operation and maintenance

• Extraction of energy management point

• Planning and execution management of energy conservation measures

② Knowledge of the Energy Conservation Law and its implementation provisions

The focal point of training of qualified persons for energy management in Vietnam is the above competence ①, as the Energy Conservation Law was enacted and it is necessary to increase its implementation capacity, so that it should be obtained especially from practical point of view.

< Qualified persons for energy audit >

Qualified persons for energy audit are human resources to implement the energy audit required in the Energy Conservation law. Their role and the necessary competence are as the following.

(Roles)

① Understanding of energy use and preparing of improvement scheme

• Grasp the current situation under the support of energy administrator, furthermore, select the applied technology, extract the issues, and carry out such as measures planning

② Giving the recommendations and advice

(Necessary competence)

① The competence of reviewing the energy management process and advising

② The ability and competence of understanding the overall energy use

• The competence of such as technical findings and applied technique selection, issues extraction, improvement measures planning including making smart of energy conservation, power-saving, energy management, etc

• The competence of such as calculation of energy consumption improvement amount, evaluation of investment efficiency and priority, proposing and reporting

• The ability and personality competence of managing the energy audit

(3) Reflect the above in the implementation of the project

The review study of the curriculums, textbooks by the working group (see 2.3.4) was carried out based on the above basics. About the items that are considered to be a good idea to add to the textbooks from these points of view, the English proposal from Japan was presented, and was translated to Vietnamese by working group member of the Vietnamese side and added to the training materials, etc., with an aim to enhance the training content.

3.1.3 Key considerations for the examination and qualification system

(1) Positioning

The training is carried out in each individual training center, but the qualification is the system of the country corresponding to the Energy Conservation Law, so that the certification and testing of competence should be performed with the unified standard from the viewpoint of uniformity and stability of the qualification level.

The examination for the qualification has already been started in a unified manner by MOIT itself, and this implementation system has been also continued after the establishment of EMTC. However, advancing the development of the contents of the examination was considered. Such as the embodiment of the qualification examination and certification are summarized in the Report on examination and qualification system of the first year.

(2) Specific confirmation and advice items related to examination and qualification system

In the working group (see 2.3.4), the examination and qualification system was considered and advised with the following points.

<Contents of the qualification examination >

It is required that the content of the qualification examination is configured from a practical technology for the basic knowledge and promotion of energy conservation related to energy and the consumption of energy as qualified persons for energy management and energy audit. From this point of view, the advice was given on the development of the exam questions in Vietnam.

<Reflection of the training items of training center>

Such as training items and practical training in the EMTC are known in the laws and institutions, thereby, it is desirable to ensure the competence level of the qualified persons for energy management and energy audit. Reflecting such a point of view to the circular specifically was considered.

<Update of qualifications>

Update of qualifications has not been specifically contemplated in the current system. However, institutionalization of the update of qualifications from the point of view of disseminating the training by the EMTC to be established or training of qualified persons for energy management and energy audit in the field of industry and business and the promotion of energy conservation by this is a powerful technique. As a result of considering in the working group from this point of view, it was decided that the amendment of the notification of the update system of qualification shall be prepared.

<Reflection to the Circular>

As shown in 2.3.8, the result of considering about the revised draft in order to reflect the above discussion contents and results in the revised draft of "Provisions for training and qualification of qualified persons for energy management and energy audit" (MOIT Circular: enforcement in 2011 December, MOIT Circular No.39/2011/TT) has been submitted to MOIT.

3.1.4 Implementation method of onsite trial EA training

Trial energy audit training was carried out by the following methods. In this case, C/Ps refers to the charge of carrying out the planning, operation and management of the trial energy audit in the Vietnamese side, particularly, this time is DOIT-HCMC.

- ① Pre-adjustment
 - Explanation to C/Ps on procedure of trial energy audit training and on desire on the business areas of objective party
 - Selection of objective party for trial energy audit training, acquisition of the cooperation of the party, determination of the participants of the Vietnamese side, adjustment of the schedule by C/Ps
- ② Preliminary survey
 - Require for listing the necessary information and submitting before going to the site.
 - This time, a questionnaire of necessary items was created also in Japan, but there is a member of the energy audit company in the instructors participating in the trial energy audit trainings, and it was found that there was a questionnaire for energy audit as conventionally used, so that it is decided to use that one. Since it was already created in Vietnamese, the preparation of audit destination was also carried out smoothly, and it was able to get the answer to the previous visit.
- ③ Analysis of the preliminary survey
 - Analysis of the preliminary survey of information by audit practitioner (the person who attends OJT, hereinafter the same)
 - Carry out the advice by Japanese experts (e-mail, internet meeting, etc.).
 - Audit practitioner gathered on each first day of the trial energy audit training of the building and factory, and the analysis training of the answers to questionnaires was conducted over one full day by audit guidance experts from Japan. The energy consumption situation of the visited company and the problem whether yes or not that can be read from the question-and-answer, site verification and audit matters were exchanged and shared information and knowledge mutually by discussions and reports by the two groups.
- ④ Pre-study of local audit point
 - Include the role share of the check of audit practitioner at the site.
 - In the previous section, the energy conservation audit matters, equipment and location, etc. were identified, instruments to use and measurement contents were also planned and provided in the visiting site.
- ⑤ Audit activities in the site
 - The implementation period was assumed about three to five days depending on the size, but this time, among the four audit days at both of the building and factory, there was one day of the first day devoted for previous pre-study and one day of the last day devoted for considering and preparing report and reporting, so that the site audit itself became two days only. The number of days of the site audit was a little short, but we were able to carry out the

contents that were deeper than the simple audit.

- Implement audit activities in the field by the audit practitioner.
 - The two audit guidance experts gave the appropriate advice to the audit activities responding to the two groups.
- ⑥ Summary and Explanation of the site
- The Overview Summary as audit by audit practitioner (including suggestions for improvement) was done in the morning of the fourth day of the final day.
 - Audit guidance experts gave appropriate advice even for the summary of audit activities of each group.
 - Explain and discuss with the other party about the summary of audit result to by the audit practitioner (leader, etc.).
- ⑦ Preparation of report
- Prepare a report by the audit practitioner (including a summary of suggestions for improvement, measures effect prediction.): The report is prepared by PowerPoint by each of the two groups, the interim report was also conducted and confirmation of the contents was exchanged with experts, then the report was reported to the persons of the audited company in the afternoon of the final day. Each group also gave questions to each other, and experts from Japan provided the questions, confirmation, advice and the general comment.
 - Do advise by Japanese leadership expert (e-mail, internet meeting, etc.).
 - Send report by audit practitioner (leader, etc.) (to the visited party, C/Ps).
- ⑧ Evaluation by Japanese leadership expert
- Evaluate the implementation of the trial audit training in the whole and send to C/Ps
 - Although the PowerPoint report about audit result was in a simple style, it covered the creation of summary tables such as energy conservation effect, investment cost, payback period, implementation priorities of energy conservation measures item, too, so that it was thought that the report had easy-to-understand contents by using photos of the site and diagrams, and that the creating guidelines have been fully taught.

3.1.5 Promotion of placement of instructors and staff for the operation and training of the EMTC

In DOIT-HCMC and PRET, the draft of instructors and staff for the operation and training of the EMTC was already prepared and presented in December 2014, but in the second year, such as corresponding by the agency that can supply instructor human resources such as energy consultants like Ho Chi Minh City University of Technology, the Energy Conservation Center of Ho Chi Minh City, Ho Chi Minh City Electric Power University, ENERTEAM when necessary was also placed under consideration, so that the activities of advising and recommending to the PRET about the enhancing of such as part-time instructors were continued and promoted about the enhancing and securing the proper instructors.

A system that requires of carrying out the activities in accordance with the annual plan and reporting on a regular basis has been established by this staff.

Besides, the training on operation and maintenance management of training equipment was carried out from April to May, 2015 by NSSMC that delivered the training equipment, and regarding to this respect, the technology transfer was also thought to be done smoothly.

The trainer's training for qualified persons for energy management with training equipment was carried out in June 2015 in PRET. Instructors and leaders of this training were conducted by Nippon Steel Sumikin Management (NSSMC) as a part of the supply contract of equipment (technology transfer business). ECCJ carried out the discussion with MOIT and DOIT Ho Chi Minh City, PRET to fix the implementation of these training, and realized the participation of candidates of the future instructors for the EMTC of Hanoi that is requested on the purpose of this project. Total of sixteen (16) people participated in this training included nine (9) persons from Ho Chi Minh City who are teachers of Ho Chi Minh City University of Technology, Ho Chi Minh City Electric Power University and expert of ENERTEAM that is an energy conservation audit company in and seven (7) persons from Hanoi who are from the Energy Conservation Center in Hanoi and Electric Power University. Despite a limited number of people, technology transfer was carried out in the form of involving not only Ho Chi Minh City but also instructors of Hanoi with the intention of MOIT became even more meaningful.

3.1.6 Promotion of WG establishment and support for operation related to curriculum, text, examination system

Regarding to the activities of support and promotion for establishment of a working group on curriculums, textbooks, examination system and activities of operation, even in the second year, the working group activities is beneficial from the point of view of such as support of the training center activities, the operation of the examination system, the activities of the technical evaluation, so that along with giving advice of the activities continuation in the required range, we also supported its activities.

WG was established with the purpose of considering about the curriculums and textbooks for training the qualified person for energy management and energy audit in the EMTC and considering about the revised draft of the Circular No.39 which provide it, discussion about the technology and management content, creation and checking of the final version of the text, creation of Circular No.39 revised draft that reflects the intention of MOIT and considering of qualification exam questions were also carried out.

Members of WG includes one from MOIT as the organizer as same with the first year, four (4) people who are the deans, professors of energy management department of EPU (Electric Power University) and four (4) experts from ECCJ.

Activity period was from January 2015 until October 2015, although the start was delayed, and eight (8) meetings were carried out in total.

The work content was to review the textbooks for lecture, review of training textbooks for

training equipment and review of the Circular No.39 of MOIT on energy management training and energy audit training, but in fact, the work content became creation of text for lecture that reflects the additional material lecture from Japan to the conventional ones, review of text for the training that NSSMC provided, review of the Circular No.39 that reflects the new training programs and updates and creation of the draft one as well as submitting to MOIT. Initially, it was planned to complete between June and August 2015 for each group, but both groups slight delayed and completed in October 2015 with the reason of delayed start, and the outcomes were submitted to MOIT in December 2015.

3.2 Creative means relating to the implementation and management of the project

3.2.1 Personnel plan of this project

For personnel planning of the second year, basically, as the content that reflects a slight review based on the personnel of the first year, to continually raise a higher achievement in this business, the experts who form a strong network with C/Ps and the experts who are familiar with the implementation of each business were selected.

(1) Selection of experts who form a strong network with C/Ps

The experts who form a strong network with C/Ps were selected in order to ensure the flexibility of the project as described in "2.2 Considerations relating to this project", ensure the consistent with the existing laws and regulations, take the cooperation of the implementation system of the Vietnam side. Specifically, one person of the international cooperation division of the Energy Conservation Center, who is familiar to the Vietnam's Energy Conservation Law system and designated business operators, the qualified persons system for energy management and energy audit is assigned as the deputy operations chief, besides, requested the participation of one who has long experience of representative in Vietnam, so that a system to implement operations will be fully supported by international cooperation headquarters and the aforementioned relevant divisions of ECCJ. In addition, a cooperative system for the headquarters of JICA, its Vietnam office, local C/Ps and relevant institutions, and procurement of equipment, shall be established.

(2) Selection of experts who are familiar with the implementation of each business

Experts are assigned for considering of Energy conservation laws and regulations system, training facilities operations, examination and qualification system, training program and text as well as training curriculum for the qualified persons of energy management and energy audit.

3.2.2 The role-share work contents of each worker

The work contents and main role-share work contents that each expert is responsible for are

shown in Table 1 "The role-share work contents of each expert" below. Of these, the deputy operations chief (Vice Chief), in addition to the experience and ability required for the promotion of support for establishment of the project and promotion of the project of EMTC in Vietnam, should have a detailed knowledge of the situation in Vietnam, and have a network, and be qualified. He also served as an appropriate personnel such as support for laws and regulations when performing the overall promotion related to this project.

In addition, Mr. Kunitoku had been participating in the WG activities, but because he was unable to participate in the onsite trial energy audit training, he was replaced by Mr. Kitagawa. The replacement of the worker obtained the consent of JICA on a meeting memo dated in October 13, 2015.

Table -1: The role-share work contents of each expert

Full name	In charge	Work contents
Akira Ishihara	Chief & Energy Conservation (support for qualification and examination, laws and regulations)	<ul style="list-style-type: none"> • Planning and management of the entire project • Reflecting in the examination and qualification system and other laws and regulations • Considering and proposing related to the qualification and examination of qualified persons for energy management and energy audit
Yutaka Ogura	Vice Chief & Energy Conservation (heat A)	<ul style="list-style-type: none"> • Vice Chief • Review for training curriculum and text for the training of qualified persons for energy management and energy audit related to the field of heat of energy conservation • Support for preparing training curriculums and textbooks in MOIT WG • Guidance of onsite trial energy audit training
Hideo Kubota	Energy Conservation system	<ul style="list-style-type: none"> • Support for operational of MOIT WG • Support for ensuring instructors of training qualified persons for energy management and energy audit • Support for ensuring personnel for operation and maintenance of PRET training equipment
Kazuhide Kunitoku	Energy conservation (electricity)	<ul style="list-style-type: none"> • Review of training curriculums and textbooks for training of qualified persons

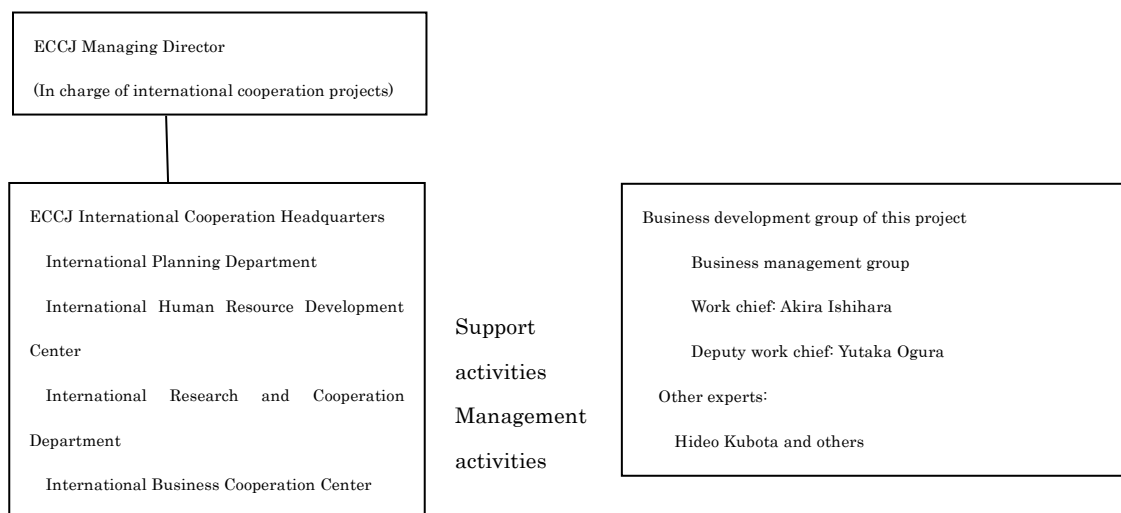
		for energy management and energy audit related to the field of electricity of Energy Conservation • Support for preparing training curriculums and textbooks in MOIT WG
Hisao Kazama	Energy Conservation (equipment operation)	• Guidance of operation confirmation of the training equipment of Energy Management Training Center • Guidance of onsite trial energy audit training
Nirou Kitagawa	Energy Conservation (heat B)	• Guidance of onsite trial energy audit training

3.2.3 Operating system

(1) Backup by the business management organization

Business operations is mainly the activity of business propulsion group of the project in which the work chief is the core one, further, by baking up that activity by the operating system of the international cooperation division of Energy Conservation Center, it ensured the implementation capacity and realized the reliable output. The crisis management system was also carried out by this business management organization. However, there was no occurrence of safety issues or a situation requiring emergency.

Figure 1: Business operations management organization chart



(2) Backup by the specialized field of each division of The Energy Conservation Center, Japan

Energy Conservation Center, Japan has contributed to the promotion of domestic energy conservation by activities related to the enforcement of the Energy Conservation Law and energy conservation policy in Japan, and established itself the positioning as the core institution of promoting energy conservation.

In addition, besides the implementation of energy conservation audit and research in factories and buildings, we also carried out the activities related to the execution of the policy and legislation on energy conservation, including the operation of the examination system for qualified persons for energy management, the activities such as study and survey of standards and systems for energy management, energy conservation guidance for energy audits, etc., holding of energy conservation technology courses and practical training courses, and have accumulated the wealth of information and management experience as well as know-how related to policies and institutions, energy management or energy conservation technologies.

In the field of international cooperation, primarily technology transfer and guidance were performed by training and dispatching experts to the developing countries such as Asia, by information gathering and dissemination in the field of international conferences, it has contributed to promoting the energy conservation in each country.

In the implementation of this project, we preceded the work steadily by taking advantage of these know-how, human resources, the network with related organizations, and along with it, we tried the best to achieve the results by the effective and efficient execution.

3.2.4 Materials and equipment necessary for the local work

It was confirmed in the MOU that C/Ps will provide the Oval Office and the necessary materials in MOIT of Hanoi and PRET of Ho Chi Minh City, but we were able to borrow a copy machine to copy the subjected document.

In addition, with respect to the Internet environment, Wi-Fi could be used in Ho Chi Minh City office of PRET.

Regarding to the office at local PRET of trainers of NSSMC for training equipment delivery, installation, technology transfer, the conference room was provided from PRET, so that we were able to carry out the business without any problems.

3.2.5 Use of local network

ECCJ has built cooperative relationships with those parties concerned in a variety of organizations all over the world by promoting cooperative and exchange projects as well as current projects in the field of energy conservation. In Vietnam, it has attained diverse achievements and built a network with MOIT and other entities involved in the promotion of energy conservation policies. In implementing this project, it made use of such cooperative relationships and networks for the purpose of smoothly promoting the work.

3.2.6 Other useful information

We at ECCJ have issued and hand out lots of brochure in English related energy conservation technique for visitors from overseas countries. Also, we are making efforts to make our activities widely understood by holding seminars in overseas countries. A variety of publications including brochures in English and Japanese, “Energy Conservation Guidebooks,” etc., may be downloaded from the URL: <http://www.eccj.or.jp/pamphlet/index.html#05>. Further, we are updating information on the Japanese legal structure relating to energy conservation, the global trend in environmental load, the Japanese and global trend in energy consumption, etc., by issuing the “Japan Energy Conservation Handbook” in English every year. This publication may be downloaded from the URL: <http://www.asiaeec-col.eccj.or.jp/databook/2013/index.html> at our website.

Also, the Japanese Business Alliance for Smart Energy Worldwide (JASE-W) was founded in October 2008, and its bureau and the corresponding international business cooperation department were established within ECCJ with an aim to expand Japanese business relating to superior energy technologies, facilities and systems in overseas countries. This entity is commonly called “JASE-W,” which comprises sixty nine (69) corporate members, nineteen (19) organization members and twelve (12) observer entities including the Japan International Cooperation Agency (JICA) and other entities under the control of the Ministry of Foreign Affairs, the Ministry of Economy, Trade and Industry, etc., as of April 2013. It is involved in support for global expansion of energy conservation business by encouraging the public and private sectors to make joint efforts. As part of this activity, “Japanese State-of-the-art Smart Energy Products & Technologies” was issued by gathering information on the latest Japanese energy conservation technologies. This publication contains a total of two hundred and eight (208) technological case examples in seven (7) fields (i.e., plant, office, life, electrical power, construction, transport, petroleum, chemistry, and iron and steel) and the contact information of the companies involved. In JASE-W, five (5) WGs are developing their own activities including exhibitions at international trade fairs. For details about the activities of JASE-W, please visit the website “<http://www.jase-w.org/english/top/>.”

3.3 Lessons learned from the implementation and management of the project

3.3.1 Structure of C/Ps

(1) MOIT

The building of project response system of GENERAL DIRECTORATE OF ENERGY/GDE

(hereinafter called MOIT GDE) of MOIT which is the center of the C/Ps of this project was applied to realize in early July 2013 or later, but due to significant delay by personnel changes of MOIT GDE and the Deputy Minister of MOIT, it became to be built in May 2014, and finally, seven (7) persons including DOIT-HCMC and PRET, following Project Director, have been determined by the MOIT Decision No. 4178. Since the structure was not built until Spring of 2014, the whereabouts of responsibility was unknown when interacting with C/Ps, or there was not much support, but right after the structure was determined in May 2014 and from then, a good communication network with the personnel of Science, Technology, Energy Efficiency & Conservation Department of GDE, MOIT, who is the official contact person, was established. Although the personnel change of C/Ps would be inevitable, we had felt the importance of building a decent system at an early stage.

(2) DOIT-HCMC

DOIT and PRET of HCMC built the structure early and supported without even waiting for the above-mentioned Decision 4178. In addition, for the delay of the application for PRET remodeling budget and approval of MOIT, they took into account the local carry-in schedule of training equipment, and made exertions in order to minimize the delay. The HCMC affiliate was corresponding with a quick and enthusiasm throughout the project period.

(3) Holding of JCC

Initially, the holding of JCC had been scheduled for third quarter of 2013, but the first meeting was delayed about one year until August 2014. The main reason of this is that the structure for this project of internal MOIT couldn't be built. According to MOIT, there were much of personnel changes of the Deputy Minister who had been in charge and the structure needed to be reorganized after new Deputy Minister was assigned.

In the second year contract period, the second JCC meeting was held on June 26, 2015 in conjunction with the opening ceremony of the PRET EMTC, and the third JCC meeting was held on December 23, 2015 at the same time with the Terminal Evaluation meeting. So these activities resulted in the efficient operation.

(4) Establishment of WG

At the first JCC (August 2014), MOIT was supposed to determine the members in the end of September, 2014. However, in fact, the members were determined in January 2015. It was found later that the TOR creation for WG establishment and the determination of the honorarium content for members are necessary to be agreed first and they couldn't do nothing but handling it. It can be said that having not considered the necessary time for honorarium decision for WG members was a reflection point.

WG activities of the second year were carried out from April 2015 to October 2015 with five (5) times of meeting (three (3) times in the first year) without any delay.

(5) Others

For operating system, in this period, not only at the C/Ps side but also at the Japan side, there were some personnel changes of person in charge and manager in JICA and the Energy Conservation Center and changes in relation to business division, etc., but it was able to operate without hindrance by close cooperation of the concerned parties.

3.3.2 Schedule adjustments

(1) Budget period

The progress of the first year was delayed about three months, so that the contract deadline of the second year was set until April 2016 instead of the end of December 2015, which was assumed at the start of business of the first year (See 1.4, "Project duration").

(2) Tet New Year

As the complete of equipment installation work of PRET was forecast to be last until Tet New Year of 2015 (February 19), we planned the complete ceremony on 12th which was one week before Tet in order to avoid the confusion, but the site started the holiday from 12th, so that we changed the complete expression ceremony to 11th. We learnt that some holiday started 7 day earlier before Tet holiday.

For the second year, February 8, 2016 falls on Tet holiday, and therefore, the original schedule of onsite training that had been planned to visit for a follow-up on February was changed to March, thus the follow-up activities in the site were supposed to be concentrated in March.

(3) Others

Site business trip period in the second year was also planned to be roughly about one week for each time except for a part. This was the arrangement in view of the effective and efficient work of the local stay and was not particularly a problem.

3.3.3 Collaboration with other entities, etc.

(1) Cooperation with equipment procurement contractor

We took a close cooperation with NSSMC, the equipment procurement contractor, in the second year, especially technology transfer training from April to June 2015, particularly TOT (Training of Trainers) training plans relating to instructor training and review of training text books of the MOIT Working Group activities. However, because NSSMC was merged to Nippon Steel Sumikin Technology (NSST) in October 2015, there was a concern about the continuity from the C/Ps with respect to the guarantee system of the training equipment and the system of supplying and contacting for spare parts in the future, but this was handled even by the new structure organization, so the problem was resolved.

(2) Cooperation with ODA Japanese Yen Loans on "Support Program to Respond to Climate Change" (SPRCC)

In the exhibition ENERTEC on energy held on July 23rd, 2015 in Ho Chi Minh City, we performed a Public Relation of the EMTC to the enterprises by PRET's booth setup and EMTC introduction. In addition, we participated in the seminar held by the Japanese Business Alliance for Smart Energy Worldwide (JASE-World) which had the office inside the ECCJ. Along with having the opening remarks done by DOIT Ho Chi Minh City, we were introduced of SPRCC by JICA Vietnam Office member, carried out dissemination of technology of Japanese companies and cooperation activities with SPRCC in cooperation with DOIT Ho Chi Minh City.

(3) Cooperation with other JICA projects trustee

With the "Dissemination and demonstration project", the project of assisting overseas development of small and medium-sized enterprises of JICA, Oosumi Inc. was decided to implement the "Dissemination and demonstration project of energy conservation audit technology and energy conservation effect using a simple measurement method" in Da Nang, Vietnam for 2 years from 2015. Responding to the demand of information sharing of the project overview from the company and the demand of training facility tour and training participation at PRET of Ho Chi Minh City including the concerned parties of Da Nang, we explained the situation as well as introduced the concerned parties of DOIT-HCMC and PRET.

4. Degree of attainment of the project goal

In the result of evaluation by JICA Terminal Evaluation study team, confirmation of actual performance and degree of attainment of the project goal of the performance has been evaluated as follows.

【Achievement 1】 The training curriculums, textbooks, training equipment for training qualified persons for energy management and energy audit are developed.

--- Each index of the achievement 1 has been achieved, degree of attainment of achievement 1 is high.

【Achievement 2】 Counterparts will be able to carry out practical training for qualified persons for energy management.

--- All of evaluation index of achievement 2 has been achieved, degree of attainment of achievement 2 is evaluated to be high.

【Achievement 3】 Counterparts will be able to carry out practical training for qualified persons for energy audit.

--- All of evaluation index of achievement 3 has been achieved, degree of attainment of achievement 3 is evaluated to be high.

【achievement 4】 Awareness-raising ability of energy conservation activities to corporate counterparts is strengthened.

--- Degree of attainment of achievement 4 is evaluated to be high. (Note 1)

【Degree of attainment of the project goal】

--- Project goal is evaluated to be achieved at the end of the project. (Note 2)

Five (5) evaluation items of evaluation results by JICA Terminal Evaluation study team are as follows.

- (1) Validity: high
- (2) Effectiveness: high
- (3) Efficiency: slightly high (Note 3)
- (4) Impact: high
- (5) Sustainability: slightly high (Note 4)

(Note 1) It is cited that the contents of the opening ceremony and the training center was reported on TV and was public widely, and that public relations activities such as through public relations in ENERTEC (2015/7) by PRET, introduction of various laws and regulations on energy conservation in the home page of MOIT, news introduction of energy conservation activities are ongoing. In addition, it is cited that the building of cooperative relationships (network) with various universities of trainers with PRET and energy conservation related companies, the implementation of energy conservation learning by training equipment of PRET for university students of engineering shall be discuss between the parties, and the business of PRET is being larger recognized by such as issuing the instruction document about participating in the training of PRET by Ho Chi Minh City People's Committee.

(Note 2) It is cited that a facility that has a function as EMTC's planning was opened inside PRET, the installed training equipment is showing the planned performance, and regarding to training for instructors, necessary technology transfer was carried out by the implementation of a series of practical trainings. In addition, with respect to the enactment of the revision of training curriculums, textbooks that includes practical training and examination and qualification system, it is cited that its contents through WG activities have been completed as revised text of Circular No.39, and that the revision procedures will begin in 2016, and it is confirmed to be formally enacted in 2017. Moreover, together with it, it has been also pointed out that Japanese experts will join the training carried out by PRET for 3 months from January to March, 2016, that was extended by the agreement to provide advice and comments.

(Note 3) It is cited that though it was able to implement the training for instructors efficiently, direct communication with related organizations is sufficiently in some scenes for not dispatching long-term experts due to the difficulty of the right personnel selection, and that the remodeling work of PRET in Vietnam side was delayed, etc.

(Note 4) It is noted that the allocation from the national budget for the administrative expenses of EMTC is not necessarily sufficient, and DOIT-HCMC has shown the intention to secure a part of the training implementation budget, and continue to discuss if there is a formal request of MOIT.,

In addition, in the Terminal Evaluation result table, it was evaluated that the Vietnam side strongly recognizes and highly trusts the actual achievement, technology, efforts of Japan side, and that the situations of being developing energy-conservation-related legislation system, the ability of organizing a WG comprised of MOIT, Vietnamese experts, Japanese experts to consider in accompaniment with a subjectivity that is efficient and needed in Vietnam side, etc., led to a smooth implementation of the project. For these points, from the point of view of execution of the project the achievement of project goals, such as the following elements became a strong driving force.

(1) The energy conservation legislation system that was constructed with Japan as a reference, the trust of the Vietnamese government to the human resource development and technology of Japan, furthermore, the consistent implementation intention of the Vietnamese side on the basis of these, and the cooperation and network with the Vietnam side that the Japanese side formed through project activities

Energy conservation legislation has already been established; this project has been positioned as necessary for promoting its effectiveness; placing the EMTC in PRET has been agreed. Based on these, cooperate relationship of MOIT, DOIT - HCMC, PRET has become the basis of this project. As a result, though there were issues such as taking time to decide the Promotion Officer of MOIT, delaying of remodeling work of PRET due to the budget of the Vietnamese side, a lot of time taking of customs clearance, etc., ultimately, the project was smoothly advanced by the efforts of

each institution.

The Energy Conservation Law itself is the one that used the Energy Conservation Law of Japan as a reference, the trust of the Vietnamese side to the findings in the energy conservation technology and human resource development of Japan is thick, and the activities of Japanese side were also carried out in order to further enhance its reliability. This trust relationship reinforces the communication between institutions such as MOIT and DOIT-HCMC and the consistent implementation intention in the Vietnamese side.

The Japanese side not only did the technology transfer merely, but also paid attention to close communication with MOIT, DOIT-HCMC, PRET and form the cooperation relationship and network. By this network, authority and activities of each of the above institutions is finally matched and it has contributed to the promotion of the project.

By establishment of energy conservation training center in Ho Chi Minh City, training system for qualified persons for energy management and energy audit of Vietnam has been greatly enhanced. MOIT, DOIT-HCMC, PRET have expressed its intention for the utilization and development of EMTC, and expected that strengthening of the effective of the Energy Conservation Law such as training of the qualified human resources for energy conservation in the future, appointment of competent energy administrator in companies and effective implementation of the statutory energy audit, energy conservation potential by development of energy conservation activities in the enterprise would be realized.

(2) Based on the cooperation and the network of (1), WG was formed under the independence of MOIT, framework with human resource development of EMTC, which is the core, was formed under independence of the Vietnam side and strong support activities of the Japanese side such as considering about curriculums, textbooks, examination system and revised draft of Circular No. 39.

WG was formed by the implementation of the Energy Conservation Law nominated by MOIT and the participation of Vietnamese experts, such as member of the Electric Power University (Hanoi) of deep relationship, the participation of Japanese experts as support, and they consider about curriculums, textbooks, examination system and revised draft of Circular No. 39. This helps to strengthen the implementation independence of the Vietnam side, to make the amendment of Circular No. 39 have more possibility of transiting to the process of realization, and along with it, it has become possible to effectively implement the textbooks development in Vietnamese.

In addition, at the same time, WG activities increase the cooperation of academic background and EMTC, become the effective foundation of EMTC that shall be established in the future besides Ho Chi Minh City such as Hanoi where this project is assumed to be executed by the Vietnamese side in the future.

5. Recommendations towards achieving the higher goal

In the Terminal Evaluation report (prepared by JICA Terminal Evaluation Study Team), there are five (5) recommendation items as follows.

(1) Effective utilization of extended period of the project (PRET and Japanese experts)

It is effective that Japanese experts are participating as observers to provide comments and advice to the improvement of practical training.

(2) Sharing of know-how of training center operations between the related EMTC (MOIT & EMTCs)

It is necessary to provide the opportunity for EMTC other than PRET (for example Hanoi), to share the operational know-how obtained from the training activities in PRET in the future.

(3) Continued publicity of energy conservation measures (MOIT)

It is necessary to continue the public relations activities that MOIT is working on, in order to ensure the widespread use of energy conservation measures and the expression of the reliable effect of energy conservation.

(4) Continuous monitoring by measurement indicator of the higher goal (MOIT)

It is important to aggregate data by use of the trace method proposed in the baseline report by MOIT, DOIT-HCMC, PRET and share between Japan and Vietnam.

(5) Ensuring the sustainability of institutional aspect, financial aspect and technical aspect (MOIT)

The revised Circular No.39 to be enforced in 2017 should be put into force certainly by MOIT, and the Vietnam side has to secure the budget necessary for the maintenance of the practical training equipment of EMTC.

Of these, (1) and (5) are items for the operation of EMTC. (1) is conducted as a follow-up matter before finishing the project after the Terminal Evaluation (see 2.3.13 of this report). About (5), the Vietnamese side has expressed its implementation, and is carrying out the actions such as creating Circular proposal, exchanging with MOIT and DOIT about the idea of securing the budget. In the future, ensure correspondence in Vietnam side can be expected.

(4) is a proposal from the point of view to monitor the impact of this project against the upper target. The specific methods for grasp of monitor data was discussed between DOIT, PRET and the sharing of its contents with MOIT is conducted as a follow-up matter before finishing the project after the Terminal Evaluation (see 2.3.16 of this report). Its contents are intended to tie the improvement of energy use in the energy using companies (energy intensity) with the training for qualified persons for energy management and energy audit which is the activity purpose of EMTC. It can be said that such grasp activities not only contribute to the understanding of the effects of the project, but also help to understand the actual situation of energy conservation in the enterprise.

Total energy consumption of 1725 designated enterprises in 2013 is 16,974 kTOE excluding that of 22 power plants, and it shares 58 % of total energy consumption of industry, building and transportation sectors, which are the background of the designated enterprises. Energy consumption volume of these three sectors also shares 84% (in 2013) of that of whole Vietnam. Based upon the

Baseline Survey Report result, it is necessary to have the target of 5% reduction on energy intensity in the designated enterprises in five years from 2016 to 2020, and to monitor it from now on. Supposing 5% reduction of the energy consumption of the designated enterprises it would be $16,974 \times 0.05 = 849$ kTOE (as equivalent of 2,431 kTon-CO₂*1*2 reduction), so it would be said **this target has a very big impact*2**. For reference, as 5% reduction in five years is equivalent as 1% reduction per year, so this impact is equivalent to be 0.4% ($0.84 \times 0.58 \times 0.01$) of whole Vietnam energy consumption.

(2) and (3) are related to measures to continue to disseminate the effect in the whole Vietnam. About (2), in this project, it is expected that the candidate of future instructors of Hanoi will be able to participate in the training for instructors, textbooks and curriculums are being prepared for the entire Vietnam target under the participation of Vietnamese government and the academic members of Hanoi, moreover, information about the equipment and components required for the promotion of EMTC of Hanoi by the Vietnamese government has already been made measures in the form of such as already being shared by the Vietnamese side, etc., and these will be utilized in the Vietnam side.

About (3), also in the period of this project, (3) has been carried out in the form of such as EMTC opening ceremony, TV broadcasting, provision of information in ENERTEC, but associated with legislation such as Circular No.39 which will be revised in the future, also, penetration activities to companies on strengthening and utilization of EMTC and qualified persons for energy management and energy audit by the Vietnamese government are expected. Penetration of the awareness of the significance and effectiveness of EMTC to the companies will strengthen the role of EMTC and contribute to the activation of energy conservation activities in the enterprise and the strengthening of human resources for energy conservation and efficient economic development in Vietnam.

Remarks *1: CO₂ Coefficient of Crude Oil: $2.8641 \text{ Ggt-CO}_2/10^{10}\text{kcal}$, $1 \text{ TOE} = 1 \times 10^7 \text{ kcal}$,
 $849 \text{ kTOE} = 849 \times 10^{10} \text{ kcal} = 849 \times 2,8641 \text{ Gg-CO}_2 = 2,431 \text{ kton-CO}_2$)

Remarks*2: In case of the annual CO₂ discharge of Japanese Ultra-supercritical-pressure coal fired power plant (1000MW, Utilization rate of the facility as 70%) is 4,500- 5,000 kton-CO₂, this figure is equivalent to the reduction volume to offset approx. 50 % of it.

The end

Project Design Matrix (PDM) – Version 2 (revised on 25th June, 2015)

Project Name: The Project on Establishment of Energy Management Training Center (Stage 2)

Project Area or Location: General Directorate of Energy , Ministry of Industry and Trade (MOIT) in Hanoi, and Plastic- Rubber Technology and Energy Conservation Center (PRET), Department of Industry and Trade (DOIT) in HCMC

Target Group: Direct beneficiaries: MOIT, DOIT-HCMC, PRET

Indirect beneficiaries: Instructors of EMTC in HCMC and Hanoi, and Energy Managers and Energy Auditors of the Designated Enterprises, that annually energy consumption of 1000 ton or more of Oil Equivalent fuel for Industrial Sector and annually energy consumption of 500 ton or more of Oil Equivalent fuel for Commercial Sector

Project Period: From 1st July 2013 to 31st March 2016 (2.75 years)

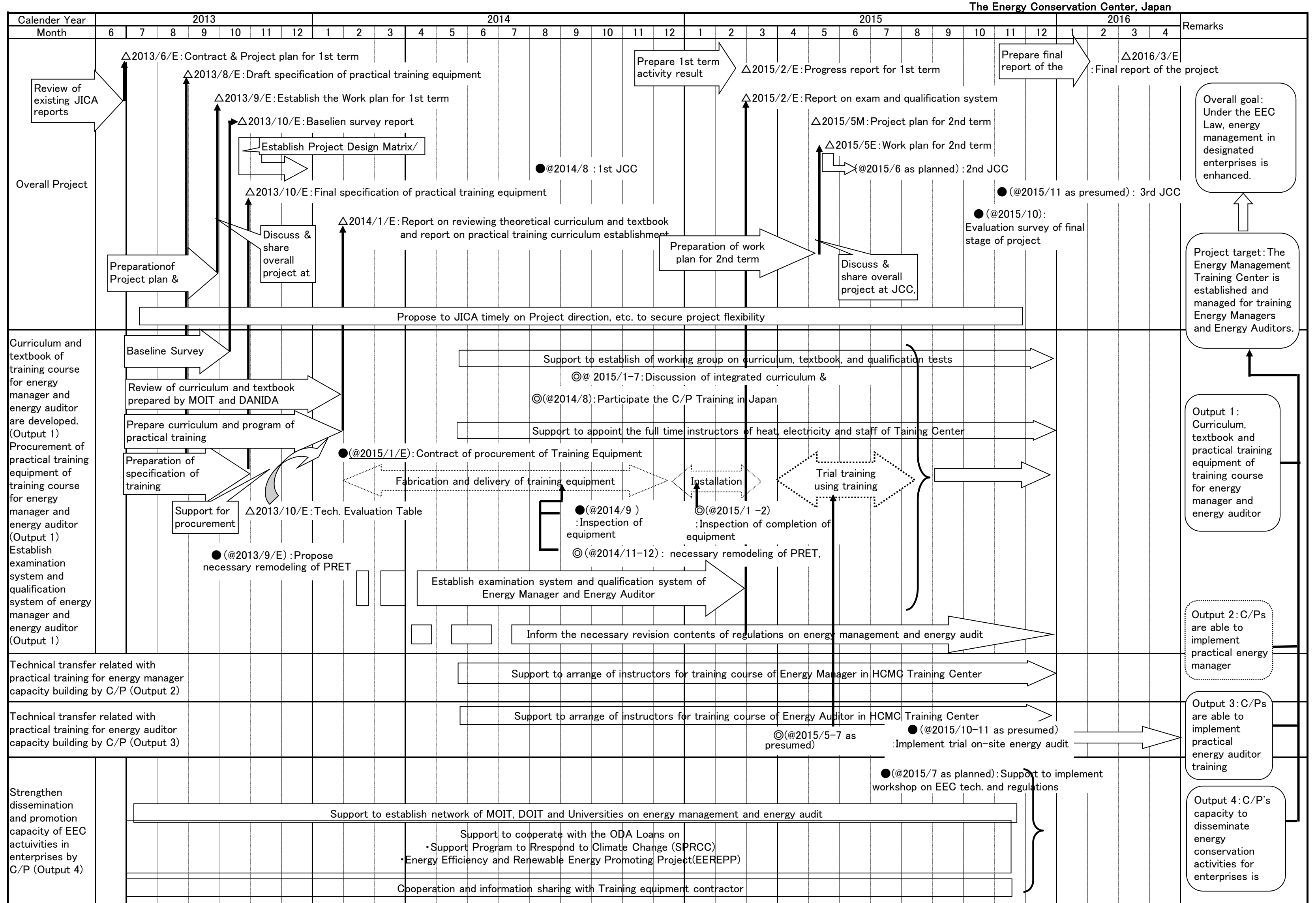
Version 1: to 31st December 2015 (2.5years)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
<p><u>Overall Goal</u> Under the Law on Energy Efficiency and Conservation, energy management in designated enterprises is enhanced.</p>	<p>Energy intensity of designated enterprises is reduced by 5%, comparing the data between 2016 and 2020.</p>	<p>Government information (by MOIT)</p>	
<p><u>Project Purpose</u> The Energy Management Training Center is established and managed for training Energy Managers and Energy Auditors.</p>	<p>Establishment of training and qualification system of energy manager and energy auditor</p> <p>Curriculum and textbook are completed as Guiding Document of the Minister.</p>	<p>Records of trial training course</p> <p>Questionnaire by JICA experts</p> <p>Annual operation reports</p> <p>Mid-term planning on energy conservation</p> <p>Test paper and record sheet of practice examination</p>	<p>Energy data management system is developed and operated by the Government.</p> <p>The designated enterprises properly implement their mandate to assign energy managers, submit energy management reports, and receive energy audits according to the law.</p> <p>Government policy to promote energy conservation activities is maintained.</p>
<u>Outputs</u>			

<p>1. Curriculum, textbook and practical training equipment of training course for energy manager and energy auditor are developed</p> <p>2. C/Ps are able to implement practical energy manager training</p> <p>3. C/Ps are able to implement practical energy auditor training</p> <p>4. C/P's capacity to disseminate energy conservation activities for enterprises is strengthened.</p>	<p>1-1 C/P's establish curriculum and program of practical training course.</p> <p>1-2 C/P's are able to develop textbook and materials of practical training course</p> <p>1-3 C/P's are able to operate training equipment for practical training course.</p> <p>2-1 C/P's are assigned for training course.</p> <p>2-2 C/P's are able to utilize training facilities and equipment efficiently.</p> <p>2-3 C/P's are able to maintain training facilities and equipment sufficiently.</p> <p>3-1 C/P's are assigned for training course.</p> <p>3-2 C/P's are able to instruct energy audit report of factories and buildings in accordance with Circular 09/2012/TT-BCT</p> <p>3-3 C/P's are able to implement training courses.</p> <p>4-1 C/P's disseminate energy conservation technology and case studies to designated enterprises.</p> <p>4-2 Network of DOIT, MOIT, universities and factories on energy management is established.</p>	<p>1-1 Printed curriculum and program</p> <p>1-2 Evaluation of developed training materials and textbooks by trainees</p> <p>1-3 Performance test record and operation record of training equipment</p> <p>2-1 Organization chart and training course record</p> <p>2-2 Information from trainees and JICA experts</p> <p>2-3 Information from trainees and JICA experts</p> <p>3-1 Organization chart and training course record</p> <p>3-2 Evaluation of energy audit report of factory and building prepared by C/P.</p> <p>3-3 Evaluation of training courses by the trainees</p> <p>4-1 Record of workshops</p> <p>4-2 Evaluation of network document</p>	<p>Trainers of the Energy Manager Training and Energy Auditor Training stay within the organization.</p>
<p><u>Activities</u></p>	<p>Inputs</p>		

<p>1-1 Implement baseline survey</p> <p>1-2 Appoint the full time instructors of heat, electricity and staff of training center</p> <p>1-3 Establish working group on curriculum, textbook, and qualification tests</p> <p>1-4 Review curriculum and textbooks so far prepared by MOIT and DANIDA</p> <p>1-5 Prepare curriculum and program of practical training course for Energy Manager and Energy Auditor</p> <p>1-6 Install training facilities and equipment</p>	<p>The Vietnam Side</p> <p>1. Local personnel</p> <ul style="list-style-type: none"> - Project Director - Project Manager - Project Coordinator - Professors of the universities - Administrative Staff - Trainers and Maintenance Staff 	<p>The Japanese Side</p> <p>1. Personnel</p> <p>Short-term experts</p> <ul style="list-style-type: none"> - Expert on Heat Technology - Expert on Electricity Technology - Experts for supervision of installation - Experts on curriculum and textbook 	<p>Necessary support from related institutions are provided.</p>
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<p>1-7 Prepare operation and maintenance manual including spare parts list of training equipment and measurement devices</p> <p>1-8 Prepare textbook of practical training course</p> <p>1-9 Establish examination system and qualification system of Energy Manager and Energy Auditor</p> <p>1-10 Inform the necessary revision contents of regulations on energy management and energy audit</p> <p>2-1 Appoint instructors for training course of Energy Manager in HCMC Training center</p> <p>2-2 Carry out the practical training on its operation and maintenance</p> <p>2-3 Carry out the training on energy conservation by training equipment.</p> <p>2-4 Implement trial training course for Energy Manager</p> <p>3-1 Appoint instructors for training course of Energy Auditor in HCMC training center</p> <p>3-2 Carry out the practical training on its operation and maintenance</p> <p>3-3 Carry out the training on energy conservation by training equipment.</p> <p>3-4 Implement trial training course for Energy Auditor</p> <p>3-5 Implement trial energy audit in factories and buildings</p> <p>4-1 Implement workshop on energy conservation technology and regulations</p> <p>4-2 Establish network of MOIT, Department of Industry and Trade (DOIT) and Universities on energy management and energy audit</p>	<p>2. Land, building(s), rooms and facilities</p> <ul style="list-style-type: none"> - Office & necessary facilities for the Japanese experts and Vietnamese C/P. - Meeting room(s) for the transfer of technology. - Buildings, facilities and space necessary for the equipment and materials to be provided by JICA <p>3. Local cost</p> <ul style="list-style-type: none"> - Allocation of the budget necessary to implement the Project, including the in-land transportation and installation cost for the equipment. 	<ul style="list-style-type: none"> - Experts on energy audit - Experts on examination system and qualification of Energy Management and Energy Auditor - Appropriate number of other experts will be dispatched as necessary arises. <p>2. Training of C/P in Japan Approx 5-10 instructors for training course of Energy Manager and Energy Auditor</p> <p>3. Machinery and Equipment including measurement devices.</p>	<p>Preconditions</p> <p>Necessary budget, office space and training facilities for the project are allocated.</p>
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Remarks: △/Prepare report, ●/Required activities, ◎/Proposed activities, [dashed box]/Activities by Training equipment contractor

WORK BREAKDOWN STRUCTURE of Work Plan of "The Project Implementation Contract for the Establishment of Energy Management Training Center in Vietnam (Stage 2)"

May 25, 2015

Contents of this Project (by the Duty)	2014												2015												2016																											
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4																		
(Referential Information)													Lunar New Year Holiday: 2014/1/31 ~												Lunar New Year Holiday: 2015/2/19 ~																											
1. Contract on Procurement of Training Equipment													●(2015/1/B)																																							
2. Planned Schedule of fabrication, delivery, installation of training equipment and trial training at PRET (Output 2 & 3)													Fabrication and Delivery of Training Equipment												Installation of TR Equipment												Trial Training using TR Facilities															
I . Overall Project																																																				
1. Contract preparation	△2013/7/11 : Contract (First Term)																								△2015/4/B : Second Term Contract																											
First Term Contract	←																								→																											
Second Term Contract																									←												→															
2. Preparation of Project Plan	△until 2013/7/21 : Project Plan (for First Term) : to be submitted within 10 days after the contract																								△2015/4/B : Preparation of Project Plan for second term																											
3. Preparation of Work Plan : Make Basic Policy, Project Procedure, Project Implementing Plan, etc.	△2013/9/E : Preparation of Work Plan for first term																								△2015/5/B : Preparation of Work Plan for second term																											
4. Establish Project Design Matrix/ PDM (Output 1)																																																				
5. Implement Baseline Survey (Output 1)	△2013/10/E : Submit Baseline survey report																																																			
6. Hold the JCC (Joint Coordinating Committee) : Discuss, exchange and sharing whole picture of the Project opinions in the JCC, etc.													●1st JCC (@2014/8)												●2nd JCC (@2015/6 as planned)												●3rd JCC (@2015/11 as planned)															
7. Propose to JICA properly on the direction of the Project, etc. ,if necessary, in order to have the flexibility of the project																																																				
8. Support to establish the network among EEC related organization (Output 4)																																																				
9. Support for cooperation with Japanese Yen Loan project (Output 4)																																																				
Cooperation with the ODA Loans on Support Program to Respond to Climate Change (SPRCC) and on Energy Efficiency and Renewable Energy Promoting Project (EEREPP)																																																				
10. Cooperation with the Contractor of Procuring the Training Equipment (Providing Facilities, Conduction the Training in Japan, and Dispatching Short Term Experts), and share the information (Output 4)																																																				
11. Preparation & submit the monthly working report of the project members in the consultant	△												△												△												△															
12. Summarize the progress of the Project for the first term and the second term																									△2015/2/B												△															
13. Evaluation survey of the final stage of the Project																																					△2016/3/B															
II . Curriculum and textbook of training course for energy manager and energy auditor are developed.(Output 1)																																																				
1. Review curriculum and textbooks so far prepared by MOIT and DANIDA	△2014/1/E : Submit Report on reviewing curriculum and textbooks by MOIT and DANIDA																																																			
2. Prepare curriculum and program of practical training course for energy manager and energy auditor	△2014/1/E : Submit Report on Curriculum and program of practical training course																								◎(@2015/1-7 as planned) : Meeting on reviewing final consolidated curriculum and textbook by MOIT WG																											
3. Participate for C/P Training in Japan, and evaluate																									◎(@2014/8-9)																											
4. Attend the training by training equipment at site																									◎(@2015/6-7 as planned)																											
5. Implement trial energy audit in factories or buildings																																					●(@2015/10 as planned)															
III . Procurement of practical training equipment of training course for energy manager and energy auditor (Output 1)																																																				
1. Preparation of specification draft of training equipment and its training function	△2013/8/E : Submit Specification of training equipment and its training function (Tentative draft)																																																			
	△2013/10/E : Submit Specification of training equipment and its training function (Draft Final)																																																			
2. Preparation of technical evaluation table (draft)	△2013/10/E : Submit Technical Evaluation Table (draft)																																																			
3. Support for Procurement (attend pre-bid explanation)													●(@2014/1)																																							
4. Review necessity of remodeling of PRET building and propose to C/P	●(@2013/9/E)																																																			
5. Inspection of Training equipment (at delivery and after completion)																									●(@2014/9)												◎(@2015/1-2)															
IV . Establish examination system and qualification system of energy manager and energy auditor (Output 1)																																																				
1. Establish examination system and qualification system of energy manager and energy auditor																									△2015/3/E : submit report on exam and qualification system																											
2. Inform the necessary revision contents of regulations on energy management and energy audit																																																				
V . Support to implement workshop on energy conservation technology and regulations (Output 4)																																																				
																																					●(@2015/7 as planned)															

Remarks : △/Preparation of report, ●/as ordered by JICA, ◎/as proposed by the consultant

(Output 1) Curriculum, textbook and training equipment of training course for energy manager and energy at (Output 2) C/P's are able to implement practical energy manager training

(Output 3) C/P's are able to implement practical energy auditor training

(Output 4) C/P's capacity to disseminate energy conservation activities for enterprises is strengthened

④ Expert dispatch result vs plan

March 25, 2016

Expert dispatch is carried out according to the original plan and revised plan, and total dispatch frequency was nine (9) times, total dispatched personnel was thirty (30), and total dispatched days was 162, although some dispatches were a little delayed. Detail of dispatch contents in the second term is shown in below table.

No. of dispatch	Duration	Dispatched personnel	Main purpose	vs plan
First	2015/5/11-14	Ishihara, Kubota, Ogura	Hold forth MOIT WG and observe part of Trainers training	As planned
Second	2015/6/23-27	Ishihara, Kubota, Ogura	Hold fifth MOIT WG, observe part of Trainers training, hold second JCC, and attend the opening ceremony of PRET EMTC	As planned
Third	2015/7/20-25	Ishihara, Kubota, Ogura, Kunitoku	Hold sixth MOIT WG	As planned
Forth	2015/9/9-12	Ishihara, Kubota, Ogura, Kunitoku	Hold seventh MOIT WG	As planned
Fifth	2015/10/14-23	Kubota, Ogura, Kazama, Kitagawa	Hold eighth MOIT WG and conduct trial onsite energy audit at building	As planned
Sixth	2015/11/23-29	Kubota, Ogura, Kazama, Kitagawa	Conduct trial onsite energy audit at factory	As planned
Seventh	2015/12/6-24	Ishihara, Kubota, Ogura	Guide the terminal evaluation team of JICA to visit C/Ps and hold third JCC	As planned
Eighth	2016/1/26-30	Kubota, Ogura	Confirmation of training program in 2016 and schedule of Circular 39 revision and preliminary discussion on the following issue	As planned

No. of dispatch	Duration	Dispatched personnel	Main purpose	vs plan
Ninth	2016/3/8-19	Ishihara, Kubota, Ogura	Confirmation and discussion on following issue, and request for future cooperation	As planned by revision

⑤ Training Result in Vietnam

March 25, 2016

Although ECCJ didn't have the training courses in Japan, we assisted on the Training of Trainers at PRET and we conducted the trial onsite energy audit training,

1. Training of Trainers (TOT) : TOT for the lecturers using the training equipment was implemented in June 2015 by NSSMC (Nippon Steel Sumikin Management Co.), who had delivered the equipment. In addition to nine lecturers in PRET, ECCJ consulted with MOIT to consider other lecturers in other city, MOIT decided to add seven lecturers from Hanoi, so total 16 members were selected as the participants for TOT.

Region	No.	Name	Organization
Ho Chi Minh	1	Dr. Nguyen Van Tuyen	HCM University of Technology
	2	Dr. Nguyen Nhat Tan	HCM Electric College
	3	Dr. Nguyen Thi Minh Trinh	HCM University of Technology
	4	Dr. Tran Van Hung	HCM University of Technology
	5	Dr. Ha Anh Tung	HCM University of Technology
	6	Mr. Ma Khai Hien	ENERTEAM
	7	Mr. Tiet Vinh Phuc	ENERTEAM
	8	Dr. Dang Tan Tai	PRET
	9	Mr. Phan Tan Phong	PRET
Hanoi	1	Ms. Tran Thi Loan	ECC-Hanoi
	2	Mr. Nguyen Tuan Anh	ECC-Hanoi
	3	Mr. Dan Hong Quang	ECC-Hanoi
	4	Mr. Tran Anh Thinh	ECC-Hanoi
	5	Mr. Nguyen Dinh Tuan Phong	EPU (Electric Power University)
	6	Mr. Mai Sy Thanh	EPU (Electric Power University)
	7	Mr. Do Huu Che	EPU (Electric Power University)

2. Trial Onsite energy audit training : ECCJ conducted the trial onsite energy audit training for the lecturers in PRET at the building, Hung Vuong Plaza in October 2015, and at the factory, Saigon Tobacco Company in November 2015. Lecturers and other related member as shown in the next table were participated.

No.	Name	Organization
1	Dr. Nguyen Van Tuyen	HCM University of Technology
2	Dr. Nguyen Nhat Tan	HCM Electric College
3	Dr. Nguyen Thi Minh Trinh	HCM University of Technology
4	Dr. Tran Van Hung	HCM University of Technology
5	Dr. Ha Anh Tung	HCM University of Technology
6	Mr. Ma Khai Hien	ENERTEAM
7	Mr. Tiet Vinh Phuc	ENERTEAM
8	Mr. Lam Thai Duy Linh	ENERTEAM
9	Mr. Dang Quang Vinh	ENERTEAM
10	Mr. Lam Huu Tan	ENERTEAM
11	Dr. Dang Tan Tai	PRET
12	Mr. Phan Tan Phong	PRET
13	Ms. Nguyen Thi Kim Anh	PRET
14	Mr. Phan Minh Tuan	DOIT-HCMC

3. Training seminar : Training seminar was held for the eleven (11) PRET lecturers by ECCJ and Dr. Kien of EPU, who was the leader of MOIT WG in November 2015, introducing revised contents of curriculum and textbook and related circular 39. Participants were shown in the below table.

No.	Name	Organization
1	Dr. Nguyen Van Tuyen	HCM University of Technology
2	Dr. Nguyen Nhat Tan	HCM Electric College
3	Dr. Nguyen Thi Minh Trinh	HCM University of Technology
4	Dr. Tran Van Hung	HCM University of Technology
5	Dr. Ha Anh Tung	HCM University of Technology
6	Mr. Ma Khai Hien	ENERTEAM
7	Mr. Tiet Vinh Phuc	ENERTEAM
8	Dr. Dang Tan Tai	PRET
9	Mr. Phan Tan Phong	PRET
10	Ms. Nguyen Thi Kim Anh	PRET
11	Mr. Phan Minh Tuan	DOIT-HCMC

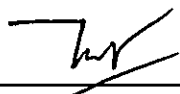
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**MINUTES OF MEETING
OF
THE 2nd JOINT COORDINATING COMMITTEE
ON
THE PROJECT FOR THE ESTABLISHMENT OF
ENERGY MANAGEMENT TRAINING CENTER (STAGE 2)
IN VIETNAM**

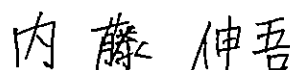
The 2nd Joint Coordinating Committee (hereinafter referred to as "JCC") meeting of the Project For The Establishment of Energy Management Training Center in Vietnam (Stage 2) (hereinafter referred to as "the Project") was organized on the 25th June, 2015 at the Plastic-Rubber Technology and Energy Conservation Training Center (hereinafter referred to as "PRET"), Ho Chi Minh. The meeting was chaired by Mr. Trinh Quoc Vu, Director, Science Technology and Energy Efficiency Department, General Directorate of Energy, Ministry of Industry and Trade (hereinafter referred to as "MOIT") for the purpose of discussing the framework and activities conducted under the Project, reviewing the progress and exchanging views on major issues arising from or concerning the Project.

As a result of the 2nd JCC meeting, Japanese side and Vietnamese side (hereinafter referred to as "both sides") agreed to the matters referred to in the document attached hereto.

Ho Chi Minh, 25th June, 2015



Mr. Trinh Quoc Vu
Director
Science Technology and Energy Efficiency
Dept. General Directorate of Energy
Ministry of Industry and Trade, Vietnam



Mr. Shingo Naito
Assistant Director
Industrial Development and Public
Policy Dept.
Japan International Cooperation Agency



Mr. Nguyen Phuong Dong
Deputy Director
Department of Industry and Trade Ho Chi
Minh City
Vietnam

Main Points Discussed

1. **Completion of the Renovation of the Workshop**
Both sides confirmed that the renovation of the workshop at PRET has been successfully completed in January 2015.

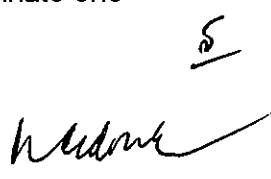
2. **Completion of the Installation of Training Equipment for PRET**
Both sides confirmed that the installation and commissioning of the training equipment for PRET has been successfully completed in 11th February 2015 by Nippon Steel & Sumikin Management Co., Ltd (hereinafter referred to as "NSSMC"). Both sides also confirmed that the training equipment was handed over to PRET on 11th February 2015 with the ownership of assets and the responsibility of operation and maintenance.

3. **Completion of practical training on its operation and maintenance**
Both sides confirmed that practical training on its operation and maintenance using training equipment has been successfully completed for the five members of PRET by NSSMC in April 2015.

4. **Trial Trainers' Training for Energy manager and Energy Auditor training courses**
Both sides confirmed that the trial trainers' training had been held by NSSMC, starting from 8th June and finishing on 26th June 2015 at PRET as Appendix 1.

5. **Opening Ceremony of PRET Energy Conservation Training Center (hereinafter referred to as "EMTC")**
Both sides agreed that the opening ceremony of PRET EMTC will be held on 26th June 2015 to announce and celebrate opening PRET EMTC.

6. **Onsite Energy Audit Trainers' Training**
Both sides agreed that the onsite energy audit trainers' training by The Energy Conservation Center, Japan (hereinafter referred to as "ECCJ") will be held, possibly in October 2015 for two weeks. Department of Industry and Trade (hereinafter referred to as "DOIT")-HCMC and PRET will select and coordinate one factory and one building as onsite by September 2015.



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7. MOIT Working Group

Both sides confirmed that MOIT Working Group (hereinafter referred to as "WG") had already functioned with MOIT, Electric Power University and ECCJ since January 2015. One subject is to prepare new curriculum and training materials for the Energy Management Training course and Energy Audit Training course, and the other is to provide draft of the revised Circular No. 39/2011/TT-BCT on Training and Certification of Energy Manager and Energy Auditor. Draft Circular will be prepared possibly by August 2015 by WG.

8. ENERTEC Expo HCMC 2015

Both sides agreed that PRET EMTC Project should be introduced at the booth of DOIT-HCMC and the seminar at ENERTEC Expo 2015, which will be held from 22th to 25th July, 2015 in HCMC.

9. Start of Operation of PRET EMTC

Both sides agreed that operation of PRET EMTC will start in January 2016, and that it would be recommended to announce the PRET EMTC training courses by December 2015 in advance.

10. Extension of Project period

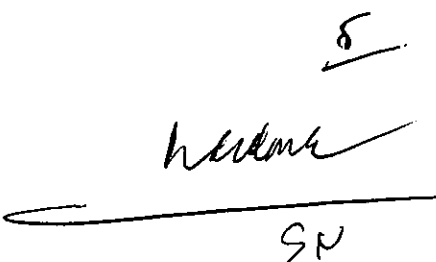
Both sides discussed and agreed that it is necessary that the Project end date would be extended from 31st December 2015 to 31st March 2016, due to the delay of PRET's renovation and following training for the project. Both sides agreed to work for the amendment of Memorandum of Understanding which is subject to the approval of relevant authority in each side.

11. Project Terminal Evaluation and Third JCC

Both sides agreed that Project Terminal Evaluation and Third JCC would be carried out jointly possibly in December 2015.

Appendix 1 List of participants for the Trial Trainers' Training

Appendix 2 List of participants of 2nd Joint Coordinating Committee

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Appendix 1

List of Participants for the trial trainers' training

No.	Region	Full Name	Organization	Professional description	Heat or Electric
1	Hanoi	Tran Thi Loan (Mrs.)	ECC Hanoi	Energy Management	Electric
2	Hanoi	Phung Van Tue	ECC Hanoi	Master in Management engineer	Electric
3	Hanoi	Dan Hong Quang	ECC Hanoi	Electrical equipment engineering	Electric
4	Hanoi	Tran Anh Thinh	ECC Hanoi	Measurement and control engineering	Electric
5	Hanoi	Nguyen Dinh Tuan Phong	EPU	Electrical saving engineering	Electric
6	Hanoi	Mai Sy Thanh	EPU	Electrical saving engineering	Electric
7	Hanoi	Do Huu Che	EPU	Electrical saving engineering	Electric
8	HCMC	Nguyen Van Tuyen	HCM Polytechnic University	PhD in Heat technology	Heat
9	HCMC	Nguyen Nhat Tan	HCM Electric College	Master in Electrical energy	Electric
10	HCMC	Nguyen Thi Minh Trinh	HCM Polytechnic University	Master in Heat technology	Heat
11	HCMC	Ma Khai Hien	ENERTEAM	Mechanical & heat engineer	Heat
12	HCMC	Tran Van Hung	HCM Polytechnic University	PhD in Heat technology	Heat
13	HCMC	Ha Anh Tung	HCM Polytechnic University	PhD in Heat technology	Heat
14	HCMC	Tiet Vinh Phuc	ENERTEAM	Power system engineer	Electric
15	HCMC	Dang Tan Tai	PRET	PhD in Chemistry	Heat
16	HCMC	Phan Tan Phong	PRET	Electrical engineer	Electric

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Appendix 2

List of participants of 2nd Joint Coordinating Committee

1. Ministry of Industry and Trade (MOIT)

- Mr. Trinh Quoc Vu, Director, Science Technology and Energy Efficiency Department
- Mr. Nguyen Hoang Linh, Official, Science Technology and Energy Efficiency Department

2. Department of Industry and Trade, Ho Chi Minh City (DOIT-HCMC)

- Mr. Nguyen Phuong Dong, Deputy Director
- Mr. Vong A Loc, Head, Energy Management Division
- Ms. Luong Xuan Nhung, Deputy Head, Energy Management Division

3. Plastic-Rubber Technology & Energy Conservation Training Center (PRET)

- Mr. Truong Van Long, Director
- Mr. Dang Tan Tai, Deputy Director

4. Japan International Cooperation Agency (JICA)

- Mr. Kotaro Taniguchi, Representative, JICA Viet Nam Office
- Mr. Shingo Naito, Assistant Director, Industrial Development and Public Policy Department, JICA Headquarter
- Ms. Hoang Thu Thuy, Senior Program Officer, JICA Viet Nam Office

5. Energy Conservation Center, Japan (ECCJ)

- Mr. Akira Ishihara, Project Leader
- Mr. Hideo Kubota, Energy Efficiency Expert
- Mr. Yutaka Ogura, Sub-Leader & Heat Expert

6. Electric Power University (EPU)

- Dr. Duong Trung Kien, Dean of Energy Management Faculty
- Dr. Bui Manh Tu, Deputy Dean of Energy Technology Faculty
- Dr. Nguyen Huong Mai, Power System

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**MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY AND
MINISTRY OF INDUSTRY AND TRADE ON
JOINT TERMINAL EVALUATION OF
THE PROJECT ON ESTABLISHMENT OF
ENERGY MANAGEMENT TRAINING CENTER (STAGE 2)
IN SOCIALIST REPUBLIC OF VIET NAM**

The Japanese Terminal Evaluation Team (hereinafter referred to as “the Japanese Team”) organized by the Japan International Cooperation Agency (hereinafter referred to as “JICA”) lead by Mr. Kaoru Suzuki, visited Socialist Republic of Viet Nam (hereinafter referred to as “Vietnam”) from 6th to 24th December 2015, for the purpose of conducting a terminal evaluation of “the Project on Establishment of Energy Management Training Center (Stage 2)” (hereinafter referred to as “the Project”). The Vietnamese Terminal Evaluation Team (hereinafter referred to as “the Vietnamese Team”), organized by the Government of Vietnam lead by Mr. Trinh Quoc Vu , worked together with the Japanese Team.

This evaluation was conducted by the Joint Terminal Evaluation Team (hereinafter referred to as “the Team”), which consists of the Japanese Team and the Vietnamese Team. As a result of a series of surveys and discussions, the Team agreed on the contents of the joint terminal evaluation report (hereinafter referred to as “the Report”) attached hereto, which was submitted to chairperson of Joint Coordinating Committee (hereinafter referred to as “JCC”) and the counterpart personnel of the Project, and the Team agreed to forward to the respective authorities concerned the matters referred to in the Report.

Hanoi, 23th December, 2015

鈴木 肇

Mr. Kaoru Suzuki

Senior Advisor to the Director General
Industrial Development and Public Policy
Department
Japan International Cooperation Agency



Mr. Trinh Quoc Vu

Director
Science Technology and Energy
Efficiency Department
General Directorate of Energy
Ministry of Industry and Trade



Mr. Vong A Loc

Head of Energy Management Division
Department of Industry and Trade
Ho Chi Minh City

ATTACHMENT

Agenda

3rd Joint Coordinating Committee meeting
The Project on Establishment of Energy Management Training Center (Stage 2)

Date: 23 December 2015

Time: 9:00-12:00

Venue: The meeting room in MOIT office

1. Opening speech Mr. Trinh Quoc Vu
Director
Science Technology and Energy Efficiency
Dept. General Directorate of Energy
Ministry of Industry and Trade, Vietnam

2. Opening remarks Mr. Kaoru Suzuki
Senior Advisor to the Director General
Industrial Development and Public Policy
Dept.
Japan International Cooperation Agency

3. Outline of Project Mr. Akira Ishihara
Project Team Leader
Senior General Manager
The Energy Conservation Center, Japan

4. Progress of the project Mr. Truong Van Long
Director, Plastic – Rubber Technology &
Energy Conservation Training Center

5. Report of the “Terminal Evaluation
of the Project” Mr. Kenji Okamura
Deputy Director
Industrial Development and Public Policy
Dept.
Japan International Cooperation Agency

6. Q & A session

7. Signing on Minutes of Meeting Mr. Kaoru Suzuki
And Mr. Trinh Quoc Vu
Joint Terminal Evaluation Report

8. Conclusion & closing remarks Mr. Trinh Quoc Vu

Appendix Report of the "Terminal Evaluation of the Project"

REPORT OF THE TERMINAL EVALUATION
ON
THE PROJECT ON ESTABLISHMENT OF ENERGY MANAGEMENT
TRAINING CENTER
(STAGE 2)

Socialist Republic of Vietnam

December 23, 2015

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- Annex 1 Project Design Matrix (PDM) version 2
- Annex 2 Plan of Operations version 2
- Annex 3 Evaluation Grid
- Annex 4 List of Stakeholders Interviewed
- Annex 5 List of Japanese Experts
- Annex 6 List of Equipment provided by Japan
- Annex 7 List of Participants to C/P Training Course in Japan

Abbreviations

DANIDA	Danish International Development Agency
DOIT-HCMC	Department of Industry and Trade, Ho Chi Minh City
DOIT-HN	Department of Industry and Trade, Hanoi
EA	Energy Auditor
ECC	Energy Conservation Center
ECC-HCMC	Energy Conservation Center, Ho Chi Minh City
ECC-HN	Energy Conservation Center, Hanoi
ECCJ	Energy Conservation Center, Japan
EE&C	Energy Efficiency and Conservation
EM	Energy Manager
EMTC	Energy Management Training Center
ENERTEAM	Energy Conservation Research Development Center
EPU	Electric Power University
GOJ	Government of Japan
GOV	Government of Vietnam
HCMC	Ho Chi Minh City
HCMUT	Ho Chi Minh University of Technology
HEPC	Ho Chi Minh Electric Power College
HUST	Hanoi University of Science and Technology
IEEJ	Institute of Energy Economics Japan
JASE-W	Japanese Business Alliance for Smart Energy Worldwide
JCC	Joint Coordinating Committee
JTER	Joint Terminal Evaluation Report
JICA	Japan International Cooperation Agency
M/D	Minutes of Discussion
METI	Ministry of Economy, Trade and Industry
MOU	Memorandum of Understanding
MOIT	Ministry of Industry and Trade
MOIT-GDE	General Directorate of Energy, Ministry of Industry and Trade
MOIT-WG	Ministry of Industry and Trade Working Group
NTPEEC	National Target Program for Energy, Efficiency and Conservation
NTP-RCC	Target Program to Respond to Climate Change
PDM	Project Design Matrix
PRET	Plastic Rubber Technology and Energy Conservation Training Center
SPRCC	Support Program to Respond to Climate Change
TOE	Tons of Oil Equivalent
VND	Vietnamese Dong
VNEEP	Vietnam Energy Efficiency Program

1. Introduction

1.1 Back ground of the Terminal Evaluation

The Project on Establishment of Energy Management Training Center (stage 2) (hereinafter referred to as “the Project”) was launched in July 2013, and has been carried out for two year and four months. This time, at the end of the Project period, the Terminal Evaluation Study (hereinafter referred to as “the Study”) was conducted in accordance with the Japan International Cooperation Agency’s (hereinafter referred to as “JICA”) evaluation guideline to evaluate whether the Project has been achieving the expected outputs and the project purpose.

1.2 Objectives of the Evaluation Study

The specific objectives of the evaluation study are outlined as follows:

- (1) To review the progress and achievements of the Project
- (2) To evaluate the achievements in accordance with the five criteria (relevance, effectiveness, efficiency, impact and sustainability) and
- (3) To make recommendations for the Project

1.3 Members of the Evaluation Team

The Joint Terminal Evaluation Team (hereinafter referred to as “the Team”) was organized by the members shown in Table 1-1 and 1-2.

Table 1-1: Evaluators from Japanese Side

Name	Title	Organization and position
Mr. Kaoru SUZUKI	Team Leader	Senior Advisor to the Director General (Energy), Industrial Development and Public Policy Department, Japan International Cooperation Agency
Mr. Kenji OKAMURA	Evaluation Planning	Deputy Director, Team 1, Energy and Mining Group, Industrial Development and Public Policy Department, Japan International Cooperation Agency
Mr. Yasunori MINAGAWA	Evaluation Analysis	Evaluation Analyst SKK Research & Consulting Inc.

Table 1-2: Evaluators from Vietnamese Side

Name	Title	Organization and position
Mr. Trinh Quoc Vu	Leader	Director, Science Technology and Energy Efficiency Department, General Directorate of Energy, Ministry of Industry and Trade (MOIT)
Mr. Nguyen Hoang Linh	Member	Science Technology and Energy Efficiency Department, General Directorate of Energy, Ministry of Industry and Trade (MOIT)

Dr. Duong Trung Kien	Member	Dean, Faculty of Engineer, Energy Management Faculty, Electric Power University (EPU)
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1.4 Schedule of the Evaluation

The study was conducted from 6 December to 25 December, 2015 as follows;

Table 1-3 Schedule of the Study

No.	Date		JICA	Evaluation Analysis
			Mr. Suzuki/Mr. Okamura	Mr. Minagawa
1	Dec. 6	Sun		Narita → HCMC 14:20 (VN301)
2	Dec. 7	Mon		09:30 Interview with C/P at DOIT 13:30 Interview with C/P at PRET
3	Dec. 8	Tue		09:30 Interview with Lecturers at PRET 13:30 Site visit to PRET EMTC Hiep Phuog
4	Dec. 9	Wed		08:10 HCMC → Hanoi (VN234) 14:00 Interview with C/P at MOIT GDE 16:00 Meeting at JICA Vietnam Office
5	Dec. 10	Thu		10:00 Interview with EPU 14:00 Interview with HUST 17:00 Interview with C/P at MOIT GDE
6	Dec. 11	Fri		09:00 Interview with ECC Hanoi PM Data analysis
7	Dec. 12	Sat		Data analysis and report preparation
8	Dec. 13	Sun		Data analysis and report preparation
9	Dec. 14	Mon		Documentation of Joint Terminal Evaluation Report (JTER)
10	Dec. 15	Tue		Documentation of JTER
11	Dec. 16	Wed		Documentation of JTER
12	Dec. 17	Thu		Documentation of JTER
13	Dec. 18	Fri		Documentation of JTER 14:00 Meeting at JICA Vietnam Office
14	Dec. 19	Sat		Preparation of presentation PP in the JCC
15	Dec. 20	Sun	Narita → Hanoi 14:30 (VN311)	Preparation of presentation PP in the JCC 17:00 Reviewing the draft of JTER
16	Dec. 21	Mon		09:30 Meeting with JICA Vietnam Office 13:00 Courtesy visit and kick-off meeting at MOIT
17	Dec. 22	Tue		09:00 Discussion and finalization of JTER with MOIT PM Documentation
18	Dec. 23	Wed		09:00 3 rd JCC in MOIT
19	Dec. 24	Thu		09:00 Report to Embassy of Japan PM Site visit to EMTC in Hanoi
20	Dec. 25	Fri		00:20 Hanoi → Narita 07:00 (VN310)

1.5 Methodology of the Evaluation

The Project was evaluated jointly by the Vietnamese and Japanese team, based on the Project Design Matrix (PDM), which is a summary table of the Project. The details of methodology are as follows.

1.5.1 Design of the Evaluation

Based on materials showing the framework of the Project such as PDM (see Annex 1) and Plan of Operation (PO, see Annex 2), the Team formulated the Evaluation Grid (see Annex 3) and Evaluation Plan in advance, which identified the specific evaluation points and the data collection methods. The evaluation grid was designed based on the PDM.

1.5.2 Evaluation activities

For the data and information collection, the Team applied various methods such as analysis on reports, individual and group interviews with counterparts (hereinafter referred to as the “C/P”), JICA experts (hereinafter referred to as the “JET”), based on the questionnaire distributed before the field survey, the observation of the Project site, the provided equipment in use, and the project activities.

1.5.3 Points for Evaluation and Analysis

(1) Achievements and Implementation Process of the Project

Achievement of the Project was reviewed in terms of Inputs, Activities, Outputs, and Project Purpose. Implementation of the Project was examined to see if the activities had been implemented according to the schedule, to see if the Project had been managed properly, and to identify promoting and inhibiting factors that had affected the implementation process.

(2) Five Evaluation Criteria

In addition to the review of the achievement and implementation process, the Team reviewed the Project from the viewpoints of the following Five Evaluation Criteria.

Table 1-4 Definition of Five Evaluation Criteria

Five Criteria	Definition of Five Evaluation Criteria
Relevance	Relevance refers to the validity of the Project and the Overall Goal in connection with the development policy of the government of Vietnam and assistance policy of Japan
Effectiveness	Effectiveness refers to the extent to which the expected benefit(s) was(were) brought about as a result of the Project
Efficiency	Efficiency refers to the productivity of the implementation process. It examine whether the inputs of the Project have been efficiently converted into the outputs.
Impact	Impact refers to direct and indirect, positive and negative impacts caused by the implementation of the Project, including the extent to which the Overall Goal has been attained.

Sustainability	Sustainability refers to the extent to which the Project can be further developed by the Vietnam authorities concerned and the extent to which the benefits generated by the Project can be sustained under the national policies, technology, systems and financial state.
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1.6 List of Interviewees

The interviewees in the study are listed in Annex 4.

2. Outline of the Project

2.1 Background of the Project

In recent years, Vietnam is growing at a GDP growth rate of 6% to 7% per year, yet the energy consumption rate is growing at a faster rate of over 10% per year. In order to secure sustainable economic development, energy utilization including energy efficiency and conservation are seen as an essential issue. Government of Vietnam (GOV) has been implementing many activities in the energy efficiency and conservation sector such as the Vietnam National Energy Efficiency Program (VNEEP) from 2006 to 2015.

From 2008 to 2009, JICA implemented “the study on Master Plan for Energy Conservation and Effective Use” in Vietnam and made recommendations on energy efficiency policy measures. Upon its completion, GOV decided to utilize the recommendations to formulate “the Law on Economical and Efficient Use of Energy” in January 2011.

Under this legal framework, the energy management system and energy audit system is introduced, and designated enterprises have an obligation to appoint energy managers, to submit annual and five year plan and reports, and to receive energy audits.; Therefore, the human resources development of energy managers and energy auditors are recognized as one of the key issues for implementation.

GOV had acknowledged the need for human resource development and officially requested “the Project for Establishment of Energy management Training Center” to Government of Japan (GOJ) in July 2010. Under the support of JICA, The center is expected to provide not only theoretical program but practical training to energy managers and energy auditors who will become the key human resource to promote EE&C in designated enterprises in Vietnam.

2.2 Outline of the Project

The original PDM Ver.0 was established on 28th February 2013, as apart of MOU between JICA and MOIT on the Project for the Establishment of Energy Management Training Center (Stage 2). Then, the PDM was revised and approved at the first JCC which was held on 8th August 2014 as a version 1. The Project summary described in PDM Ver.2 is as follows (For more details, see Annex1).

(1) Overall Goal

Under the Law on Energy Efficiency and Conservation, energy management in designated

enterprises is enhanced.

(2) Project Purpose

The Energy Management Training Center is established and managed for training Energy Managers and Energy Auditors.

(3) Outputs

1. Curriculum, textbook and practical training equipment of training course for energy manager and energy auditor are developed.
2. C/Ps are able to implement practical energy manager training.
3. C/Ps are able to implement practical energy auditor training.
4. C/P's capacity to disseminate energy conservation activities for enterprises is strengthen.

3. Achievements and Implementation Process of the Project

During the Study, the achievements of the Project including inputs, activities and outputs, as well as the implementation process were reviewed to assess the degree of achievements, the results of which are described as follow.

3.1 Inputs

The Team has confirmed that the Project has provided the following inputs along with the plan stated in PDM Ver.1

3.1.1 Inputs from the Japanese side

(1) Assignment of Japanese experts

The Project has been implemented by eight short-term experts of The Energy Conservation Center, Japan (ECCJ), totaling 38.72 man-months (MMs) as of the end of November 2015. The list of Japanese experts is shown in Annex4.

Table 3-1: MMs of Japanese experts input to the Project

	Year	MM Planned	MM Actual
Work in Vietnam	The 1 st term	7.40	6.77
	The 2 nd term	4.27	3.73
	Sub total	11.67	10.50
Work in Japan	The 1 st term	25.10	24.62
	The 2 nd term	3.55	3.60
	Sub total	28.65	28.22
Total		40.32	38.72

(Source) Information from Japanese experts of ECCJ

Note-1; the 1st term; July 2013~March 2015

The 2nd term; April 2015~December 2015. The figures of the 2nd term in the above table shows actual ones as of the end of November 2015

Note-2; Besides the above assignment of Japanese experts of ECCJ, experts of NipponSteel & Sumikin Management Co. Ltd. were dispatched for the procurement and installment of equipment provided by JICA as well as the implementation of trainings of equipment

operation in Plastic Rubber Technology and Energy Conservation Training Center (PRET) in HCMC in February-March 2015 and trainers training in PRET in June 2015. The total MMs of experts of NipponSteel & Sumikin Management was 10.70 MMs for work in Japan and 6.34 MMs for work in Vietnam.

(2) Local operational cost borne by Japanese side

By the end of November 2015, a total of 5,597,000 yen, which is equivalent to 45,877 US dollar¹, was disbursed as the operational cost for the project activities. The local operational cost mainly consisted of temporary employment, consumables, travel and transportation, communication and delivery, documentation, rent, etc.

(3) Machinery and equipment provided by Japan

Machinery and equipment for establishing Energy Management Training Center (EMTC) in HCMC (PRET²) were provided. The list of machinery and equipment provided is shown as Annex 6. The cost for machinery and equipment are 1,298,450 US dollar.

(4) Related Training

Training in Japan on the operation of equipment referred in (3) above which were provided for the Project was conducted on 24 August – 6 September 2014. A total of 15 stakeholders participated in the training. The list of participants is shown in Annex7. In addition, necessary cost for the related training both in Vietnam and Japan are about 894,000 US dollar.

3.1.2 Vietnamese Side

(1) Counterparts

A total of 8 personnel were assigned as counterparts by Vietnamese side; three persons from Ministry of Industry and Trade (MOIT), including Director of General Directorate of Energy, MOIT as Project Manager, two persons from Department of Industry and Trade, Ho Chi Minh City (DOIT-HCMC) and three persons from PRET are assigned. The more details are shown below.

Table 3-2 List of Counterpart

	Name	Position/Title Office	Role in the Project
1	Mr. Trinh Quoc Vu	Director, MOIT-GDE	Project Manager Project Deputy Director
2	Mr. Dang Hai Dung	Deputy Director, MOIT-GDE	Member
3	Mr. Nguyen Hoang Linh	Official, MOIT-GDE	Project Coordinator
4	Mr. Vong A Loc	Head, DOIT-HCMC	Member
5	Ms. Luong Xuan Nhung	Deputy Head, DOIT-HCMC	Member
6	Mt. Truong Van Long	Director, PRET	Member
7	Mr. Dang Tan Tai	Deputy Director, PRET	Member
8	Mr. Phan Tan Phong	Engineer, PRET	Member

(Source) Information from the Project

¹ 1US \$ is equivalent to 122 Japanese Yen as of the end of November 2015.

² PRET is operating EMTC in HCMC.

(2) Local cost sharing by Vietnamese side

Vietnamese side explained that total operational costs could not be calculated precisely because of difficulty of clear separation of the expenditure related to the Project. As for the renovation work of EMTC in HCMC (PRET), Vietnamese side mentioned that 3 billion VND from national state budget and about 600 million VND from local budget were disbursed. The local operational cost mainly consisted of temporary employment, consumables, travel and transportation, communication and delivery, documentation, opening ceremony, etc.

(3) Provision of the space and necessary facilities

No special space with working facilities is provided for Japanese experts.

3.2 Achievement of the Outputs

The Project has implemented its activities as per the plan stated in the PDM View.1 and PO. The Team reviewed the performance and progress of the Project activities and measures the achievement of the Outputs in the following.

3.2.1 Output 1

Currently, the status of indicators suggests high achievement level of Output 1 as seen below.

Narrative summary	Achievement
Output 1: Curriculum, textbook and practical training equipment of training course for energy manager and energy auditor are developed.	high ³
Verifiable Indicators	Achievement
1-1: C/Ps establish curriculum and program of practical training course.	Achieved
1-2: C/Ps are able to develop textbook and materials of practical training course.	Achieved
1-3: C/Ps are able to operate training equipment for practical training course.	Achieved

Activities

- 1-1 Implement baseline survey
- 1-2 Appoint the full time instructors of heat, electricity and staff of training center
- 1-3 Establish working group on curriculum, text book, and qualification tests
- 1-4 Review curriculum and textbooks so far prepared by MOIT and DANIDA
- 1-5 Prepare curriculum and program of practical training course for Energy Manager and Energy Auditor
- 1-6 Install training facilities and equipment
- 1-7 Prepare operation and maintenance manual including spare parts list of training equipment and measurement devices
- 1-8 Prepare textbook of practical training course
- 1-9 Establish examination system and qualification system for Energy Manager and Energy Auditor
- 1-10 Inform the necessary revision contents of regulation on energy management and energy audit

Activities and Achievement

³ The rating is set for high, slightly high, fair, slightly low, and low.

- At the beginning of the Project, the Project team conducted the baseline survey to grasp the current condition of energy consumption and measures on energy efficiency and & conservation (EE&C) in Vietnam and the Government's plans on EE&C. As the result of the survey, the team proposed the target on the reduction of energy intensity of designated enterprises as 5% for the period of 5 year starting from 2016 when training equipment installed in PRET will start its operation after the Project completion to 2020. The team set up the target as a verifiable indicator of the Overall Goal of the Project and proposed a method for how to trace the target.
- A training course for Energy manager (EM) and that for Energy Auditor (EA), which the Energy management Training Center (EMTC) is to implement, are closely related with Law on EE&C, Law No. 50/2010/QH12, and other related regulations. For amending those regulations, a working group (WG) was established under MOIT. After the first meeting of the WG held in January 2015, the meetings were held eight (8) times in total by October 2015 intensively. The WG members consisted of MOIT, Japanese experts and Electric Power University (EPU). The WG finalized the revision of training curriculum and text books which supplemented practical training in October 2015 and submitted them to MOIT in December 2015.
- Equipment for practical training such as Furnace unit, steam trap system and pump unit were handed over to PRET in February 2015. It was delayed for a half year to hand over them due to the delay of completion of PRET building. However, significant influence was not observed. For technology transfer on the equipment, training in Japan was conducted in August 2014. The participants were from EE&C related institutions nationwide in total 15 persons. Training course on the operation and maintenance of equipment was also implemented in PRET in April – May 2015 and seven (7) staff of PRET participated in the course. Besides the training, trainers trainings with the use of equipment was implemented in June 2015 in PRET. After the training, PRET has already conducted EM practical training three times using the equipment organized by themselves. Therefore, it is confirmed that equipment for practical training has been utilized in actual conditions of training activities in PRET.
- Based on confirmation above that all indicators of Output 1 has been achieved, it is evaluated that the degree of achievement of Output 1 is high.

3.2.2 Output

Currently, the status of indicators suggests high achievement level of Output 2 as seen below.

Narrative summary	Achievement
Output 2: C/Ps are able to implement practical energy manager training.	high
Verifiable Indicators	Achievement
2-1: C/Ps are assigned for training course.	Achieved
2-2: C/Ps are able to utilize training facilities and equipment efficiently.	Achieved
2-3: C/Ps are able to maintain training facilities and equipment sufficiently.	Achieved

<p>Activities</p> <p>2-1 Appoint instructors for training course of Energy Manager in HCMC training center.</p> <p>2-2 Carry out the practical training course on its operation and maintenance</p> <p>2-3 Carry out the training on energy conservation by training equipment</p> <p>2-4 Implement trial training course for Energy manager</p>
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Activities and Achievement

- Trainers who are to be in charge of EM training have been assigned and participated in necessary training courses. Nine (9) persons have been assigned as trainers of EMTC (PRET) in HCMC. On the other hand, although the construction of EMTC building has just started in

Hanoi, MOIT nominated seven (7) persons as the candidate of trainers on EM training course.

- The trainers participated in trainers training course implemented in June 2015. The composition of participants is shown in Table 3-3.

Table 3-3 Composition of Participants for Trainers Training on EM

Region	Institutes	No. of persons
HCMC	HCM Polytechnic Univ.	4
	HCM Electricity College	1
	ENERTEAM	2
	PRET	2
Hanoi	ECC Hanoi	4
	EPU	3

(Source) Project Team

- Since equipment for practical training has been installed in PRET, training on operation and maintenance of the equipment was implemented for technical staff of PRET in April - May 2015. They became capable for operating and maintaining the equipment.
- Based on confirmation above that all indicators of Output 2 have been achieved, it is evaluated that the degree of achievement of Output 2 is high.

3.2.3 Output 3

Currently, the status of indicators suggests high achievement level of Output 3 as seen below.

Narrative summary	Achievement
Output 3: C/Ps are able to implement practical energy auditor training.	high
Verifiable Indicators	Achievement
3-1: C/Ps are assigned for training course.	Achieved
3-2: C/Ps are able to instruct energy audit report of factories and building in accordance with Circular 09/2012/TT-BCT.	Mostly achieved
3-3: C/Ps are able to implement training course	Mostly achieved

<p>Activities</p> <p>3-1 Appoint instructors for training course of Energy Auditor in HCMC training center.</p> <p>3-2 Carry out the practical training course on its operation and maintenance</p> <p>3-3 Carry out the training on energy conservation by training equipment</p> <p>3-4 Implement trial training course for Energy Auditor</p> <p>3-5 Implement trial energy audit in factories and buildings</p>

Activities and Achievement

- Output 2 is for the capacity building of trainers for EM training course and Output 3 is for that of trainers for EA training course.

- Trainers are trained to cover not only EM training course but also EA training course in the Project. The activities of Output 3 are almost as same as that of Output 2. Trainers group consists of 7 persons from Hanoi and 9 persons from HCMC as seen in the Table-1. The trainers participated in three training courses for capacity building; Training in Japan in August 2014, Trainers Training course conducted in June 2015 and On-site EA training course conducted in HCMC in October – November 2015 (Trainers from Hanoi did not participated in On-site EA training course). The training course is OJT type training in which the participants experience actual energy audit on site and the training courses were conducted in two sites. The first training course was conducted in October 2015 at Hung Vuong Plaza in HCMC selected as a training site for building sector and the second one was conducted in November 2015 at Saigon Tobacco Company selected as the site for industrial sector. Total of 18 participants attended the course including 9 trainers in HCMC and some observers. They experienced the documentation of EA report based on the regulation and they are already capable for trainers for EA training.
- According to interview to lecturers in PRET, all of them evaluate highly a practical training using equipment, because through a theoretical training with practical one, it was quite effective for them to learn EE&C effectively and to understand phenomena deeply with actual observation.
- Based on confirmation above that all indicators of Output 3 have been achieved, it is evaluated that the degree of achievement of Output 3 is high.

3.2.4 Output 4

Currently, the status of indicators suggests high achievement level of Output 4 as seen below.

Narrative summary	Achievement
Output 4: C/P's capacity to disseminate energy conservation activities for enterprises is strengthen.	high
Verifiable Indicators	Achievement
4-1: C/Ps disseminate energy conservation technology and case studies to designated enterprises.	Mostly achieved
4-2: Network of DOIT, MOIT, universities and factories on energy management is established.	Mostly achieved

Activities

- 4-1 Implement workshop on energy conservation technology and regulation
- 4-2 Establish network of MOIT, Department of Industry and Trade (DOIT) and Universities on energy management and energy audit.

Activities and Achievement

- The opening ceremony of EMTC in HCMC was broadcasted by TV in June 2015 and the center's activities were disseminated widely.
- MOIT continues its publicity work such as dissemination of regulations on EE&C in Vietnam and official news on EE&C through their homepage, www.vneec.

- The network among universities, enterprises and institutions related to EE&C was developed through training activities and WG's activities in the Project. Relation between EMTC and companies and factories were also developed through on-site EA trainings conducted in October – November 2015 and is expected to be enhanced through energy audit implemented by the participants of training courses conducted in EMTC in future.
- Based on confirmation above that all indicators of Output 4 have been achieved, it is evaluated that the degree of achievement of Output 4 is high.

3.3 Achievement of the Project Purpose (Prospect)

Narrative summary	Achievement
The Energy Management Training Center is established and managed for training Energy Managers and Energy Auditors.	high
Verifiable Indicators	Achievement
1. Establishment of training and qualification system of energy manager and energy auditor	Achieved
2. Curriculum and textbook are completed as Guiding Document of the Minister	Mostly Achieved

- Since the revision of Circular 39 was planned, the revision was drafted through the discussion in the WG. As a result, Draft Circular has been developed with supplementary provisions about
 - (1) Time and contents of theoretical and practical parts for training of EM and EA;
 - (2) Time and contents of examination for certification of EM and EA
 - (3) Validity of certificates and renewal procedures.
- It is considered that training and qualification system of energy manager and energy auditor were established and, thus, Indicator 1 was achieved.
- As for indicator 2, training materials, including theoretical slides and practical slides and practical guideline have been completed and will become the Guiding document from the Ministry. According to MOIT, the draft Circular of No.39 revision will be set in process in 2016 and will be enacted in 2017. The completed training materials, however, can be used in a training course substantially.
- As mentioned above, through the activities of the Project, equipment for practical training has been installed in EMTC in HCMC and technical staff in EMTC has been trained for maintaining the equipment. Trainers for EM and EA training courses also have been trained through some training courses implemented in the Project such as trainers training for EM and EA and on-site EA training, and has become capable trainer. Vietnamese side and Japanese side have agreed to extend the Project period for January – March 2016. During the extension period, since PRET are planning to implement EM and EA training independently, it is expected that more effective capacity building of trainers will be made with advice and comments from Japanese experts.
- Considering the extension of the Project period, Project Purpose is expected to be achieved by the Project completion.

In this connection, assuming the extension of the Project period and effective implementation of On-site training in the remaining period of the Project, the Project Purpose is expected to be

achieved by the Project completion.

3.4 Achievement of the Overall Goal (Prospect)

Narrative summary	Prospect of Achievement
Under the Law on Energy Efficiency and Conservation, energy management in designated enterprises is enhanced.	high
Verifiable Indicators	Prospect of Achievement
Energy intensity of designated enterprises is reduced by 5%, comparing the data between 2016 and 2020.	Mostly achieved

- At the beginning of the Project, the Project team conducted the baseline survey to grasp the current condition of energy consumption and measures on energy efficiency and & conservation (EE&C) in Vietnam and the Government's plans on EE&C. As the result of the survey, the Project team set up the verifiable indicator for Overall Goal as written above.
- The training system of Vietnamese on EM and EA has been strengthened by the establishment of EMTC in HCMC substantially. In this regard, since MOIT explained the utilization of EMTC for training EM and EA, it is expected that a capable EM is appointed and energy audit is implemented effectively in an enterprise by the implementation of training for EM and EA in EMTC from now on.
- Training of EM and EA contributes the promotion of EE&C in industrial / business sector through the promotion of energy conservation in a company. Each industrial field is thought to possess more than roughly 20 % of energy conservation potential. It is expected that the realization of the potential contribute to realization of energy conservation target as a state.

Based on confirmation above that the indicator is expected to be mostly achieved, it is evaluated that prospect on achievement of Overall Goal is high.

3.5 Implementation Process of the Project

(1) Progress of the Activities

The following point was confirmed as delay on the progress by this project, but it isn't significant delay as a result.

- 1) Installation of equipment and materials for EMTC shifted 2 months behind from the original schedule because of the delay of renovation work in the site of Vietnam side due to budget reason. Due to the influence, technology transfer activities moved to November 2015 but the schedule for training by PRET is secured to start at the beginning of 2016
- 2) The Project leader of MOIT didn't fix at first, and the 1st JCC was held in June 2014.
- 3) According to the interview, coordination between Vietnamese side and Japanese side took time, because of lack of face-to-face communication.

(2) Promoting factors to implementation process

- 1) Activity in WG was effective. WG was organized by MOIT and some members of Hanoi Electric Power University participated. The main activity was to establish a curriculum and textbooks for training, to arrange training and to establish systematic position with qualification and test system, and to establish a training system. It functioned effectively.
- 2) The Project team tried as WG was operated with the initiative of Vietnamese so that they made documents quickly and could come into action efficiently.
- 3) The way of doing by Japanese experts was helpful. They are friendly, open and favorable.
- 4) It was possible to carry on project activity under strong ownership of a Director of PRET.

4. Evaluation by Five Criteria

Through the Study, the relevance, effectiveness, efficiency, impact and sustainability of the Project were assessed and the major findings of which are described in the section below.

4.1 Relevance

Relevance of the Project is evaluated as **high** based on the following confirmations:

(1) Relevant to the Vietnam's Policy

Vietnam Government established National Strategic Program on Energy Savings and Effective Use (Vietnam National Energy Efficiency Program, VNEEP) (2006 – 2015) in 14 April 2006 and promoted EE&C in the country. In January 2011, Vietnam Government enacted Law on Energy Efficiency and Conservation and tried to further promote EE&C activities in the country. In Law on EE&C, energy manager and energy auditor, designated enterprises and its responsibility are provided. Since the Project is dealing with EM and EA training and EMTC, it is clear that the Project is in line with the national policies of Vietnam.

(2) Relevant to Japan's ODA policy towards Vietnam

The Project is serving to development assistance program toward Vietnam by the Japanese Government such as "Facilitation of Economic growth and strengthen international competitiveness" through EE&C activities. Since the Project is dealing with technical assistance and human resource development in the field of EE&C, it is also in line with a development issue of "stable supply of natural resources and energy". The Project is also relevant to environmental conservation, one of priority area of the assistance, because the reduction of CO2 by promotion of EE&C address to city environmental management and natural environmental conservation.

(3) Responsiveness to the needs of the target group

The target group of the Project, STEED-MOIT (Science, Technology and Energy Efficiency Department, MOIT), is responsible for the promotion of EE&C in MOIT and is obligated to achieve the national targets provided in National Target Program on EE&C (NPTEEC, June 2012)(2012-2015) such as the target of trained EM and EA and the establishment of EMTC. The Project is to enhance training course of EM and EA in EMTC and is surely in line with the needs of STEED-MOIT.

(4) Advantage of Japan's Technical Experiences

Most of laws and regulation in the field of EE&C to be introduced in Vietnam have already been enforced in Japan. Moreover, Japan had a lot of experience of JICA's technical cooperation on EE&C in other countries in the past could be best utilized in Vietnam through the Project.

4.2 Effectiveness

The effectiveness of the Project is assessed as **high** through the following observations:

(1) Achievement of Project Purpose (Prospect)

- EMTC was established with expected functions in PRET in HCMC in June 2015 and equipment

for practical training for EM and EA installed is working with expected performance (Output 1).

- Trainers training for EM training and EA training, including practical training using equipment provided by Japan has been implemented in June 2015 as the Project's activity. Revision of training curriculum and training textbooks on EM and EA training has been completed and necessary technology has been transferred to Vietnam (Output2 & 3).
- Training implementation plan on EM and EA for next year, 2016, has been prepared by PRET with their initiative and the preparation of the training course has been completed (Output 4).
- Based on the observation above, it is confirmed that main results of the Project were achieved and, thus, the effectiveness of the Project is evaluated as high.

(2) Contribution of Outputs to the achievement of Project Purpose

As seen in (1) above, all Outputs are set up in the structure of PDM for contributing to the achievement of Project Purpose.

(3) Analysis of factors

1) Promoting factors

- Set up of WG

Working Group which consists of MOIT, Japanese experts and the specialists nominated by MOIT (member of Electric Power University in Hanoi which has a close relation with enforcement of Law on EE&C) was organized and worked for the revision of curriculum and textbooks, and the legal arrangements. Through the activities of WG, (a) tasks including revision of textbooks, examination and certification system have been done in Vietnamese as a main language so that the preparation activities have been carried out with an initiative of Vietnamese; (b) the members of the WG obtained the opportunity to participate in training in Japan, conducted in August 2014, and trainers training for EM and EA training courses, conducted in June 2015 at PRET in HCMC, for the establishment of EMTC in Hanoi in the future; and (c) relation between universities concerned and EMTC has been developed.

- Effective implementation of training courses

In the Project, since a series of training activities including training in Japan, trainers training, On-site training for EA were implemented for the same members who are lecturers of a university, staff of PRET and staff of ECC Hanoi, lecturers for future training courses were trained effectively. Moreover, those who are expected to serve as trainers on EM training and EA training in EMTC Hanoi in future participated in abovementioned training courses by nomination of MOIT.

- Collaboration between Japanese consultant and supplier

MOIT mentioned in the interview that collaboration between two Japanese companies, namely, ECCJ who is responsible for overall management of the Project, and Nippon Steel & Sumikin Management who is responsible for installation of equipment, was a key factor to manage the Project well.

2) Hampering factor

- Since the Project leader of MOIT did not fix at the beginning of the Project, some work was in

the pending state and the 1st JCC was held in August 2014.

4.3 Efficiency

The efficiency of the Project is considered as **slightly high**, based on the following consideration:

(1) Provision of equipment

For the technical contents and the setting of equipment provided from Japanese side, JICA's other projects related to EMTC in the past were reviewed and the know-how obtained in the projects were utilized.

(2) Vietnamese initiative in WG activities

WG utilized textbooks written originally in Vietnamese as a basic reference and added materials and textbooks from Japan to the textbooks so that the WG could revise teaching materials efficiently with the consistency with original teaching materials written in Vietnamese. The Project team tried to consider Vietnamese initiative in managing the WG activities so that documentation by Vietnamese was done quickly and efficiently.

(3) Absence of a long-term expert

A long-term expert who was to be responsible for coordination work among JICA, the Project team and institutions concerned in Vietnam was not assigned in the Project. The long-term expert was planned in the original PDM, however due to the difficulty of recruitment, the input was cancelled. Since the opportunity of face-to-face communication between the Project team and Vietnamese side was limited, arrangement of schedule did not go smoothly and the change of schedule was occurred so frequently, and the Project team was forced to change mission schedule accordingly at the last minute.

(4) Delay of installation of equipment for practical training for EM and EA

The delay of renovation work of the building of EMTC HCMC affected the delay of the installation of equipment for practical training for EM and EA, although the influence was not so significant.

4.4 Impact

It is assessed that the Project would bring about **high and positive** impacts, in view of the following aspects:

(1) Achievement of Overall Goal

According to interview to MOIT, they have positive prospect for the achievement of Overall Goal. They believe that compared with the present training course on EM and EA, more effective training on EM and EA will be conducted, high possibility of awareness on energy manager in the society will be seen, and a big effect of EE&C will be realized.

(2) Hampering factor for achieving Overall Goal

It is not a hampering factor for achieving overall goal, but the place where practical training can be put into effect is only Ho Chi Minh City for the time being, so the expansion of a policy in the

whole country is not easy.

(3) Expansion of Effects

- Through the interview, the voice that people are feeling a sense of responsibility to implementation of an environmental problem, global warming and energy conservation activity as a member of international society was heard.
- AS mentioned in NTPEEC 2012-2015, the construction of next EMTC in Hanoi is one of the goals of the national government and it is planned to construct it in 2016 and to open in 2017. MOIT has already allocated the budget of a building construction for EMTC Hanoi as the national budget and is supporting it aggressively. Moreover, MOIT explained their idea that they are considering to establish the third EMTC in the central region of Vietnam.
- According to PRET, It is scheduled to conduct energy audit training including practical training in PRET in January of next year to an electric power company in HCMC. Like this, needs for new training have come out. Since the result of the energy conservation can be seen by practical training, an enterprise got interested in energy conservation. As there is a training facility in Ho Chi Minh City, the interest of enterprise on EM and EA training is getting high. PRET is planning to put EM training and EA training into effect every month alternately by their next year's training plan.
- PRET is planning to establish EA section and develop a business of the energy audit. After trainers training was implemented, PRET has already implemented three times of training courses which included practical training with PRET initiative. MOIT is hoping that many enterprises send their technical staff to EM and EA training aggressively so that they can contribute to EE&C in Vietnam as much as possible.

4.5 Sustainability

The Team could expect **slightly high** sustainability in all of aspects below:

(1) Political and institutional sustainability:

- EMTC in HCMC which was established by this project is a part of development program of human resources on energy management and energy audit of Vietnam and MOIT has a plan to establish another training center in other key areas, Hanoi, which is also recognized in this project.
- MOIT has already decided to construct a building for EMTC in Hanoi and MOIT sent members from Hanoi to participate in trainers training for EM and EA training which was conducted in HCMC. So, continuous development of human resource on EM and EA in Vietnam is being supported by the Vietnam Government.
- Since the establishment of EMTC is provided by Law on EE&C, the support of Vietnam Government to activities of the training center continues. Although NTPEEC (2012-2015) which shows national goals on EE&C will end on 31th December 2015, a new document, NPEEC, is under preparation. Therefore, the political sustainability on EE&C of Vietnam Government is secured.

(2) Organizational and financial sustainability:

- NTPEE 2012-2015 provides that EMTC is established in HCMC and Hanoi City and the construction of EMTC in Hanoi has started
 - Ho Chi Minh City's Peoples Committee issued an instruction to designated enterprises in HCMC that designated enterprises in the City should participate in EM and EA training courses to be conducted in EMTC HCMC (PRET). PRET has got a big support from the City's Peoples Committee which shows high sustainability in organizational aspect.
 - Since EMTC in HCMC is managed by PRET and its trainers includes PRET staff and outside resources such as lecturers from Ho Chi Minh Electric Collage who are assigned by PRET, the ownership of PRET is secured.
 - Since the establishment and administration of EMTC is a national policy, the national government allocates the necessary budget of course. However, EMTC is requested to look for the way of independent development such as by collecting an admission fee and to secure a center's operation cost in the long run. In this regard, according to EMTC in HCMC, they are facing with budget shortage already. Considering this point, the financial sustainability is less secured.
- (3) Technical sustainability:
- Training textbooks were prepared by WG whose main members are from EPU. It is, therefore, expected that the EPU members is able to revise the textbooks independently when necessity arise.
 - Member of PRET is capable of maintenance of training equipment and is able to improve a manual on the maintenance by themselves, as they participated in training course on equipment maintenance conducted in April 2015 in the Project. So, the technical sustainability of the Project is secured.
 - Information on Suppliers of machinery and materials at the Japanese side is requested by the Vietnam side for the procurement of spare parts, for example.

5. Conclusion

The Team confirmed that the expected outputs have largely been achieved without any critical problem or notable delay in the implementation of the Project. Since the training system for Energy Manager and Energy Auditor in Vietnam has been enhanced significantly by the establishment of EMTC in HCMC in June 2015, the relevance of implementing the Project is very high. The Team has confirmed that Vietnamese C/Ps evaluate the transferred technologies with facilities as appropriate and effective, and the sustainability of the outcomes is assumed slightly high.

It is, therefore, concluded that the Project would successfully achieve its expected purpose within the cooperation period, if it is extended for three months until the end of March 2016.

6. Recommendations and Lessons learnt

6.1 Recommendations

(1) Extension period of the Project (for PRET & Japanese experts)

Both Japanese and Vietnamese sides have already agreed that the Project is extended until the end of March of next year for 3 months. During the extended period, PRET is planning to implement some training courses such as EM training course for the city electric power company and new EM and EA training courses with practical training as their periodic EM and EA training courses. Therefore, it is recommended that the Project team will dispatch some Japanese experts to training courses above as observers and the experts will make advice or comments for improving the training courses.

(2) Promotion of information sharing among EMTCs on the management (for MOIT-GDE)

EMTC in HCMC is only a training center whose activities is on-going in Vietnam at the present moment and the know-how of practical training implementation will be accumulated in PRET. In order for EMTC Hanoi, the second EMTC in Vietnam, to share the know-how for the management of EMTC, it is recommended that MOIT should promote information sharing among EMTCs such as holding workshops and observation trip.

(3) Continuous publicity work on EMTC activities (for MOIT-GDE and EMTCs)

Several comments about necessity of aggressive participation by a Vietnamese national level about energy conservation and environmental issues, etc. have been heard from the interviewees in the Study. It's recommended to continue the publicity campaign on which MOIT - GDE is working to utilize the rise of the interest of Vietnamese people and secure the spread of energy conservation measures and manifestation of the certain energy conservation effect through EMTCs.

(4) Continuous monitoring by the Overall Goal's indicator (for MOIT-GDE)

In JICA, Ex-Post evaluation is to be implemented about three years later after the termination of the Project. For the evaluation, the recipient country is requested to conduct

continuous monitoring by the Overall Goal's indicator. In the Project, an indicator of "Energy Intensity of designated enterprises is reduced by 5%, comparing the data between 2016 and 2020" is set up as a monitoring one and ECCJ has proposed a tracing method for monitoring in the report of baseline survey. It is, therefore, important that Institutions concerned in Vietnam including MOIT-GDE, DOIT-HCMC and PRET apply the monitoring method to collect necessary data and report it to JICA for sharing data between Japan and Vietnam.

(5) Secure institutional, organizational and financial sustainability (for MOIT-GDE)

MOIT should issue the revision of "Regulation of Training and Certification for Energy Manager and Energy Auditor" (Circular 39) and it is expected to be enacted in 2017.

Vietnamese side should allocate necessary budget for operation and maintenance of equipment for practical training in EMTC.

Also, information of suppliers of spare parts, for example, for the maintenance of equipment provided by the Project will be provided.

Annexes

- Annex 1 Project Design Matrix (PDM) version 1
- Annex 2 Plan of Operations version 1
- Annex 3 Evaluation Grid
- Annex 4 List of Stakeholders Interviewed
- Annex 5 List of Japanese Experts
- Annex 6 List of Equipment provided by Japan
- Annex 7 List of Participants to C/P Training Course in Japan

Project Design Matrix (PDM) – Version 2 (revised on 23rd December 2015)

Project Name: The Project on Establishment of Energy Management Training Center (Stage 2)

Project Area or Location: General Directorate of Energy , Ministry of Industry and Trade (MOIT) in Hanoi, and Plastic- Rubber Technology and Energy Conservation Center (PRET), Department of Industry and Trade (DOIT) in HCMC

Target Group: Direct beneficiaries: MOIT, DOIT-HCMC, PRET

Indirect beneficiaries: Instructors of EMTC in HCMC and Hanoi, and Energy Managers and Energy Auditors of the Designated Enterprises, that annually energy consumption of 1000 ton or more of Oil Equivalent fuel for Industrial Sector and annually energy consumption of 500 ton or more of Oil Equivalent fuel for Commercial Sector

Project Period: From July 1st 2013 to 31st March 2016

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
<p><u>Overall Goal</u> Under the Law on Energy Efficiency and Conservation, energy management in designated enterprises is enhanced.</p>	<p>Energy intensity of designated enterprises is reduced by 5%, comparing the data between 2016 and 2020.</p>	<p>Government information (by MOIT)</p>	
<p><u>Project Purpose</u> The Energy Management Training Center is established and managed for training Energy Managers and Energy Auditors.</p>	<p>Establishment of training and qualification system of energy manager and energy auditor</p> <p>Curriculum and textbook are completed as Guiding Document of the Minister.</p>	<p>Records of trial training course</p> <p>Questionnaire by JICA experts</p> <p>Annual operation reports</p> <p>Mid-term planning on energy conservation</p> <p>Test paper and record sheet of practice examination</p>	<p>Energy data management system is developed and operated by the Government.</p> <p>The designated enterprises properly implement their mandate to assign energy managers, submit energy management reports, and receive energy audits according to the law.</p> <p>Government policy to promote energy conservation activities is maintained.</p>

<u>Outputs</u>			
<p>1. Curriculum, textbook and practical training equipment of training course for energy manager and energy auditor are developed</p>	<p>1-1 C/P's establish curriculum and program of practical training course. 1-2 C/P's are able to develop textbook and materials of practical training course 1-3 C/P's are able to operate training equipment for practical training course.</p>	<p>1-1 Printed curriculum and program 1-2 Evaluation of developed training materials and textbooks by trainees 1-3 Performance test record and operation record of training equipment</p>	<p>Trainers of the Energy Manager Training and Energy Auditor Training stay within the organization.</p>
<p>2. C/Ps are able to implement practical energy manager training</p>	<p>2-1 C/P's are assigned for training course. 2-2 C/P's are able to utilize training facilities and equipment efficiently. 2-3 C/P's are able to maintain training facilities and equipment sufficiently.</p>	<p>2-1 Organization chart and training course record 2-2 Information from trainees and JICA experts 2-3 Information from trainees and JICA experts</p>	
<p>3. C/Ps are able to implement practical energy auditor training</p>	<p>3-1 C/P's are assigned for training course. 3-2 C/P's are able to instruct energy audit report of factories and buildings in accordance with Circular 09/2012/TT-BCT 3-3 C/P's are able to implement training courses.</p>	<p>3-1 Organization chart and training course record 3-2 Evaluation of energy audit report of factory and building prepared by C/P. 3-3 Evaluation of training courses by the trainees</p>	
<p>4. C/P's capacity to disseminate energy conservation activities for enterprises is strengthened.</p>	<p>4-1 C/P's disseminate energy conservation technology and case studies to designated enterprises. 4-2 Network of DOIT, MOIT, universities and factories on energy management is established.</p>	<p>4-1 Record of workshops 4-2 Evaluation of network document</p>	

<u>Activities</u> 1-1 Implement baseline survey 1-2 Appoint the full time instructors of heat, electricity and staff of training center 1-3 Establish working group on curriculum, textbook, and qualification tests 1-4 Review curriculum and textbooks so far prepared by MOIT and DANIDA 1-5 Prepare curriculum and program of practical training course for Energy Manager and Energy Auditor 1-6 Install training facilities and equipment	Inputs		Necessary support from related institutions are provided.
	The Vietnam Side	The Japanese Side	
	1. Local personnel - Project Director - Project Manager - Project Coordinator - Professors of the universities - Administrative Staff - Trainers and Maintenance Staff	1. Personnel Short-term experts - Expert on Heat Technology - Expert on Electricity Technology - Experts for supervision of installation - Experts on curriculum and textbook	

<p>1-7 Prepare operation and maintenance manual including spare parts list of training equipment and measurement devices</p> <p>1-8 Prepare textbook of practical training course</p> <p>1-9 Establish examination system and qualification system of Energy Manager and Energy Auditor</p> <p>1-10 Inform the necessary revision contents of regulations on energy management and energy audit</p> <p>2-1 Appoint instructors for training course of Energy Manager in HCMC Training center</p> <p>2-2 Carry out the practical training on its operation and maintenance</p> <p>2-3 Carry out the training on energy conservation by training equipment.</p> <p>2-4 Implement trial training course for Energy Manager</p> <p>3-1 Appoint instructors for training course of Energy Auditor in HCMC training center</p> <p>3-2 Carry out the practical training on its operation and maintenance</p> <p>3-3 Carry out the training on energy conservation by training equipment.</p> <p>3-4 Implement trial training course for Energy Auditor</p> <p>3-5 Implement trial energy audit in factories and buildings</p> <p>4-1 Implement workshop on energy conservation technology and regulations</p> <p>4-2 Establish network of MOIT, Department of Industry and Trade (DOIT) and Universities on energy management and energy audit</p>	<p>2. Land, building(s), rooms and facilities</p> <ul style="list-style-type: none"> - Office & necessary facilities for the Japanese experts and Vietnamese C/P. - Meeting room(s) for the transfer of technology. - Buildings, facilities and space necessary for the equipment and materials to be provided by JICA <p>3. Local cost</p> <ul style="list-style-type: none"> - Allocation of the budget necessary to implement the Project, including the in-land transportation and installation cost for the equipment. 	<ul style="list-style-type: none"> - Experts on energy audit - Experts on examination system and qualification of Energy Management and Energy Auditor - Appropriate number of other experts will be dispatched as necessary arises. <p>2. Training of C/P in Japan</p> <p>Approx 5-10 instructors for training course of Energy Manager and Energy Auditor</p> <p>3. Machinery and Equipment including measurement devices.</p>	<p>Preconditions</p> <p>Necessary budget, office space and training facilities for the project are allocated.</p>
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Evaluation Grid: The Project on the Establishment of Energy Management Training Center (Stage 2)

19/Nov/2015

1) Verification of Performance

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Inputs provided	1) Has inputs from Japan side been provided as planned?	Comparison of actual results with the plan	Names, periods, and TORs of Experts assigned	* Project documents * Experts	Document review Questionnaire Interview
	a. Dispatch of Experts		Contents, No. of the participants, period, and costs of trainings in Japan		
	b. Trainings in Japan		Items, volumes, and purposes of the Inputs		
	c. Machinery provided		Items of activities and amount allocated		
	d. Local cost for activities				
	2) Has inputs from Vietnam side been provided as planned?	Comparison of actual results with the plan	No. of assigned C/P and their positions and periods	* Project documents * Experts * C/P	Document review Questionnaire Interview
a. Assignment of the C/P	Area, facilities, and other items of the office				
b. Project office	Items and amount of the budget				
Achievement of the Outputs	Has the Output-1 been achieved as planned? "Curriculum, textbook and practical training equipment of training course for energy manager and energy auditor are developed."	PDM Indicators	1- a: C/Ps establish curriculum and program of practical training course.	* Project documents * Experts * C/P	Document review Questionnaire Interview
			1-b: C/Ps are able to develop textbook and materials of practical training course.		
			1-c: C/Ps are able to operate training equipment for practical training course.		
	Has the Output-2 been achieved as planned? "C/Ps are able to implement practical energy manager training."	PDM Indicators	2-a: C/Ps are assigned for training course..	* Project documents * Experts * C/P	Document review Questionnaire Interview
			2- b: C/Ps are able to utilize training facilities and equipment efficiently.		
			3- c: C/Ps are able to maintain training facilities and equipment sufficiently.		
	Has the Output-3 been achieved as planned? " C/Ps are able to implement practical energy auditor training."	PDM Indicators	3-a: C/Ps are assigned for training course.	* Project documents * Experts * C/P	Document review Questionnaire Interview
			3-b: C/Ps are able to instruct energy audit report of factories and building in accordance with Circular 09/2012/TT-BCT.		
			3-c: C/Ps are able to implement training course		
	Has the Output-4 been achieved as planned? "C/P's capacity to disseminate energy conservation activities for enterprises is strengthen."	PDM Indicators	4- C/Ps disseminate energy conservation technology and case studies to designated enterprises.	* Project documents * Experts * C/P	Document review Questionnaire Interview
			4-b: Network of DOIT, MOIT, universities and factories on energy management is established.		
	Achievement of the Project Purposes (prospect)	Will the Project Purpose be achieved by the end of the Project? "The Energy Management Training Center is established and managed for training Energy Managers and Energy Auditors."	PDM Indicators	a. Establishment of training and qualification system of energy manager and energy auditor	* Project documents * Experts * C/P
b. Curriculum and textbook are completed as Guiding Document of the Minister					
Achievement of Overall Goals (prospect)	Is there a prospect that the Overall Goal will be achieved within 5 years after the completion of the Project? "Under the Law on Energy Efficiency and Conservation, energy management in designated enterprises is enhanced."	PDM Indicators	a. Energy intensity of designated enterprises is reduced by 5%, comparing the data between 2016 and 2020..	* Project documents * Experts * C/P	Document review Questionnaire Interview

2) Verification of Implementation Process

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Progress of the Activities	Has the Project activities been implemented as planned?	Comparison of actual results with the plan	Actual/planned activities based on the PO Conditions, reasons and countermeasures of major delays of the activities	* Project documents * Experts * C/P	Document review Questionnaire Interview
	Were there any factors which have influenced the progress of the Project?		Factors which have influenced the progress of the project		
C/P	Is the commitment and ownership of the C/P high?		Evaluation on the C/P assigned in terms of ownership and understanding of PDM	* Project Documents * Experts	Document review Questionnaire Interview
	Have the C/P participated in the Project activities positively? Is the C/P' appreciation on the Project high?		Level of the participation and appreciation of the C/P in the Project activities		
	Have other related persons/institutions participated in the Project activities positively? Is other related persons/institutions' appreciation on the Project high?		Level of the participation and appreciation of other related persons/institutions in the Project activities (including the budget allocation)		
Project Management	Is Vietnam's implementation framework clear and functional? Is WGs fuctional?		Comments on Vietnam's implementation framework	* Project documents * Experts * C/P	Document review Questionnaire Interview
	Is there any problem in the project management? (monitoring system, decision-making process, etc.)		Framework of the project management(Mechanism and frequency of monitoring, feedback through monitoring)		
	Have the Project members communicated each other smoothly?		Meeting records (frequency, agenda, etc.), problems		
	Has the Project team communicated well with the C/P?		Meeting records (frequency, agenda, etc.), problems		

3) Five Evaluation Criteria

(1) Relevance

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Necessity	Has the framework of the Project been consistent with the needs of MOIT?	Description on the topics	Issues which MOIT is facing	* Development policy documents of Vietnam * C/P t	Document review Interview
Priority	Have the Project Purpose and Overall Goal been consistent with the development priority of Vietnam?	Description on the topics	Development policies in bridge management sector of Vietnam	* Development policy documents of Vietnam * C/P	Document review Questionnaire
	Has the Project Purpose been consistent with Japan's ODA policy for Vietnam?	Description on the topics	Japan's country-focused assistance plan and JICA's country-focused program implementation plan	* Vietnam - focused assistance plans by Japan	Interview
Appropriateness of measures	Has the cooperation method undertaken by the Project been relevant for each Output?		Features of cooperation methods undertaken by the Project Relation with the approaches of other donors' assistance	* Project documents * Experts	Document review Interview
	Was the target training center selected for the Project appropriate?		Reasons for the selection of the target training center	* C/P	Questionnaire
	Has Japanese experiences and cooperation experiences been utilized?		Cases in which the experiences and know-how of Japan's previous assistance projects have been turned to advantage		
Others	Was there any change in the environment surrounding the Project (political/economic/social aspects)?		Information on the change in the environment surrounding the Project	* Experts * C/P	Interview

(2) Effectiveness

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Achievement of the Project Purpose	Will the Project Purpose be achieved by the end of the Project?	Verification result of the performance	Degree of the achievement of the Project (verification result of the performance)	* Experts * C/P	Document review Interview
Causality	Was the setting of Outputs relevant for achieving the Project Purpose?	Verification result of the performance	Causal relation between the Project Purpose and the Outputs	* Project documents * Experts * C/P	Document review Interview Questionnaire
	Are there any important assumptions which have influenced the achievement of the Project Purpose?		Influence of the important assumptions to the achievement of the Project purpose (below) - Precondition Necessary budget, office space and training facilities for the Project are allocated. - Important assumption for the outputs Necessary support from related institutions are provide. - Important assumption for the Project Purpose Trainers of the Energy Manager Training and Energy Auditor Training stay within the organization.		
	Was there any factor which has contributed to the achievement of the Project Purpose?		Promoting factors		
	Was there any factor which has inhibited the achievement of the Project Purpose?		Inhibiting factors		

(3) Efficiency

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Achievement of Output	Have all the Outputs been produced properly?	Verification result of the performance	Degree of the achievement of the output production(verification result of the performance)	* Project documents * Experts * C/P	Document review Interview Questionnaire
	Was there any factor inhibiting the achievement of Outputs?		Inhibiting factors		
Causality	Have the Inputs and the Activities been provided sufficiently for achieving the Outputs?	Verification result of the performance	Inputs from Japan (Japanese Experts, machinery provided, training in Japan, local costs for activities, and local staff) (verification result of the performance)	* Project documents * Experts * C/P	Document review Questionnaire Interview
	Was there any important assumption that has influenced the achievement of the Outputs?	Verification result of the performance	Inputs from Vietnam (Assignment of the C/P, sharing costs for the project management, etc.) (verification result of the performance)		
Appropriateness of Inputs and Activities	Have the Inputs from both sides been provided timely?	Verification result of the performance	Inputs from both Japan and Vietnam (verification result of the performance)	* Project documents * Experts * C/P	Document review Questionnaire Interview
	Were the quality, the amount and the timing of Activities relevant?	Verification result of the performance	The cases of delay of the Activities planned in PO and their influence (verification result of the performance)		
Cost	Has the Project been implemented efficiently in terms of		Cases where its outstanding cost-effectiveness has been identified	* Project documents	Document review

	cost-effectiveness, compared with other similar projects?			* Experts * C/P	Interview Questionnaire
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(4) Impact

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Achievement of the Overall Goal (prospects)	Will the overall goal be achieved in 3-5 years after the completion of the Project?	verification result of the performance	Degree of achievement of the Overall Goal (verification result of the performance)	* Experts * C/P	Questionnaire Interview
	Is there any factor inhabiting the achievement of Overall Goal?		Inhibiting factors		
Causality	Does the Project Purpose contribute to achievement of Overall Goal?		Comparison of the achievement between the Project Purpose and the Overall Goals (verification result of the performance)	Experts * C/P	Questionnaire Interview
	Are there any important assumptions which have influenced the achievement of the Project Purpose?		Influence of the important assumptions to the achievement of the Project purpose (below) - Trainers of the Energy Manager Training and Energy Auditor Training stay within the organization.		
Ripple Effect	Are there any positive or negative influences brought by the Project in the following aspects, besides the Overall Goal? - Influence to attitude for daily work - Influence for policy making and legalization; - Influence for social and cultural aspects such as gender, human right and rich/poor; - Influence on environmental protection; - Influence by technical innovation; and - Economic influence to the target group		Confirmation of the cases	Experts * C/P	Questionnaire Interview

(5) Sustainability

Evaluation Questions		Criteria for Judgment	Required Information and Data	Information Sources	Data Collection Methods
Main Items	Sub Items				
Political Factor	Will the policy support by the Vietnam government be made for continuation of the Project activities after the end of the Project?		Related policies of Vietnam government	* Vietnam related documents * Experts * C/P	Questionnaire Interview
	Have the relevant regulations and legal systems been prepared to sustain the effect of the project?		Related regulations and legal systems on energy conservation in Vietnam		
Organizational / Financial Factor	Is there any institutional framework for continuation of the activities?		Assignment of human resources Documents on decision-making process, etc.	* Experts * C/P	Questionnaire Interview
	Is the C/P's ownership for the sustainability of the Project secured sufficiently?		The degree of participation of Vietnam's institutions concerned into the project activities and the level of their ownership (verification results of the implementation process)		
	Has the C/P secured a necessary budget to sustain the effect of the Project after the completion of the Project?		Policy of Vietnam's institutions concerned for budgeting		
Technical Factor	Has technology or know-how transferred through the Project been accepted by the C/P? (in view of technical level, social or conventional factors, etc.)		Level of understanding of the C/Ps on energy conservation methods	* Experts * C/P	Questionnaire Interview
	Will the equipment introduced by the Project be well maintained by C/Ps themselves?		How is the equipment utilized and maintained?		
Other Important Factor	Is there any factor that inhibits the sustainability?		Other important factor	* Experts * C/P	Questionnaire Interview

List of Stakeholders Interviewed

1)	MOIT Mr. Trinh Quoc Vu Mr. Dang Hai Djung Mr. Nguyen Hoang Linh	Director, Science Technology and Energy Efficiency Department, GDE, MOIT Deputy Director, Science Technology and Energy Efficiency Department, GDE Science Technology and Energy Efficiency Dep., GDE
2)	DOIT-HCMC Mr. Vong A Loc Ms. Luong Xuan Nhung	Head of Energy Management Division Deputy Director, Energy Management Division
3)	PRET Mr. Truong Van Long Mr. Dang Tan Tai	Director Vice Director
4)	PRET Lecturer Ms. Nguyen thj Minh Trinh Ms. Nguyen thj Kim Anh Mr. Dang Tan Tai Mr. Phan Tan Phong Mr. Nguyen Van Tuyen Mr. Tran Van Hung Mr. Nguyen Nhat Tan Mr. Tiet Vinh Phuc	HCM City Univ. of Technology PRET Vice Director, PRET PRET HCM City Univ. of Technology HCM City Univ. of Technology HCM City Electrical Power Collage EnerTEAM
5)	EPU Dr. Duong Trung Kien Dr. Le Anh Tuan Dr. Nguyen Huong Mai Mr. Nguyen Dinh Tuan Phong Dr. Bui Manh Tu	Dean, Energy Management Faculty, EP Dean of Finance and Accounting Faculty, EPU Lecturer, EPU Lecturer, EPU Vice Dean of Energy Technology Faculty
6)	HUST Dr. Nguyen Xuan Quang	Head of Dept. of Thermal Energy System
7)	ECC Hanoi Mr. Dao Hong Thai Mr. Hoang Minh Lam Mr. Tran Anh Thinh Dang Hong Quang Phung Van Tue Tran Thi Loan Hoang Quan	Director Vice Director

	Hoang Mis Lain	
8)	Japanese Experts Team Mr. Akira Ishihara Mr. Hideo Kubota Mr. Yutaka Ogura	Leader/ECC Policy EEC Law and Regulation Sub Leader/EEC on Heat 1
9)	JICA Vietnam Office Kotaro Taniguchi	Representative

Table List of Japanese Experts: The Energy Conservation Center, Japan

No.	Responsibility	Name
1	Leader / Energy Efficiency & Conservation Policy (~April 2014)	Tsutomu Okamoto
2	Leader / Energy Efficiency & Conservation Policy (May 2014 ~)	Akira Ishihara
3	Energy Efficiency & Conservation Law and Regulation	Hideo Kubota
4	Sub Leader /Energy Efficiency & Conservation on Heat 1	Yutaka Ogura
5	Examination System and Qualification of Energy Manager and Energy Auditor	Shingo Takao
6	Supervision of Installation of Training Equipments	Hisao Kazama
7	Energy Efficiency & Conservation on Electricity	Kazuhide Kunitoku
8	Specification of Transportation of Equipments	Hiroyuki Ishigaki
9	Energy Efficiency & Conservation on Heat2	Nirou Kitagawa

(source) Japanese Experts

List of Equipment provided by Japan

Descriptions	Quantity
Furnace Unit for Practical Training	1 unit
Steam Trap System for Practical Training	1 unit
Pump Unit for Practical Training	1 unit
Fan Unit for Practical Training	1 unit
Compressor Unit for Practical Training	1 unit
Lighting System Unit for Practical Training	1 unit
Power Control Box	1 unit
Portable Measuring Instruments	1 unit
Wireless Guide System	1 unit
Tool Set	1 unit

(Source)JICA

List of Participants of Training in Japan: 24 Aug. – 6 Sept. 2014

No.	Full Name	Professional Skill	Position	Organization
01	Nguyen Hoang Linh	Power system Engineer	Official	GDOE
02	Dang Tan Tai	PhD in Chemistry	Vice Director, PRET	PRET
03	Nguyen Van Tuyen	PhD in Heat Technology	Lecturer	HCM Polytechnic University
04	Phan Tan Phong	Electrical Engineer	Technician	PRET
05	Nguyen Nhat Tan	Master in Electrical Energy	Lecturer	HCM Electricity Colleges
06	Ma Khai Hien	Mechanical and Heat Engineer	Vice Director, ENERTEAM Lecturer	ENERTEAM
07	Tran Van Hung	PhD in Heat Technology	Lecturer	HCM Polytechnic University
08	Ha Anh Tung	PhD in Heat Technology	Lecturer	HCM Polytechnic University
09	Nguyen Thi Minh Trinh	Master in Heat Technology	Lecturer	HCM Polytechnic University
10	Hoang Quan	Heat Engineer	Expert	ECC Hanoi
11	Do Van Sang	Power system Engineer	Expert	ECC Hanoi
12	Nguyen Thi Le Na	Master in Energy Economics	Lecturer	Power Management Faculty, EPU
13	Tiet Vinh Phuc	Energy Engineer	Manager	ENERTEAM
14	Doan Anh Tuan	Power system Engineer	Lecturer	Danang University of Technology
15	Duong Hoang Van Ban	Master in Heat Technology	Official	Energy Conservation and Technology Consultation Center of Danang

(Source) Project Progress Report for the first year, March 2015

The Revised Points of “Circular No. 39/2011/TT-BCT)”

The Energy Conservation Center, Japan

The revised points of “Circular No.39” are shown below as the result of the activity of MOIT Working Group.

Chapter II UNITS OF TRAINING ENERGY MANAGEMENT AND ENERGY AUDITOR

Article 4. Conditions to be recognized as a unit of training energy management and energy auditor

<Added contents>

1. Material facilities

b) There is a training management room: Having boards to write training program and training progress in the year, desks, chairs, and other necessary equipment for training management staff.

c) There is a training preparation room for teachers (it is able to use the training management room): Having enough desks, chairs, boards, filing cabinets, and necessary training tools.

4.Documents to serve the training and training management of the energy management/energy auditor training units:

a) Current training curriculum on energy auditing/energy management issued by the Ministry of Industry and Trade.

b) Descriptive documents for review and drill, test, examination, and reference documents to serve training and learning.

c) Notebooks and forms to serve the management of learning and training processes according to regulations.

Article 6. Appraising and recognizing training units

3. For the training units which have already had licenses, the General Directorate of Energy shall appraise and check the practical capacity of the units every 03 years. If the units do not meet the conditions in the Article 4 of this Circular, their licenses shall be revoked.

<Changed Title and Contents>

Article 7. Condition for candidates (Before)

Article 7. Checking and supervising the quality of training (After)

The recognized training units shall be responsible for yearly sending their summary reports to the General Directorate of Energy and the Ministry of Industry and Trade before March 31 of the next year. Contents of the report consist of:

The number of trainees who attended the energy management training

The number of trainees who received the Energy Manager certificate
The number of trainees who received the Energy Auditor certificate
Quantity and operation situation of training and practice equipment
Teaching staff

<Changed Title and the contents are the same as old Article 7>

Article 8. Training organization (Before)

Article 8. Conditions for the person who participates in enrolment (After)

<Changed Title and the contents >

Article 9. Conditions to take the exam for certificate (before)

Article 9. Dossier of the people who learn energy management/energy auditing (After)

1. For the first time of participating in the energy manager/energy auditor training courses, the trainees shall prepare 01 dossier and directly submit to the training unit, including:

- a) Application form;
- b) A copy of identification card or passport which is still valid;
- c) Healthy certificate issued by authorized medicine unit according to regulations.
- d) Certified copies of the degrees stipulated in the Article 8 of this Circular.

2. The energy managers who attend the additional training course in order to take the examination of energy auditor shall prepare 01 dossier and directly submit to the training unit, including:

- a) The documents stipulated in the item 1 of this Article;
- b) A certified copy of the Energy Manager certificate which has the valid time (showing the original certificate when attending the examination and receiving the energy auditor certificate).

<Changed Title and the contents are the same as old Article 8>

Article 10. Issue and recognition of the certificate (Before)

Article 10. Training organization (After)

<Changed Title and added contents>

Article 11. Change; re-issue the certificate of energy management and energy audit.(Before)

Article 11. Contents of training (After)

1. Time of training:

- a) The training course for the Energy Manager certificate is 07 days (theory: 33 hours, practice: 16 hours)
- b) The training course for the Energy Auditor certificate is 12 days (theory: 52 hours, practice: 32 hours)
- c) The additional training course for energy manager to become energy auditor is 5.5 days (theory: 19 hours, practice: 10.5 hours)

2. The training program and time allocation:

	Contents	Unit	Training course		
			Energy Management	Energy Auditor	Additional training course
	Energy situation of Vietnam and relevant legal documents	day	1	1	0
	Models of energy management	day	0.5	0.5	0
	Methods of economic and financial assessment	day	0.5	0.5	0
	Process of energy audit	day	0	0.5	0.5
	Measuring devices in energy auditing and instruction	day	0	0.5	0.5
	Power supply system and lighting system (theory + practice)	day	0.7	1	0.3
	Motor and pump system (theory + practice)	day	0.3	1	0.7
	Air compressor system (theory + practice)	day	0.3	1	0.7
	Fan system and refrigeration system (theory + practice)	day	0.7	1	0.3
	Furnace and burning technique (theory + practice)	day	1	1	0
0	Heat balance	day	0	1	1
1	Boiler and steam distribution system (theory + practice)	day	1	1	0
2	Practice of energy auditing	day	0	1	1
	Energy auditing report (theory and practice)		0	0.5	0.5
3	Calculation of energy saving potentiality (theory + practice)	day	1	0.5	0
	Total days for a training course	Hou r	7	12	5.5

<Changed Title and the contents are the same as old Article 9>

Article 12. Revoke certificate for energy auditor (Before)

Article 12. Conditions to take the exam for certificate (After)

<Changed Title and added contents>

Article 13. File storage (Before)

Article 13. Implementation of examination for receiving certificate and dossier for examination (After)

1. The unit which organizes the examination of Energy Auditor certificate or the Energy Manager certificate is the Ministry of Industry and Trade or is assigned by the Ministry of Industry and Trade

2. Contents of examination:

a) For the Energy Manager certificate: Theory and practice examination in laboratory

- Theory: 60 minutes, 50 test questions in the following fields:

+ General information about the energy industry of Vietnam

+ The Law on on Economical and Efficient Use of Energy

+ Power supply system and lighting system

+ Motor and pump system

+ Air compressor and fan system

+ Civil and industrial refrigeration systems

+ Furnace and burning technique

+ Boiler and steam distribution system

+ Calculation of energy saving potentiality

- Practice: testing in groups, and balloting questions

- Assessment: In order to receive the Energy Manager certificate, the trainee shall reach 75/100 points of theory test and good completion of the practice examination based on assessment of examiners

b) For the Energy Auditor certificate: Theory and practice examination in laboratory and completion of 01 energy auditing report

- Theory: 120 minutes, 100 test questions in the following fields:

+ General information about the energy industry of Vietnam

+ The Law on on Economical and Efficient Use of Energy

+ Power supply system and lighting system

+ Measurement instrument

+ Motor and pump system

+ Air compressor and fan system

+ Civil and industrial refrigeration systems

+ Furnace and burning technique

+ Heat balance

+ Boiler and steam distribution system

+ Calculation of energy saving potentiality

+ Auditing process and report

- Practice: testing in groups and balloting questions, performing examination and writing energy auditing report

- Assessment: In order to receive the Energy Auditor certificate, the trainee shall reach 75/100 points of theory test and good completion of practice examination based on assessment of examiners

c) The Energy Manager takes the examination of the Energy Auditor certificate: Theory and practice examination in laboratory and completion of 01 energy auditing report in accordance with the item 2a of this Article

3. Dossier for examination consists of:

- a) Curriculum vitae
- b) 02 photos with size of 3x4
- c) A certified copy of identification card
- d) Certified copies of the degrees stipulated in the Article 8 of this Circular.

<Changed the Title and added items to the old Article 10>

Article 14. Validation of implementation (before)

Article 14. Issuing certificates, recognizing and accepting certificates (After)

2. The person who has the energy manager and energy auditor certificates issued by authorised foreign or international organizations shall prepare the following documents to be issued with Vietnam certificates:

- a) Application form for issuing energy manager/energy auditor certificates;
- b) Translation version of foreign certificates into Vietnamese language with translation quality proven by notary organizations, Embassy, Consulate in Vietnam and sealing the copies of the original certificates;
- c) A copy of identification card/passport;
- d) 02 colour photos with size of 3x4 cm

3. The energy manager certificate and energy auditor certificate have value in 05 years, after that time, the person who has the certificate need to apply for reissuing the certificate according to the Article 15 of this Circular.

<Changed Title and added contents>

Article 15. Organization of implementation (Before)

Article 15. Changing and reissuing certificates of energy management and energy auditor (After)

1. Within 30 days before the certificate expires, the person who has the certificate shall submit a dossier of changing and reissuing certificate in accordance with the item 3 of this Article.

2. For the person who has the expired certificate

- a) Within 01 year from the expired date, theory test is needed for reissuing the certificate;
- b) After 01 year from the expired date, theory test and practice examination are needed to reissue the certificate.

The dossier for examination is according to the item 3, Article 13 of this Circular.

2. For the person whose certificate is ragged or lost but still having valid time and original dossier, it is reviewed to reissue the certificate.

3. Dossier for changing and reissuing certificate consists of:

- a) Request letter applying for changing and reissuing (including reasons of changing and reissuing);
- b) Original dossier and/or the expired certificate
- c) 02 photos with size of 3x4.

<Added new Article, same contents as old Article 12>

Article 16. Revoking the energy auditor certificate

< Added new Article, same contents as old Article 13>

Article 17. Archiving dossiers

The changes of Article No. and Title

Article No.	Before	After
7	Conditions for the person who participates in enrolment	+ Checking and supervising the quality of training
8	Training organization	Conditions for the person who participates in enrolment
9	Conditions to be taken examination for receiving certificate	+ Dossier of the people who learn energy management/energy auditing
10	Issuing certificates, recognizing and accepting certificates	Training organization
11	Changing and reissuing certificates of energy management and energy auditor	+ Contents of training
12	Revoking the energy auditor certificate	Conditions to be taken examination for receiving certificate
13	Archiving dossiers	+ Implementation of examination for receiving certificate and dossier for examination
14	*Validation of implementation	Issuing certificates, recognizing and accepting certificates
15	*Organization of implementation	Changing and reissuing certificates of energy management and energy auditor
16	Nil	Revoking the energy auditor certificate
17	Nil	Archiving dossiers

- * The **old Article 14 and 15** were deleted. The contents of old Article 15 are included in Article 7.
- + The new Titles newly added are in **light blue**.

**Baseline Survey Report
for
the Energy Management Training
Center Project
in
Vietnam**

December 16, 2013

**JICA Energy Management Training Center Project
Team**

Content

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I. Purpose of the Survey

Japan International Cooperation Agency (JICA)'s Project for Establishment of Energy Management Training Center (stage 2) has actually started from July 2013, and Energy Conservation Center, Japan (ECCJ) has been entrusted to conduct a part of this JICA EMTC Project from July 2013, and it is also requested to conduct a Baseline Survey on this Project for this team.

As the Memorandum of Understanding (MOU) on this Project for Establishment of Energy Management Training Center has been mutually exchanged between both government of Vietnam and Japan in February 28th, 2013, and the Energy Efficiency and Conservation (EEC) target value to be achieved by this project is usually described in the Project Design Matrix (PDM) of MOU, however, the concrete figure has not been decided yet at the beginning of this project. So in order to implement this project, it is required to discuss and set up this target value, overall goal value of the energy reduction at the designated enterprises, in the early stage of this project, so the baseline survey including relative data arrangement has been carried out.

II. Procedure of the Survey

In order to implement this baseline survey, following procedure is conducted, and target value is discussed.

- 1. National energy demand and consumption : Data collected from International Energy Agency (IEA), Institute of Energy (IE) of Vietnam (VN) and The Institute of Energy Economics, Japan (IEEJ)**
- 2. Prime Minister Decision No.1427 : Although there is no precise energy consumption volume and energy intensity by industry sector up to now, however, there is some description of current energy intensity and its target in 2015 for three industry sectors shown in the Decision No. 1427, those figures are to be referred.**
- 3. Prime Minister Decision No. 1294 : Content of the designated enterprises, that is stipulated in the EEC Law, has been under collecting, so it is not clear now, however, in the Prime Minister Decision No. 1294/2011, list of name and its energy consumption of 1,190 energy using units is shown, whose annual energy consumption is equal to and more than 1,000 TOE for production facilities in industry, agriculture, transportation, and 500 TOE for construction works used as offices and houses, even though this list might be prepared by past electricity consumption data, this list is also utilized as for the reference.**
- 4. Number of Training Participants both for Energy Manager course and Energy Auditor course : The number of participants and passing the exam for two training**

courses, which started in 2011, and future plan of training number, in Hanoi and Ho Chi Minh are collected through the Ministry of Industry and Trade (MOIT) and relevant organization.

- 5. Follow up method of EEC improvement at the designated enterprises the after installing this training system : EEC improved result at the designated enterprises are to be collected through the energy manager and the energy auditor who have been qualified through this training system after 2016 until 2020, and its training effect will be evaluated through such improved result.**

III. Energy Situation in Vietnam

Following data is collected in order to investigate actual energy supply and demand situation in Vietnam from the year of 2004 up to now.

1. Final Energy Consumption

According to the energy consumption data from 2006 to 2010, energy consumption volume is increased approximately 10 % in every year. It is also reported by JICA Energy Master Plan Survey in 2008 & 2009, that Vietnam is changed to be an energy importing country after 2015 even though there is no lack of energy supply by own country now, so it is getting more important issue for the national proposition to secure energy resources and to use energy efficiently by energy conservation.

Table 1 shows Business as Usual (BAU) and actual final energy consumption and its achieved ratio. As the national EEC target from 2006 to 2010 is 3 to 5 %, compared to BAU, it was actually ranged from 1.8 to 4.4 %, and 3.4 % in 2010 as a whole.

Table 1. BAU and Actual figures on National Final Energy Consumption* (kTOE)

(Source: IE in Sept., 2013)

	2005	2006	2007	2008	2009	2010	2011
BAU: A		23,581	26,576	29,003	31,173	33,968	
Actual: B		22,701	25,619	28,493	29,787	32,801	
(A-B)/A (%)		3.7	3.6	1.8	4.4	3.4	

*: Except combustion renewable (bio-fuels) & waste

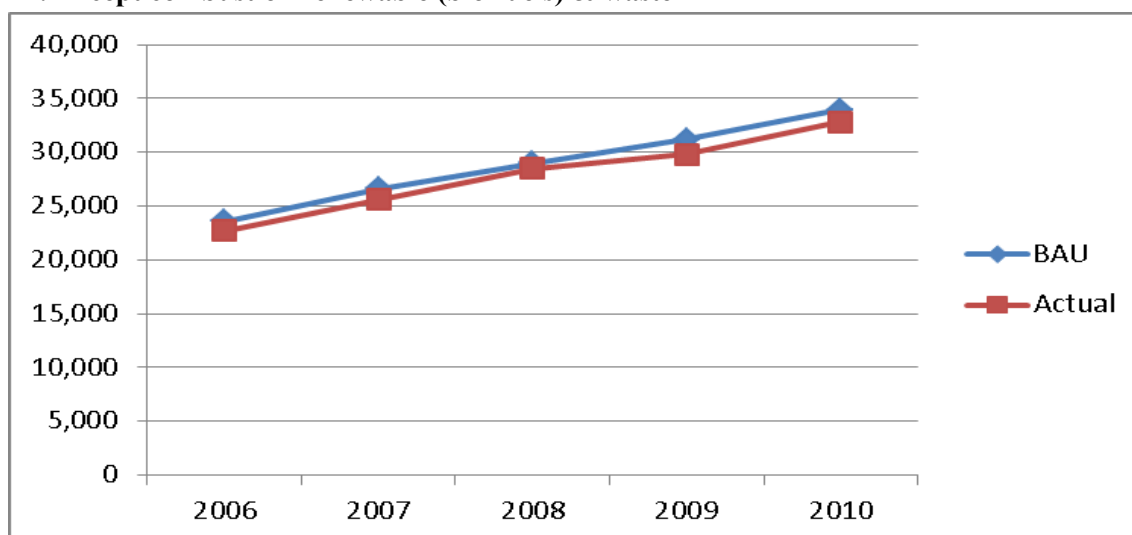


Fig. 1 BAU and Actual figures on National Final Energy Consumption* (kTOE)

2. Primary Energy Supply

Primary energy supply from 2004 to 2010 is shown in the table 2 and figure 2. It is observed that especially coal and natural gas is remarkably increased after 2008, and it is also anticipated a continuous increase of demand, so it is highly requested to have the policy to secure the resources and control of usage.

Table 2. Primary Energy Supply by Energy Resources* (kTOE) (source: IEA, IEEJ)

Energy Resources	2004	2005	2006	2007	2008	2009	2010
Coal	8,344	8,126	9,045	9,890	11,767	12,614	14,651
Crude Oil	516	465	400	662	685	2,690	7,411
Oil products	11,545	11,991	11,881	13,574	13,107	13,428	11,572
Natural gas	4,613	4,914	5,107	5,456	6,232	7,099	8,122
Hydro	1,519	1,845	2,057	1,936	2,235	2,578	2,369
Electricity			-	226	277	321	399
Total	26,538	27,341	28,491	31,745	34,303	38,730	44,523

*: Except “combustion renewable (bio-fuels) & waste”

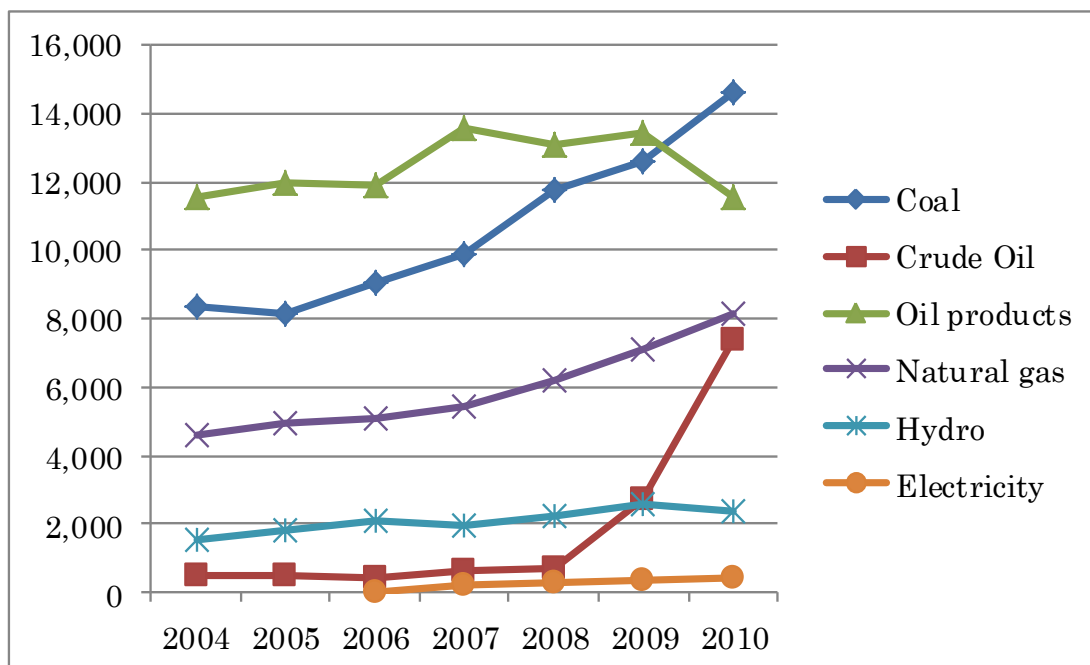


Fig. 2 Primary Energy Supply by Energy Resources (kTOE)

3. Final Energy Consumption by Energy Resources

Final energy consumption by energy resources from 2004 to 2010 is shown in the table 3 and figure 3. It is observed that especially coal, oil products and power is remarkably increased after 2006, and it is also anticipated a continuous increase of demand, so it becomes significant issue to promote EEC.

Table 3. Final Energy Consumption by Energy Resources* (kTOE) (source: IEA)

Energy Resources	2004	2005	2006	2007	2008	2009	2010
Coal	6,666	5,994	5,528	6,244	8,039	8,935	9,814
Crude oil						367	489
Oil products	11,602	11,986	12,003	13,411	13,191	14,639	16,422
Natural gas	21	100	326	541	540	639	492
Electricity	3,413	3,967	4,630	5,256	5,844	6,615	7,476
Total	21,702	22,047	22,488	25,452	27,614	31,214	34,694

*: Except “combustion renewable (bio-fuels) & waste”

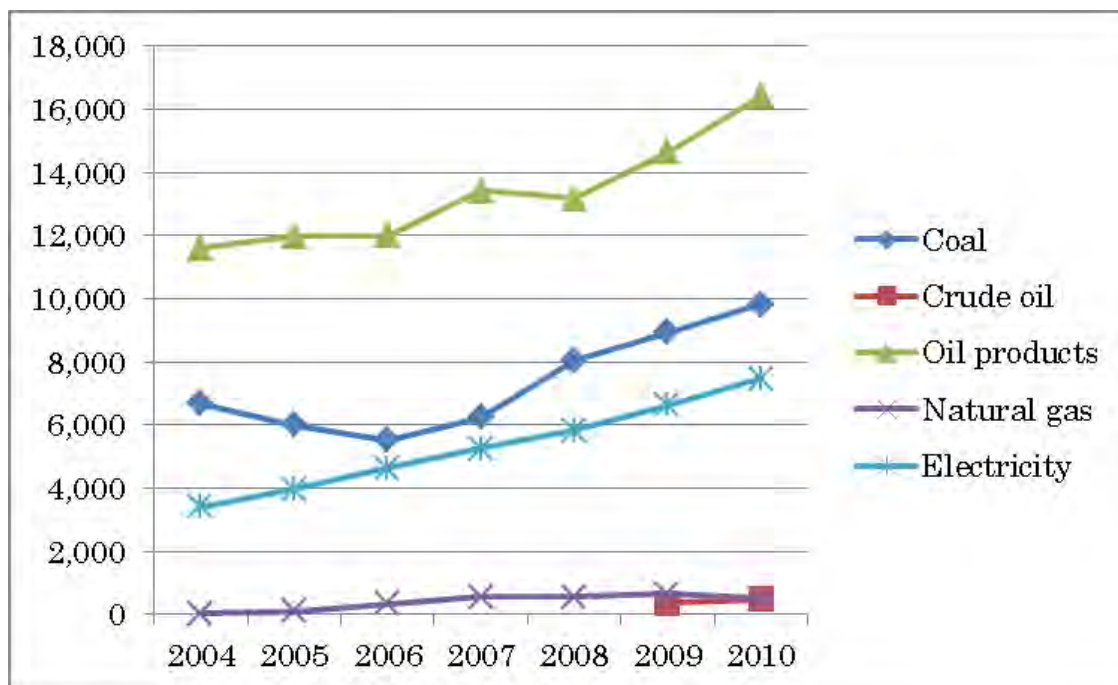


Fig. 3 Final Energy Consumption by Energy Resources (kTOE)

4. Power Generation by Energy Resources

Power generation by energy resources from 2004 to 2010 is shown in the table 4 and figure 4. It is observed that especially demand of power generation by coal and natural gas is remarkably increased after 2006, and it is also anticipated the continuous increase of demand, so it is keen issue for this countermeasures.

Table 4. Electricity Generation by Energy Resources* (GWh) (source:IEA)

Energy Resources	2004	2005	2006	2007	2008	2009	2010
Coal	7,034	8,941	14,313	14,839	15,172	14,975	19,687
Oil products	1,684	2,482	1,462	2,466	2,727	2,055	4,009
Natural gas	19,640	20,586	22,100	27,035	29,164	36,102	43,602
Hydro	17,666	21,454	23,919	22,517	25,986	29,981	27,550
Total	46,029	53,463	61,794	66,857	73,049	83,113	94,848

*: Except “combustion renewable (bio-fuels) & waste”

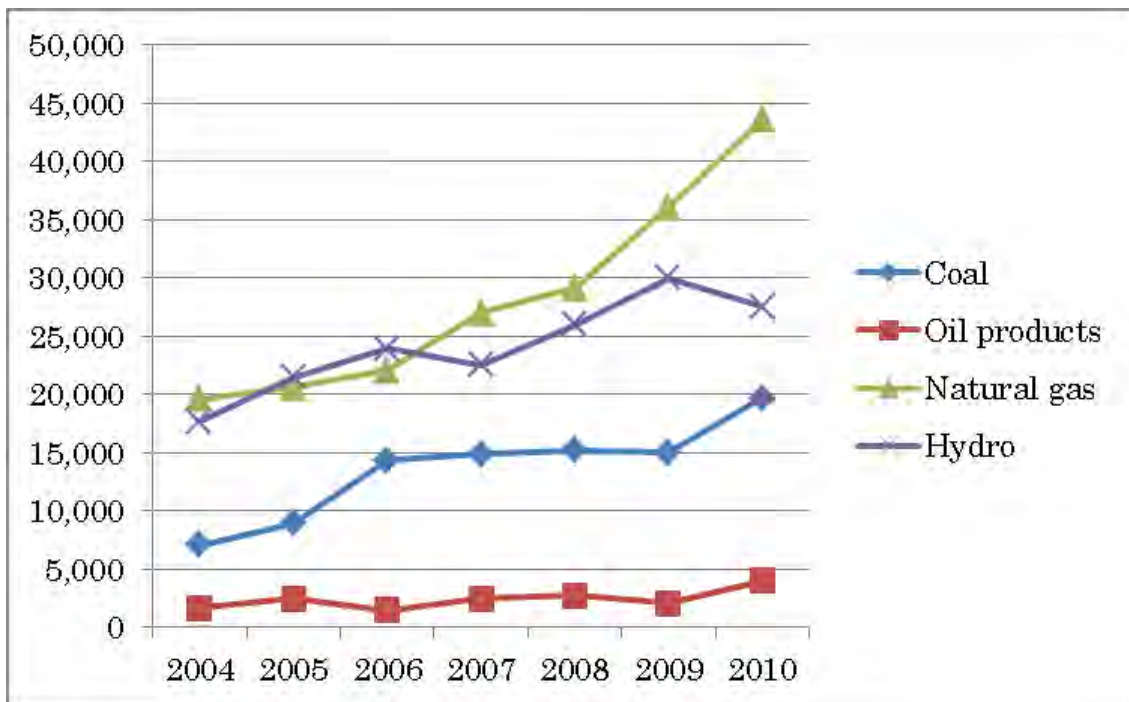


Fig. 4 Electricity Generation by Energy Resources (GWh)

5. Final Energy Consumption by End User

Final energy consumption by end user from 2004 to 2010 is shown in the table 5 and figure 5. It is observed that especially energy consumption in industries and transportation is remarkably increased after 2006, and it is important issue to secure a stable energy supply and promotion of EEC, especially in these sectors.

Table 5. Final Energy Consumption by End User (kTOE)

(source: IEA, IEEJ)

End User	2004	2005	2006	2007	2008	2009	2010
Industries	9,072	9,246	9,047	10,353	12,191	13,693	14,837
Buildings	1,524	1,629	1,564	1,545	1,576	1,598	1,751
Transport	7,093	7,065	7,308	7,840	8,091	9,478	10,144
Residence*	3,224	3,262	3,596	3,754	4,012	4,414	4,785
Others	788	845	973	1,960	1,746	2,032	3,176
Total	21,701	22,047	22,488	25,452	27,616	31,216	34,693

*: Except “combustion renewable (bio-fuels) & waste”

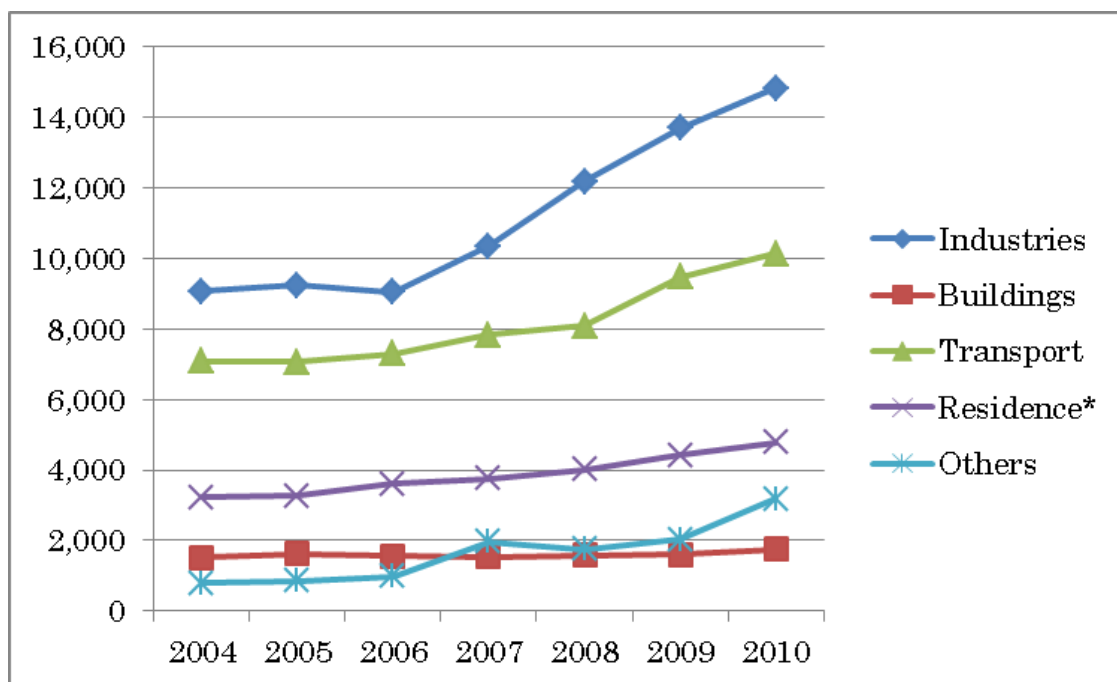


Fig. 5 Final Energy Consumption by End User (kTOE)

6. Final Energy Consumption by Industry Sector

Final energy consumption by industry sector in 2010 is shown in the table 6 and figure 6. It is observed that especially large energy consuming industry sector is cement, textile and food processing, and pulp & paper, iron & steel and chemical are followed. It is assumed that those six sectors are basically considered as the main objective industries for EEC promotion in Vietnam.

Table 6. Final Energy Consumption by Industry Sector (Year 2010)

(Source : Vietnam Energy Statistics, 2010, IE)

Industry Sector	Energy Consumption (TOE)	Energy Consumption Ratio (%)
Cement & building materials	5,644	37.9
Textile & leather	1,842	12.4
Food s & tobacco	1,501	10.0
Pulp & paper	761	5.1
Iron & steel	753	5.0
Chemical and petroleum	739	5.0
Other	3,673	24.6
Total	14,913	100

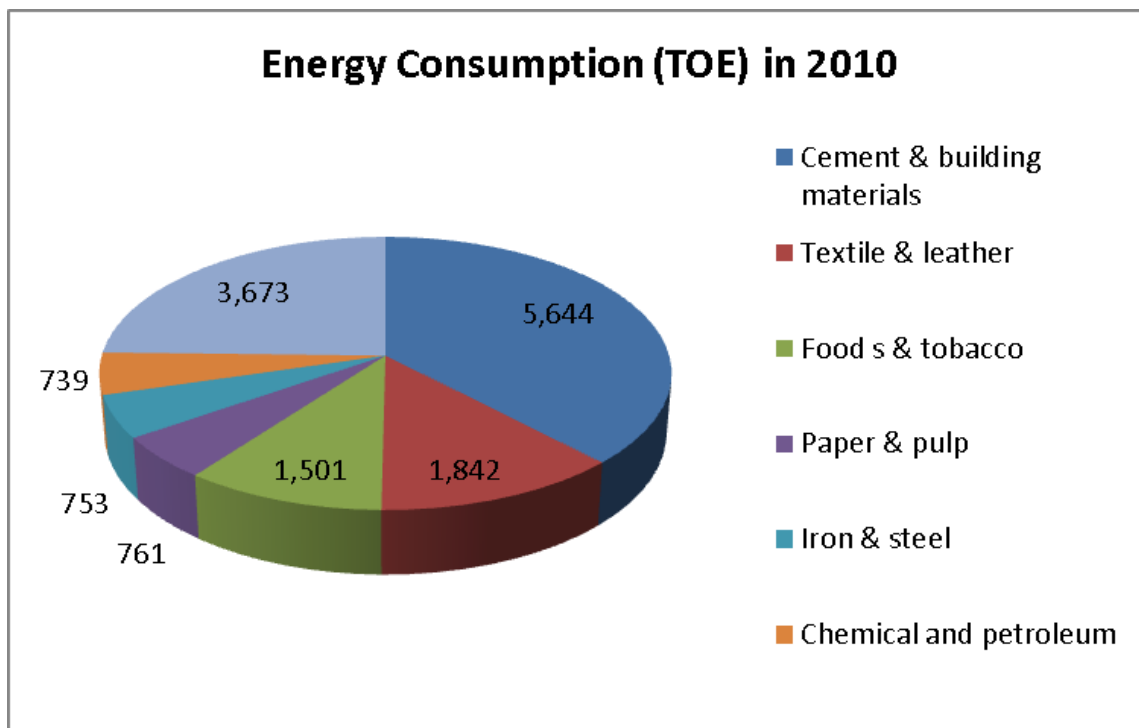


Fig. 6 Final Energy Consumption by Industry Sector (Year 2010)

IV. Implementing Situation of EEC in Vietnam

1. National Target Program of EEC

National Strategic Program on Energy Saving and Effective Use is enacted as the Prime Minister Decision No. 79/2006/QĐ-TTĐ, and EEC reduction target is set up from the year of 2006 to 2015. This ten years term is divided into two five year terms and each EEC target is stipulated as follows.

- (1) 2006 – 2010: 3-5 % reduction of national energy consumption**
- (2) 2011 – 2015: 5-8 % reduction of national energy consumption**

2. EEC Promotion Organization

Energy Efficiency & Conservation Office (EECO) was established in the Department of Science & Technology of Ministry of Industry (MOI) in 2006, and the MOI has changed to MOIT in 2007, merged with Ministry of Trade. Then General Directorate of Energy (GDE) is newly established in MOIT, and its Science, Technology and Energy Efficiency Department is in charge of core promotion organization of EEC in VN instead of EECO after 2012.

3. Establishment of Energy Master Plan

Based on the request of Vietnam government, JICA has conducted “The National Energy Master Plan in Vietnam” from 2006 to 2008, and deeply investigated on the Forecast of Energy Balance of VN, and proposed the National Energy Master Plan in Vietnam. It is also clearly pointed out that VN is changed to be energy importing country after 2015 in it.

JICA has also implemented “The Promotion of Energy Efficiency and Conservation Master Plan in Vietnam” from 2008 to 2009, and analyzed the barriers related to EEC promotion, and proposed the road map and action plan. Energy manager system and energy data collection mechanism have been also discussed and proposed.

4. Preparation of EEC Legal Framework

There has been the Decree No. 102 on Efficient Use and Conservation of Energy, which was enacted in 2003, and as ahead the EEC Law No. 50/2011, it has been utilized to establish the base of EEC Law, however, as it has no legal validity, promoting implementation of EEC in each unit is not sufficient. So it has been an urgent issue to establish a Law on EEC, and new EEC Law has been established and enacted in January 2011 with enlarged, deepened and detailed contents with the support from Japan and others. And thereafter lots of relevant Decrees, Decisions and Circulars have been prepared and enacted in a short term.

5. Designated Enterprises on Energy Use

Although the list of the designated enterprises subject to the stipulation of the EEC Law and related regulation shall be announced by MOIT every year, however, after the implementation of EEC Law on January 1st, 2011, the reports from the potential designated enterprise have been collecting now, so the official list of the designated enterprises in 2012 has not been clarified yet.

On the other hand, there appears the Decision No. 1294/2011 on “Issuing the list of Designated Energy-using units in the year 2011”, and totally 1,190 units name is announced as the designated enterprises. Although this information seems not to be official list of the designated enterprises because of before preparing official annual report stipulated in the EEC Law in 2011, however, most of those units are considered to be as equivalent to the official designated enterprises, so they may be starting to prepare the annual report, five year report, assignment of energy manager and accepting the energy audit.

6. Qualification System of Energy Manager and Energy Auditor and their Training System

EEC Training and energy audit have been conducted even before the enactment of EEC Law in 2011 at some universities, several Energy Conservation Centers and other organization with the budget of central government and local government. After the enactment of the EEC Law, as it becomes mandatory to assign the energy manager in the designated enterprises and designated enterprises shall conduct the energy audit once in every three year and submit its report to MOIT, the needs for energy auditors and energy audit companies has been much increased, so it is required to establish the training system and qualification system both for energy manager and energy auditor immediately. So MOIT has prepared the training curriculums and textbooks both for the energy managers and energy auditors with the support of DANIDA and other experts, and has started the training and qualification system from 2011, however, this training system for both courses has been carried out only by lectures, without practical training, so it has been requested to Japan to prepare the training course with practical training curriculum and related facilities, who has a lot of similar experiences in other countries such as Thailand, Turkey and Iran, so Japan has decided to participate with this project to provide both soft and hard contents on this training and qualification system for both courses.

V. EEC related Law and Regulation in Vietnam

EEC related Law and Regulation in Vietnam is formulated on the basis of Decree No. 102/2003, and has been developed, enlarged and deepened through MOIT and other Ministries cooperation, and Law No. 50 on Energy Efficiency and Conservation is enacted in June, 2010, and lots of other relevant regulations, such as decrees, decisions and circulars, have been enacted in a short term.

Major relevant Law and Regulation are shown as follows only for their titles, etc., and details are omitted herein.

- 1. The National Assembly Law No. 50/2010/QH12 on Energy Efficiency and Conservation**
- 2. Government Office Notification No. 216/2010/TB-VPCP on The conclusion on National Targeted Program on Energy Efficiency and Conservation of the Deputy Prime Minister Hoang Trung Hai**
- 3. Government Decree No. 21/2011/ND-CP on Detailed regulations and implementation measures of the Law on Energy Efficiency and Conservation**
- 4. The Government Decree No. 73/2011/ND-CP on Regulating administrative breaches against energy conservation and efficient use**
- 5. Prime Minister Decision No. 1294/QD-TTg on Issuing the list of Designated energy-using units in year 2011**
Name and energy consumption of 1,190 potential designated enterprises are listed.
- 6. Prime Minister Decision No. 51/2011/QD-TTg on Promulgating the list of devices and equipment subject to energy labeling and application of the minimum energy performance, and the implementation roadmap**
- 7. Ministry of Transportation (MOT) Circular No. 64/2011/TT-BGTVT on Regulating energy efficiency and conservation using measures in transport activities**
- 8. MOIT Circular No. 39/2011/TT-BCT on Regulation of training, certification for energy manager and energy auditor**
- 9. Prime Minister Decision No.68/2011/QD-TTg on Promulgating the List of energy saving means and equipment, which are equipped or purchased for agencies and units funded by the State budget**

- 10. MOIT Circular No. 07/2012/TT-BCT on labeling for energy used facilities and equipment**
- 11. MOIT Circular No. 09/2012/TT-BCT on Regulating planning, reporting implementation of energy saving and efficient using; energy audit implementation**
- 12. Prime Minister Decision No. 1427 on Approval of National Targeted Program on Energy Efficiency and Conservation Phase 2012 - 2015**
 - (1) Achieve saving from 5–8% of the total energy consumption of the country in the period 2012 - 2015**
 - (2) Arrangement of training and issuing certification of energy management to more than 2,000 people in the field of industrial production and about 500 people of building management; training and issuing certification of energy audit to approximately 200 people.**
 - (3) Achieve at least 10% of reduction in energy intensity in energy-intensive industries of which: Steel from 179 kgoe in 2011 to 160 kgoe in 2015, Cement 97 kgoe in 2011 to 87 kgoe in 2015, and Textile and apparel from 773 kgoe to 695 in 2011 kgoe in 2015**
- 13. Prime Minister Decision No.03/2013/QĐ-TTg on Amending and supplementing a number of articles of the Prime Minister’s Decision No. 51/2011/QĐ-TTg on Promulgating the list of devices and equipment subject to energy labeling and application of the minimum energy performance, and implementation roadmap.**

VI. Project Target

The MOU between JICA and MOIT and DOIT-HCMC on the Project for Establishment of Energy Management Training Center has been exchanged on February 28th, 2013. There is the PDM in the ANNEX 1 of MOU, and there is also the following description in the Overall Goal at the beginning of PDM.

- 1. Narrative Summary: Overall Goal; Under the Law on Energy Efficiency and Conservation, energy management in designated enterprises is enhanced.**
- 2. Objectively Verifiable Indicators: Energy Intensity of designated enterprises is reduced by XX %.**
- 3. Means of Verification: Government information (by MOIT)**

As it has not been decided yet on reduction target of the energy intensity at the designated enterprises in the above No. 2 item, it is required to set up this target value based upon related information and data. As this project will be completed at the end of December 2015, actual training term after completion of this project will be starting at the beginning of 2016, so the evaluation period for project target achievement is considered from 2016 to 2020, five (5) years, after discussion with MOIT.

VII.EEC Data in Vietnam

1. Energy Intensity by Industry Sector

According to the Prime Minister Decision No. 1427 on Approval of National Targeted Program on Energy Efficiency and Conservation Phase 2012 - 2015, that is effective on October 2012, there is a stipulation of more than 10 % reduction of energy intensity at the three major energy consuming industries, namely iron & steel, cement and textile, with concrete energy intensity for 2011 and 2015, together with the national target value of EEC as 5–8% from 2012 to 2015. It is not clear on the energy intensity reduction rate for other industry sectors and other sectors, it is basically premised to take same figure for other sectors as more than 10 % at maximum for this survey.

Table 7. Energy Intensity (EI) by Industry Sector (kgoe/t-product)

(Source: Decision 1427)

Industry Sector	EI in 2011: A	EI in 2015: B	Reduction rate:(A-B)/Ax100 (%)
1. Cement	97	87	10.3
2. Steel	179	160	10.6
3. Textile	773	695	10.1

2. EEC Potential

EEC potential in industry sectors and other sectors is assumed to be as shown in the table 8, as introduced by MOIT expert in the energy manager training course in 2011. There is wide range of EEC potential among sectors from 15 to 50 %, however, it is roughly considered that EEC potential might be equal to and more than 20 % in most sectors. But as there are other factors to be considered such as investment amount, payback period and EEC technology, etc., it is not clear for every sector to realize this target soon in early stage.

Table 8. EEC Potential of Industry and Sector in Vietnam

(Source: MOIT PPT slide in EM course, 2011)

Sector	Energy Conservation Potential
Cement Industry	50 %
Ceramic Industry	35 %
Coal fired Thermal Power Plant	25 %
Textile and Apparel Industry	30 %
Iron & Steel Industry	20 %
Food Processing Industry	20 %
Commercial Building	25 %
Waste Water Treatment	15 %
Agriculture	50 %

VIII. EEC target in the Designated Enterprises

1. Potential Designated Enterprises by Sector

As mentioned before, the official designated enterprise list has not been established yet up to September 2013, however, potential designated enterprise list as introduced in the Decision No. 1294/2011, which might be converted the power consumption data of the year of 2010, is broken down as shown in the table 9 by detailed sectors.

Table 9. Unit Number and Energy Consumption of Designated Enterprises by Category and Sector
(source: Decision 1294/2011)

Category	Sector	Year 2010	
		Unit Number	Energy Consumption (kTOE)
Industry	Power Plant	22	12,555
	Cement	88	4,106
	Fertilizer	13	1,017
	Construct. material	57	908
	Ceramic & Tile	118	860
	Iron & Steel	70	702
	Coal & Mineral	43	570
	Chemical	17	469
	Food	136	354
	Textile	74	350
	Paper & Pulp	33	287
	Mechanical parts	50	214
	Water & Beer	40	111
	Electrical parts	28	82
	Plastic	37	76
	Rubber	14	64
	Car & bike	15	44
	Wood product	21	38
	Others	135	842
		(sub-total)	1,011
Building	Office	47	52
	Hotel	37	46
	Super market	25	28
	Hospital	12	11

Category	Sector	Year 2010	
		Unit Number	Energy Consumption (kTOE)
	University, school	6	9
	(sub-total)	127	146
Transportation	Air	1	748
	Road	26	125
	Sea/Maritime	14	167
	Rail	1	57
	Inland water	10	19
	(sub-total)	52	1,116
Grand Total		1,190	24,909

2. Energy Intensity by Industry Sector

As same as VII EEC Data in Vietnam and its “1. Energy Intensity by Industry Sector”.

3. New EEC target in the Designated Enterprises

As this project will be completed at the end of December 2015, it is planned to start the training course for the energy managers and energy auditors will be starting from the beginning of 2016. So the verification term of project target achievement is firstly considered as three years from 2016 to 2018, however, after the discussion with MOIT member, five years from 2016 to 2020 is selected.

As mentioned before in this report, there is the Decision No.1427, requesting more than 10 % reduction of energy intensity for three major industries such as cement, iron & steel, and textile from 2012 to 2015, so it is highly expected to have a strong drive of EEC promotion in the designated enterprises especially for those three industry sectors. So it seems to be a little high target for the consecutive five years from 2016 to 2020 if same reduction rate of 10 % is applied, it is suggested to set up a little lower figure. As it is considered that new National EEC target and Reduction rate of energy intensity for some industry sectors for 2016-2020 will not be decided until late 2015, so taking account of the similar project result in other country and continuous requirement of more than 1 % reduction of energy intensity per year in the Japanese EEC Law, it is proposed to set up the project target as 5 % reduction of energy intensity from the year of 2016 to 2020, based on the baseline of 2015. In case that the National EEC target for 2016 to 2020 is decided by the end of 2015 and that there is a big difference between new target and 5 %, this project target will be reviewed, discussed and reset up, if necessary.

IX. Number of Actual and Planned Certified Energy Managers and Energy Auditors by the Training Courses

Number of Actual Certified Energy Managers (EM) and Energy Auditors (EA) is shown in the Table 10. And according to the Decision No. 1427, planned number of training and certification by 2015 is indicated such as 2,000 for energy management in industries, 500 for energy management in buildings and 200 for energy audit.

Assuming that there might be approx. 2,000 designated enterprises (DE) at maximum tentatively, and one energy manager is required to be assigned for each DE, so target figures of EM and EA in the Decision No. 1427 seems to be adequate.

And it is important to clarify the number of certified energy managers from the designated enterprises.

Table 10. Number of Actual and Planned Certified Energy Managers and Energy Auditors
(Source: MOIT & Decision 1427*)

	2011	2012	2013	2014	2015	Up to 2015 target
EM in Industries	90	410	110			2,000*
Hanoi (North of VN, not only Ha Noi)	(50)	(170)	(80)			
HCMC (South of VN, not only HCMC)	(40)	(240)	(30)			
EM in Buildings		70				500*
Hanoi		(40)				
HCMC		(30)				
Energy Auditors		90				200*
Hanoi		(51)				
HCMC		(39)				

X. Follow up procedure on the achievement level of EEC target

Follow up procedure on achieved result of energy conservation improvement in the designated enterprise through the efforts of certified energy manager and energy auditor after participating the training course established by this JICA project is proposed to submit the energy improvement result to PRET by the form of tables as follows every year from the year of 2016 to 2020, five years, and the result will be summarized and evaluated through PRET and JICA, and reported to MOIT.

1. Follow up procedure by the participants in the Energy Manager Training Course

The follow up report is to be submitted by the participants who attended the Energy Manager Training Course from the beginning of 2016 and after until 2020 at PRET, and who obtained the certificate of Energy Manager, and who works in the designated enterprise. The content of the report is annual energy consumption, production volume and energy intensity result for the every year from 2016 to 2020, as shown in the table 11.

The calculation of energy intensity is based upon the annual report data of the designated enterprise and report shall be submitted to PRET by March of next year, and PRET will collect and summarize those reports from all certified participants who joined the training courses, and submit the summary to MOIT and JICA. JICA will then evaluate the summary, and report the evaluation result to MOIT.

The report form is shown as table 11. Energy data in the year of 2015 and after is also filled in the table 11 as for the baseline, nevertheless the year of participated year for the training course after 2016.

Table 11. Follow up sheet for the Participants in the Energy Manager Training Course

Name of Qualified Energy Manager : _____

Name of belonged Designated Enterprise : _____

Belonged Industry Sector : _____

Trained Date for Energy Manager Training Course :

Year	Day/Month/Year		2017	Day/Month/Year		2020
	2015 Baseline	2016		2018	2019	
Energy Consumption (TOE)						
Production (Ton), etc.						
Energy Intensity (TOE/Ton-products)						
Main EEC measures and target of improvement		1.AAA: xx%				
		2.BBB: yy%				
		3.CCC: zz%				

2. Follow up procedure by the participants in the Energy Auditor Training Course

The follow up report is to be submitted by the participants who attended the Energy Auditor Training Course from the beginning of 2016 and after at PRET, and who obtained the certificate of Energy Auditor, and who conducted the energy audit for the designated enterprise from 2016 to 2020. The content of the report is the outline of the energy audit result on the designated enterprises for the every year from 2016 to 2020, as shown in the table 12.

The report shall be submitted to PRET by March next year.

And the designated enterprise that has been conducted the energy audit by the certified energy auditor who participated the training course at PRET after 2016 are requested the cooperation to fill out the form as shown table 13 and submit it to PRET by June in next year of the energy audit year, and after until 2020.

PRET will collect and summarize those reports from all certified participants, and submit the summary to MOIT and JICA. JICA will then evaluate the summary and report the evaluation result to MOIT.

The report form is shown as table 12.and 13. Energy data in the year of 2015 and after is also filled in the table 13 as for the baseline, nevertheless the year of participated year for the training course after 2016.

Table 12. Follow up sheet for the Participants in the Energy Auditor Training Course

Name of Qualified Energy Auditor : _____

Belonged Enterprise/Audit Enterprise : _____

Trained Date for Energy Manager Training Course :

_____ Day/Month/Year ~ _____ Day/Month/Year _____

Year	eg. 2017		
Name of audited designated enterprise	Company A	Company B	Company C
Province of audited designated enterprise			
Belonged sector of audited designated enterprise			
Energy Manager in the designated enterprise			
Date of energy audit			
Annual energy consumption (TOE)			
Annual production (Ton)			
Energy intensity (TOE/Ton-product)			
EEC measures and EC target	1.AAA: xx% 2.BBB: yy% 3.CCC: zz%	1.AAA: xx% 2.BBB: yy% 3.CCC: zz%	1.AAA: xx% 2.BBB: yy% 3.CCC: zz%

Remarks: Although above table shows only three cases per year, however, all energy audited information for the designated enterprises by the one certified energy auditor shall be reported according to this form after the training until year 2020.

Table 13. Follow up sheet for EEC improvement after the energy audit in the designated enterprise

Name of energy audited designated enterprise : _____

Belonged industry sector of objective enterprise : _____

Date of energy audit : _____ Day/Month/Year ~ _____ Day/Month/Year

Name of energy auditor and audit company : _____

Name of energy manager in the designated enterprise : _____

Year	2015 Baseline	2016	2017	2018	2019	2020
Energy Consumption (TOE)						
Production (Ton), etc						
Energy Intensity (TOE/Ton-product)						
Main EEC measures and target of improvement		1.AAA: xx% 2.BBB: yy%				

XI. Conclusion

Baseline survey has been carried out based on the information such as implementing situation of EEC in VN, setting of several baselines, number of qualified personnel through training courses, limited information and data with some premise. As a conclusion, starting the end of year 2015 when this project completes, the energy intensity improvement information at the designated enterprise where trained energy manager works and trained energy auditor visits for energy audit after 2016 until 2020, five (5) years at maximum, is collected through the trained energy manager and energy auditor together with the cooperation of the designated enterprises, and the verification method of the contribution and effect of this training system and project target figure as five (5) % in five (5) years are proposed. Following up activity is proposed to be conducted by PRET who is a main player to implement this project directly also after 2016 to summarize the data primarily, and its result will be reported to MOIT and JICA. And after the evaluation by JICA, the result is shared with MOIT. MOIT will finally verify this Project effect.

So it is highly appreciated to maintain a continuous cooperation network and efforts among the concerned organization.

End

**To the Japan International
Cooperation Agency (JICA)**

**Report on the Review of Theory
Curriculums and Textbooks for
“Establishment of Energy
Management Training Center in
Vietnam (Stage 2)”**

January 31, 2014

**The Energy Conservation Center, Japan
General Incorporated Foundation**

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I. Introduction

”Review of the Theory Curriculums and Textbooks” is one of the “Activities for Deliverable 1” of ”Establishment of Energy Management Training Center in Vietnam (Stage 2)”. This document reviews DANIDA and MOIT versions of theory curriculums and textbooks for the qualified energy managers/auditors trainings of to extract any missing contents that will cause inconsistency with practical trainings. Any deficiencies will be complemented by adding them to the existing theory curriculums and textbooks or covered in the practical curriculums and textbooks based on the discussion and coordination with C/P. Since a major revision of the theory textbooks is not planned, if a revision is required, JICA will have another investigation on the possibility of revision, etc.

”Ministerial Instructions concerning Training and Certification for Energy Managers and Energy Auditors” (MOIT Circular No. 39/2011/TT-BCT), was enacted in October 2011 as a law concerning energy management system and energy audit system.

II. Current Training Courses and Curriculums

Trainings for qualified energy managers and energy auditors were started in Hanoi and Ho Chi Minh by MOIT (Ministry of Industry and Trade) in fiscal 2011. They are mainly given by HUST (Hanoi University of Science & Technology) and EPU (Electric Power University) in Hanoi, and by DOIT / HCMC and PRET (Plastic – Rubber Technology and Energy Conservation Training Center) in Ho Chi Minh, with instructors from ENERTEAM, HCMUT (Ho Chi Minh University of Technology), ECC / HCMC (Energy Conservation Center / Ho Chi Minh City), in addition to HUST and EPU. The lecture on general energy and laws and regulations on energy conservation on the first day of the both trainings is given by a specialist from MOIT.

Separate training courses have been established respectively for energy management and energy audits. The durations of the trainings were initially planned to be 9 days consisting of 7 days of classroom lectures and 2 days of practical training for energy management training, and 13 days consisting of 11 days of classroom lectures and 2 days of practical training for energy audit training. However, a full set of equipment for practical training has not yet been installed at present in Ho Chi Minh, and the durations of trainings are 5 day consisting of classroom lectures only for the former, and 9 days of classroom lectures and 2 days of practical training (half a day each) for the latter.

The current training contents of the each course are shown in Table 1.

Table 1. Current Energy Management Training Course and Energy Audit Training Course

Schedule	Energy Management Training Course	Energy Audit Training Course
Day 1	Energy situations, laws and regulations on energy conservation, and energy management	Energy situations, laws and regulations on energy conservation, and energy audit
Day 2	Energy conservation for electrical installations and lighting	Energy conservation for electrical installations
Day 3	Energy conservation for pumps, fans, compressors, air conditioning and cooling systems	Energy conservation for lighting and motors
Day 4	Energy conservation for boilers and steam systems	Energy conservation for compressors
Day 5	Economical evaluation of projects	Energy conservation for pumps and fans
Day 6 (Sat)	Examination (half a day)	Practical training: Energy conservation for lighting, compressors, pumps and fans
Day 7	-	Energy conservation for air conditioning and cooling systems
Day 8	-	Energy conservation for fuels and boilers
Day 9	-	Energy conservation for steam systems and furnaces
Day 10	-	Economical evaluation of projects
Day 11	-	Practical training: Boilers and steam systems

1. Energy Management Training Course

At this time, energy management training covers industrial fields, but training covering building fields is also considered for the future depending on the demand and companies of attendees. The current training is a 5-day course consisting of classroom lectures only, followed by an examination of approximately 2 hours. Upon installation of practical training equipment, such content will be further added to the training course. As Table 1 shows, the breakdown of the 5-day lectures is 1 day spent for energy situation, laws and regulations on energy conservation and overall energy management; 2 days spent for energy conservation for electrical installations; 1 day spent for energy conservation for heat installations; and 1 day spent for economical

evaluation of energy conservation projects. The content of the course is considered to be covering the basics to cultivate a qualified energy manager. However, it is recommended to review the time distribution and necessary items to be covered in the lectures. For example, 1 day is too long to spend for lectures on economical evaluation of energy conservation projects for the limited number of 5 days available.

2. Energy Audit Training Course

The current energy audit training consists of 9-day classroom lectures and 2-day practical training (half a day each). As Table 1 shows, the contents of the 9-day classroom lectures are 1 day spent for energy situations, laws and regulations on energy conservation and overall energy audit; 5 days spent for energy conservation for electrical installations, 2 days spent for heat installations; and 1 day spent for economical evaluation of energy conservation projects. In addition, half a day each is spent for practical training of electricity and heat respectively. The content of the course is considered to be covering the basics to cultivate an energy auditor. Once again, however, it is recommended to review the time distribution and necessary items to be covered in lectures by reconsidering the 1 day spent for lectures on economical evaluation of energy conservation projects. Furthermore, the current practical skill training is held in a laboratory with existing experimental facilities and miniature equipment made for audit trainings at a university where the training is held (HUST or EPU). Although it seems possible to learn the basics, the facilities are insufficient as practical skill training facilities for trainees to have practical experience, and installations of full scale practical skill training facilities are awaited. In addition, it has not been made clear if there is a written examination after the training, but if trainees have any experience of external field trial audit or past audit experience in connection with MOIT, a report is supposed to be submitted on the details for a review to make a judgmental decision on acceptance or rejection.

III. Textbooks, etc. for the Current Trainings

Responding to the request from MOIT, DANIDA has been preparing textbooks and PPT (PowerPoint) slides for the energy management training and the energy audit training and providing them to MOIT. MOIT itself also makes original textbooks, textbooks based on DANIDA materials and PPT slides under the cooperation of specialists, universities and other institutions concerned in the country to provide them to actual trainings. DANIDA's textbooks consist of the three separate volumes listed below, and MOIT translates them into Vietnamese mostly faithfully to hand out at trainings. These textbooks are, however, not directly used in the actual trainings. Rather, lectures

are given using PPT slides of MOIT, and DANIDA textbooks are handed out for reference.

1. DANIDA textbooks: The original English version and Vietnamese version were confirmed.
 - I. Energy Management Handbook for Key Energy Using Industries in Vietnam (309 pages) (See Picture 1 for the Vietnamese version.)
 - II. Energy Management Handbook for Key Energy Using Buildings in Vietnam (259 pages) (See Picture 2 for the Vietnamese version.)
 - III. Textbook for Training Energy Auditors in Vietnam (189 pages) (See Picture 3 for the Vietnamese version.)
2. MOIT textbooks: The original Vietnamese version and English translation version (the second half has not been translated into English yet and left in Vietnamese) were confirmed.
 - I. Energy Management Handbook (319 pages): Although this has been prepared, it is currently not used in actual trainings. (See Picture 4 for the Vietnamese version.)
3. DANIDA PPT slides: The original English version was confirmed. The following contents are partly reflected into MOIT PPT slides, but they are not actually used as they are.
 - I. Energy Management for Industry Course (122 slides)
 - II. Energy Management for Building Course (577 slides)
 - III. Energy Audit Course (523 slides)
4. MOIT PPT slides: The original Vietnamese version and part of English translation version were confirmed. The following PPT slides are used in actual trainings.
 - I. Energy Management Course (518 slides) (See Picture 5 for the original Vietnamese version.)
 - IV. Energy Audit Course (864 slides) (See Picture 6 for the Vietnamese version.)

The structures and contents of each textbook and PPT slides are shown in Table 2 and Table 3.

Each category indicates that of the textbook. The content of PPT slides corresponds to the equivalent textbook category, although the content does not have exactly the same description as the textbook.

Also, pictures of the front covers of the textbook prepared by DANIDA in Vietnamese and the front covers of PPT slides in Vietnamese prepared by MOIT are shown as Pictures 1-6.

Table 2: Breakdown of Textbooks and PPT Slides for the Energy Management Training

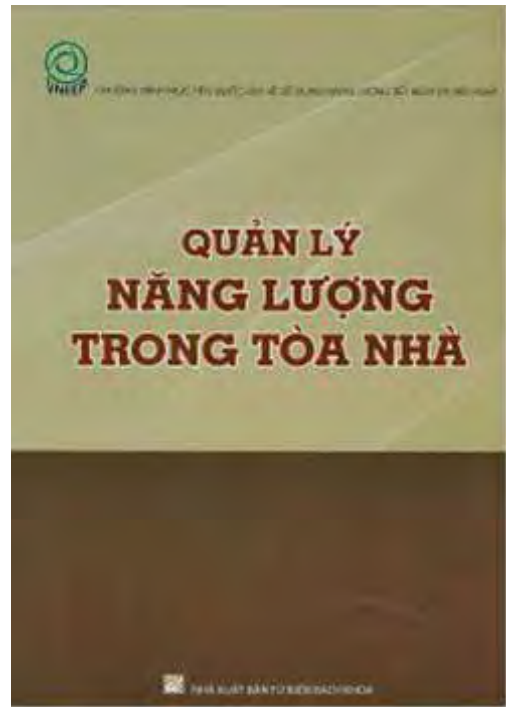
Outline of EM Text & PPT slides prepared by DANIDA and MOIT						
Category of Training Material	Textbook			PPT slides		
	DANIDA (EN & VN)		MOIT	DANIDA (EN)		MOIT
Author of Material	EM Industry	EM Building	EM	EM Industry	EM Building	EM
Category of Training Course	(309p)	(259p)	(319p)	(122sli)	(577sli)	(518sli)
Textbook/PPT slides (total volume)						
Part I : General Introduction	1	1				
1. Introduction to the Energy Manager's Handbook	1	1		6	6	1
1.1 Status of Energy and Economic Development in Vietnam	7	6	18	19	19	18
1.2 Vietnam's EE&C Law Pertaining to Energy Management in Enterprises	9	11	8	31	31	14
1.3 Objective of the Energy Manager Training and Targets	6	6		17	17	13
Part II : Energy Management Model for Key Energy-using Entities	1		33			
2. Commitment to adopt the energy management model	1	1				
2.1 Appraising Energy Management Profile of the Organization	7	6		18	18	
2.2 Setting up an Organizational Structure for Energy Management	7	11	27	28	28	15
2.3 The Energy Policy	8	9			18	
2.4 Energy Management Working Procedures	4	6			13	
3. Identification of energy and cost saving opportunities	1	1	42			119
3.1 Review of Energy Use	7	6			20	
3.2 Understanding Energy Costs	10	13			27	
3.3 Analysis of Energy Conversion Chain	5	5			18	
3.4 Identifying Major Energy Saving Potential	6	6			20	
3.5 Investment Appraisal of Energy Efficiency Projects	12	14			34	
3.6 Strategic Approach to Improve Energy Efficiency	6	3			12	
4. Planning the energy management action	1	1				74
4.1 Making a Business Case of Energy Efficiency Projects	8	8			24	
4.2 Setting Objectives and Targets	3	3			9	
4.3 Steps to Implement Energy Efficiency Projects	4	3			13	
4.4 Energy Management Working Manuals and Tools	5	5			12	
Energy Audit			29			
5. Implementation of the energy management action	1	1				
5.1 Competence and Training	2	2			7	
5.2 Awareness Raising	5	5			12	
5.3 Design of new facilities	1	2			9	
5.4 Procurement of Energy Services, Product, Equipment and Energy	3	3			8	
6. Monitoring of the energy management action	1	1				
6.1 Monitoring, Measurement and Analysis	8	14	44		46	
6.2 Documentation and Reporting	6	6			12	
7.1 Review of Energy Management System	5	5			29	
7.2 Nonconformities, Corrections and Preventive Actions	1	1			6	
7.3 Input and Output from Management Review	1	1			5	
Annexes						
1.1 Energy Efficiency in Electrical System	10	6	30			52
1.2 Energy Efficiency in Motors and Drives	10					
1.3 Energy Efficiency in Lighting	12	14	15			43
1.4 Energy Efficiency in Compressed Air System	10	3				22
1.5 Energy Efficiency in Fans and Blowers	13		24			21
1.6 Energy Efficiency in Pumping System	14					38
1.7 Energy Efficiency in Refrigeration Systems	11		19			27
1.8 Energy Efficiency in Air conditioning	9	15	10			6
1.9 Fuels and Combustion	3	5				7
1.10 Energy Efficiency in Boilers	17	1	12			14
1.11 Energy Efficiency in Steam Systems	16	1				7
1.12 Energy Efficiency in Furnaces	11	6				
A.1 Energy Interactions of building energy systems		1			21	
A.2 Energy Efficiency in the Building Envelope		15			39	
A.3 Appliances and office equipment		3				
A.4 Building Energy Management Systems (BEMS)		5				
A.5 Energy Efficiency in combined heat and power system (CHP)		2				
1.13 Training Case Questionnaire for Industry/Building	1	1				
A. International Management Systems	1	1				
B. Energy Management Practices	4	4				
C. Energy efficiency and process improvements	2	2				
D. Readiness to invest in energy efficiency	2	3				
E. Barriers to improved energy management and energy efficiency	1	1				
F. How to best support energy efficiency in your enterprise	1	1				
G. Energy consumption	3	1				
H. Production trends	1	1				
Abbreviations	2					

Table 3: Breakdown of Textbooks and PPT Slides for the Energy Audit Training

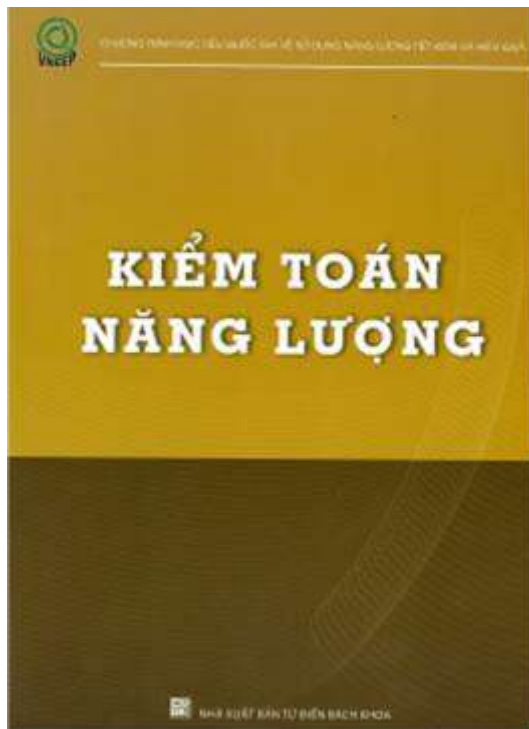
Outline of EA Text & PPT slides prepared by DANIDA and MOIT			
Category of Training Material	Textbook	PPT slides	
Author of Material	DANIDA (EN & VN)	DANIDA	MOIT
Category of Training Course	EA	EA	EA
Textbook/PPT slides (total volume)	(189 pages)	(523 slides)	(864 slides)
Introduction	1	22	12
Volume 1: Methodology and Applicability			
1.1 Energy Auditing	1	4	23
1.2 Methodology and Approach	6	17	11
Volume 2: Energy Efficiency in Utility Systems			
2.1 Energy Efficiency in Electrical System	17	62	49
2.2 Energy Efficiency in Motors and Drives	11	52	131
2.3 Energy Efficiency in Lighting	11	22	87
2.4 Energy Efficiency in Compressed Air System	10	6	37
2.5 Energy Efficiency in Fans and Blowers	14	21	32
2.6 Energy Efficiency in Pumping System	15	32	37
2.7 Energy Efficiency in Refrigeration System	9	42	41
2.8 Energy Efficiency in Air Conditioning	9	44	
2.9 Fuels and Combustion	3		29
2.10 Energy Efficiency in Boilers	17	60	66
2.11 Energy Efficiency in Steam Systems	16	28	88
2.12 Energy Efficiency in Furnaces	13	46	47
Volume 3: Making a Business Case of Energy Audit			
3.1 Financial Analysis	11	24	100
3.2 Economic Analysis	1	5	
3.3 Illustrative Examples	2	4	
Volume 4: Practical Guidance			
4.1 Planning Planning for an Energy Audit	1		19
4.2 Preassessment and Measurement	1		28
4.3 Analysis and Documentation	8		8
4.4 Reporting	2		4
Annexure: Instruments used for Energy Auditing	6	19	



Picture 1: DANIDA/MOIT Textbook on EM Industry



Picture 2: DANIDA/MOIT Textbook on EM Residential Buildings



Picture 3: DANIDA/MOIT EA Textbook



Picture 4: MOIT EM Textbook



Picture 5: MOIT EM PPT Slide Textbook for Training



Picture 6: MOIT EA PPT Slide Textbook for Training

IV. Results of Confirmation of Training Textbooks

The content of the textbooks prepared by DANIDA is generally reasonable. Below is an outline of comments made on the each category of PPT slides prepared by MOIT that are used for the actual trainings. Deficiencies and excesses have been pointed out from the perspective of whether the content is sufficient for the cultivation of competencies of qualified energy managers and energy auditors, even though they are not entirely deficiencies that will cause inconsistency with practical skill training session in nature. See Exhibit 1 and Exhibit 2 for details including the overall review of the curriculums and textbooks.

Furthermore, lists of each chapter and slide title of PPT slides prepared by MOIT for the energy management training and the energy audit training are shown in Exhibit 3 and Exhibit 4 respectively.

1. Energy Management Training

I. Overall energy management: 1 day

- A) World and Vietnamese energy situations are reasonably covered.
- B) An outline of the Energy Conservation Act in Vietnam is shown.
- C) There is hardly any description of related laws and regulations on energy conservation.
- D) There is definition of companies designated for energy management.
- E) Roles of a qualified energy manager are specified. However, there is no explanation of concrete working procedures that explain the forms of regular reports and the 5-year planning document required by the Energy Conservation Act and how to collect data and fill in the forms.
- F) There is explanation of the purpose, evaluation points and system of energy management.
- G) There is explanation of the PDCA cycle and how to implement it.
- H) Techniques for preparing an energy management implementation plan are explained in detail as a key step, in which EEI (specific energy consumption) management and energy audit are covered.
- I) There is no explanation about S & L in conjunction with laws and regulations on energy conservation.

II. Electrical installations: 2 days

- A) The content is appropriate for electrical installations and lighting.
- B) Pumps and fans: It is preferable to add information about design margin, energy conservation potentials and know-how of inverter application.
- C) Air compressors: It is recommended to add a diagram for calculation.
- D) Air conditioning and refrigeration systems: It is recommended to add case examples and a calculation diagram.

III. Heat installations: 1 day

- A) The title of the lecture is “Boilers” only, and its main content is boilers, with steam systems covered somewhat. It is better to show key points for energy conservation for boilers too.
- B) Although a simple air ratio formula and a target value for each fuel are shown, there is no explanation about fuels or a basic combustion reaction formula.
- C) There is some explanation about the flow diagram of heating furnace in conjunction with exhaust heat recovery, but heat balance, energy conservation key points, and trial calculation of heat release loss of heating furnace as a basic heat installation are not included.
- D) There is no explanation of heat release loss from steam piping, valves, etc.

IV. Economical evaluation: 1 day

- A) Even though various ways of calculation is explained in detail, the content is too detailed.
- B) It is better to explain methods and case examples here to thoroughly pick out subjects for “No Cost, Low Cost and Medium Cost Investment” based on the Simple Payback, which is a simple method.

2. Energy Audit Training

I. Overall energy audit : 1 day

- A) General energy situation is explained.
- B) Positions of energy audit and the energy audit training in laws and regulations on energy conservation are explained. Penalties in case of breach are also explained. Explanation on the association chart of overall laws and regulations on energy conservation is also needed.
- C) There is detailed explanation about energy audit methods and audit instruments too.
- D) Energy loss flow (Sankey Diagram) is explained.
- E) Explanations on the form and an outline of the regular report and 5-year planning document that a qualified energy manager of a company designated for energy management prepares, as well as explanations on the data to be checked and index are required.
- F) Key points of energy conservation audit in major industries and buildings need to be explained.
- G) Forms and content of reports specified by law and regulations should also be explained.

II. Electrical installations: 5 days

- A) Electrical systems: The content is appropriate, but explanation of harmonic is more detailed than needed.

- B) Motors and lighting: The content is appropriate.
 - C) Air compressors: A diagram needs to be added for calculation.
 - D) Fans and pumps: The theory and a diagram for calculation need to be added. Energy conservation by inverters is particularly important.
 - E) Air conditioning: It is better to add explanation on air conditioning load. It is desirable to add a case example or diagram for calculation.
 - F) Refrigeration system: COP and quantitative explanation is also required.
- III. Heat installations: 2 days
- A) The lectures are made up of three themes of “fuel, combustion and boilers”, “steam systems” and “electric furnaces” and are good as they generally cover them well.
 - B) Most of the material has been made by changing DANIDA textbook to PPT slides.
 - C) Explanations of combustion and burners are also needed.
 - D) A combustion reaction formula and a simple air ratio formula should also be shown.
 - E) A formula of boiler efficiency should be shown too.
 - F) Key points of energy conservation and audit for boilers and heating furnaces should also be shown.
 - G) Although some of heat calculation examples are shown, the basic heat transfer theory is also required.
 - H) There is no example of a trial calculation of the energy conservation effects by insulation.
 - I) Main furnaces covered are electric furnaces for iron and steel with some other industrial furnaces, but industrial heating furnaces need to be explained more. Regenerative burners also need to be covered.
 - J) More concrete case study examples are easier to understand.
- IV. Economical evaluation: 1 day. PPT made from the DANIDA textbook is mainly used.
- A) Even though various ways of calculations are explained in detail, the content is too detailed.
 - B) It is better to explain here methods and case examples to thoroughly pick out subjects for “No Cost, Low Cost and Medium Cost Investment” based on the Simple Payback, which is a simple method. Yet, explanation of methods to consider recovery property in a longer term is needed for energy auditors.
 - C) It is good that explanation of ESCO method and case study are included.
- V. Practical training: 2 days (half a day each in real terms) Case examples of EPU
- A) EPU is equipped with pumps, fans, inverters, air conditioning, lighting miniature experimental installations and cut samples of pipes for electric

practical trainings, and mini boilers for heat practical trainings, as well as many number of mobile instruments. The laboratory with these equipment is however rather small, accommodating only about 10 people. It is also unknown how much trainees can have hands-on experience. The facility of HUST has not been actually seen, but it seems bigger than that of EPU to a certain degree from a picture.

- B) These are basic experimental installations and are not training facilities designed for trainees to actually participate, so it seems difficult for them to acquire techniques in a short period of time.

V. Proposal on the Review of Training Curriculums

The training curriculums need to be reviewed in terms of the contents of not only classroom lectures but also of practical trainings. Energy management trainings in particular currently do not include practical trainings. Therefore essentially, a practical skill training part will be added. For energy audit, a practical skill training of a total of 2 days (half a day each) is already included, although it is not very much, so that will be reviewed. Practical trainings themselves relate to the content of the training textbook that will be prepared by the provider of training equipment. Therefore, the content needs to be amended by the time the training textbook is provided (around October 2014) to link with the content of practical skill trainings. Practical training curriculum (draft) will be however reported separately in another document.

1. Energy management training: The duration of the proposed training course is a total of 7 days, including the current 5 days of classroom lectures with additional 2 days of practical training; it will keep the same half a day examination as before. The purpose of the proposal is merely to change the training to make it capable of developing required competencies for qualified energy managers of a designated energy management company based on the laws and regulations on energy conservation, and the following was proposed in September and December 2013. In the reply comment to the proposal, Mr. Quang, MOIT, asked if it is possible to shorten the 3 days, which is long in his view, spent for the lectures on laws and regulations on energy conservation, energy management and energy conservation policies to about 1 day. We have replied that although we would review it again, we would like to keep the proposal as a base because these are necessary contents to cultivate qualified energy managers. MOIT would like to review the whole training as they confirm the content of textbooks for practical skill training once they have been completed.

- I. Overall energy management: 3 days

- II. Electrical installations: 2 days
- III. Heat installations: 2 days
- IV. Examination: 1 day (half a day)

Table 4: Energy Management Training (Last proposal to MOIT made on: December 12, 2013)

Schedule	Category	Main Content
Day 1	Energy situations and laws and regulations on energy conservation	Energy situations in the world and Vietnam Laws and regulations on energy conservation in Vietnam Designated companies, qualified energy manager and energy audit
Day 2	Energy management system	Energy management system Regular reports and 5-year planning documents Economical evaluation method Standards of judgment and management manual (input of Japanese example)
Day 3	Energy conservation for electrical installations 1	Lecture and practical training on energy conservation for receiving and distributing electricity, lighting and pumps
Day 4	Energy conservation for electrical installations 2	Lecture and practical training on fans, compressors and air conditioning
Day 5	Energy conservation for heat installations 1	Lecture and practical training on fuels/combustion and heating furnace
Day 6	Energy conservation for heat installations 2	Lecture and practical training on boilers and steam systems
Day 7	Energy conservation policies and roles of a qualified energy manager	Energy conservation for main industries and buildings, practice of preparing a regular report, etc.
Day 8	Examination (half a day)	Examination based on the contents of the lectures

2. Energy audit training: The duration of the proposed training course is a total of 12 days, including the current 9 days of classroom lectures and 2 days of practical with additional 1 day to; it will keep the same half a day examination as before. The purpose of the proposal is merely to change the training to make it capable of developing required competencies for energy auditors, who perform an energy audit

at energy management companies designated based on laws and regulations on energy conservation every 3 years, and the following was proposed in September and December 2013. In the reply comment to the proposal, Mr. Quang, MOIT, expressed his view that 5 days is too long to spend for lectures on laws and regulations on energy conservation and lectures and such on energy management, energy audit and preparation of an audit report and asked if it is possible to make it much shorter. We have replied that although we would review it again, we would like to keep the proposal as a base because these are necessary contents to train energy auditors. MOIT would like to review the whole training as they confirm the content of textbooks for practical training once they have been completed.

- I. Overall energy management: 5 days
- II. Electrical installations: 4 days
- III. Heat installations: 3 days
- IV. Examination: 1 day (half a day)

Table 5 Energy Audit Training (Last proposal to MOIT made on: December 12, 2013)

Schedule	Category	Main Content
Day 1	Energy situations and laws and regulations on energy conservation	Energy situations in the world and Vietnam Laws and regulations on energy conservation in Vietnam Designated companies, qualified energy manager and energy audit
Day 2	Energy management system	Energy management system Regular reports and 5-year planning documents Economical evaluation method Standards of judgment and management manual (Input of Japanese example)
Day 3	Energy audit system	Energy audit procedures and methods Key points of energy conservation and audit for buildings Key points of energy conservation and audit for major industries
Day 4	Energy conservation for electrical installations 1	Lectures on energy conservation for receiving and distributing electricity, lighting and electric measurement, and practical training on lighting and electric measurement
Day 5	Energy conservation for	Lectures on energy conservation for motors and

	electrical installations 2	pumps, and practical training on pumps
Day 6	Energy conservation for electrical installations 3	Lectures on fans and compressors and practical training on fans
Day 7	Energy conservation for electrical installations 4	Lectures on air conditioning and cooling systems and practical training on compressors
Day 8	Energy conservation for heat installations 1	Lecture and practical training on fuels/combustion and heating furnace
Day 9	Energy conservation for heat installations 2	Lecture and practical training on heat balance and heat measurement
Day 10	Energy conservation for heat installations 3	Lecture on boilers and steam systems and practical training on steam traps
Day 11	Trial audit using training facility	How to proceed with energy audit for the overall facility Practical training on heat balance and preparation of an energy flow diagram Trial audit using training facilities (trouble shooting)
Day 12	Preparation of an audit report	The audit report form and requirements under laws and regulations on energy conservation Obtaining basic energy data at a designated energy company Utilization of regular reports, etc. of a designated energy company Audit report preparation practice based on the laws and regulations on energy conservation
Day 13	Examination (half a day)	Examination based on the contents of the lectures

VI. Proposal on Supplemental Slides for Training Textbooks, etc.

The current training textbooks for both courses are based on the DANIDA textbooks, but PPT slides separately prepared by MOIT or parties involved such as universities are used at actual trainings. As mentioned in the chapter IV, the contents basically cover the essentials, but some parts of the content had excess or deficient information. As training courses to cultivate competencies required as qualified energy managers and energy auditors in conformity with Vietnamese laws and regulations on energy conservation, we consider that the trainings will become more efficient if practical training is included in an effective manner and the contents of the classroom lectures are modified slightly. The following is just the titles of proposed PPT slides that we consider are good to be added. We strongly would like the MOIT side to consider whether or not to accept this proposal by confirming the content thereof, reviewing to delete some excess part of the contents and supplementing the contents by adding the following. During our third business trip in December 2013, we explained proposed additional materials for the PPT slides of electrical installations including not only a list but also concrete PPT examples to Mr. Quang, MOIT, who understood much of the contents and commented that they will consider working on it. (Overall and heat-related materials will be explained on a later date)

1. Energy management training: An outline is shown below. See proposed supplemental material of Exhibit 1 for details.
 - I. Overall energy management
 - A) Show more of the overall picture and related information on the laws and regulations on energy conservation in Vietnam (laws, decrees, decisions, circulars, etc.)
 - B) The training needs to thoroughly teach trainees to be able to prepare reports, etc. appropriately including data collection and analysis required by precisely showing the forms of the regular report and 5-year planning document that a qualified energy manager of a designated energy company should prepare and submit.
 - II. Electrical installations
 - A) Air compressors: 4 slides including key points of energy conservation for air compressors have been added.
 - B) Fans: 5 slides including key points of energy conservation for fans and blowers have been added.
 - C) Pumps: 4 slides including key points of energy conservation for pumps have been added.
 - D) Air conditioning and refrigeration systems: 17 slides including key point in energy management have been added

- E) Electrical measurement: 10 slides have been added taking into account the importance of measurement and visualization for energy conservation.

III. Heat Installations

- A) Fuels and combustion: Fuels and basic combustion reaction formulas should also be shown. Same as the proposed supplemental PPT slides for EA.
- B) Boilers: Same as the proposed supplemental PPT slides for EA.
- C) Steam systems: Same as the proposed supplemental PPT slides for EA.
- D) Furnaces: Explanation mainly focuses on electric furnaces for iron and steel, but it is better to explain much more about industrial furnaces and heating furnaces including the plan of installing practical training facility. Same as the proposed supplemental PPT slides for EA.

- 2. Energy audit training: An outline is shown below. See proposed supplemental material of Exhibit 2 for details.

I. Overall energy audit

- A) In association with data collection, show the form and content of reports required for designated energy company subject for audit to prepare under the laws and regulations on energy conservation.
- B) Show auditing methods and key points of energy conservation and audit for major industries and buildings.
- C) Show the form of the audit report specified under the laws and regulations on energy conservation

II. Electrical installations

- A) Motors, controllers and inverters: 10 slides have been added including a case example of inverter application.
- B) Air compressors: 6 slides have been added including energy conservation policies.
- C) Fans: 8 slides have been added including key points of energy conservation for fans.
- D) Pumps: 10 slides have been added including energy conservation measures for pumps
- E) Air conditioning and refrigerating machines: 84 slides have been added including energy conservation case examples for air conditioning
- F) Electrical measurement: 25 slides have been added taking into account the importance of measurement and visualization for energy conservation.

III. Heat installations

- A) Fuels and combustion: 4 slides have been added including the basics of the theory of combustion.
- B) Boilers: 13 slides have been added including key points of energy conservation for boiler systems

- C) Steam systems: 9 slides have been added including the basic characteristics of steam.
- D) Furnaces: 13 slides have been added including key points of energy conservation for industrial furnaces.

VII. Conclusion

Energy management trainings and energy audit trainings in Vietnam started in fiscal 2011. This report has summarized the proposals on curriculum and textbooks for cultivating the competencies required for qualified energy managers and energy auditors in conformity with the laws and regulations on energy conservation in Vietnam by investigating, confirming and evaluating the curriculum and textbooks for the trainings. The consideration took into account the planned practical training curriculum that uses training equipment. However, preparation of practical training textbooks, on which the actual practical training curriculum is going to be based, is outside the scope of this operation agreement, and is due to be separately provided around in November 2014 by the contractor of the equipment procurement agreement. Therefore, practical training curriculum and the entire training curriculum will need to be reviewed by taking into consideration the practical training textbooks. This report is a review of the current state, and we will continue toward 2015 to exchange opinions, investigate, and coordinate closely with involved parties in MOIT and the contractor of the equipment procurement agreement about the finalized contents of curriculums and textbooks and then prepare our final report.

VIII. Exhibits

1. Reviewed Result on curriculum and text for the Energy Management Training Course
2. Reviewed Result on curriculum and text for the Energy Auditor Training Course
3. Title of each PPT slides for EM course
4. Title of each PPT slides for EA course

**To the Japan International
Cooperation Agency (JICA)**

**Report on the Formulation of
Practical Skill Curriculums for
“Establishment of Energy
Management Training Center in
Vietnam (Stage 2)”**

January 31, 2014

**The Energy Conservation Center, Japan
General Incorporated Foundation**

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I. Introduction

”Formulation of Practical Curriculums and Programs” is one of “Activities for Deliverable 1” of ”Establishment of Energy Management Training Center in Vietnam (Stage 2)”. This document reviews DANIDA and MOIT versions of theory curriculum textbooks for qualified energy managers/auditors to discuss and formulate practical curriculums with the C/P based on the review. With respect to the formulation of practical curriculums, the procurability of equipment for practical training will also take into account.

The contractor of the equipment procurement agreement is supposed to provide practical training textbooks too, associated with practical training equipment. Their content shall be based on “Energy Conservation Practical Training Curriculum” prepared by the Center, the contractor of such operation agreement, together with the counterpart authority (MOIT), and it shall be consistent with the theory curriculums and textbooks. On another front, the delivery deadline for the textbooks is planned in around November 2014. Therefore it is difficult to make adjustments of the practical training curriculum and practical training textbooks at present, and further adjustments are needed in the future as a result. This document reports on “Formulation of Practical Skill Curriculums” (draft) based on the content that was proposed to MOIT in December 2013.

II. Cultivation of Qualified Energy Managers and Energy Auditors

In Vietnam, qualified energy managers and energy auditors were already stipulated as systems by the laws and regulations on energy conservation in 2011, and training courses started in 2011 to cultivate competent qualification holders. Below is their positions as well as competencies to be acquired for the official qualifications, and we will make a proposal so that these points of view will be reflected by the Vietnamese side as much as possible.

1. Positions

Qualified energy managers and energy auditor are essential human resources in implementing the Energy Conservation Act in Vietnam. Under such law, companies whose annual energy consumption is over a certain amount (designated business operators) need to appoint a person with the qualification of qualified energy manager as an energy manager, and are supposed to conduct an energy audit every three years by an energy auditor qualification holder and an auditing company that has such a person.

With laws and regulations on energy conservation coming into force from 2011 to 2012, trainings for establishing the qualifications of a qualified energy manager and an energy auditor started in Hanoi and Ho Chi Minh in 2011 with a focus on classroom lectures, and they grant official qualifications. Upon establishment of the framework of training with practical skill training including this project and such and examinations, related laws and regulations are also expected to be reviewed.

2. Categories to be learned by a qualified energy manager and how to acquire them

Qualified energy managers are core human resources who pursue energy management as an energy manager of a designated business operator and fulfill legal requirements. Therefore, it is presumed that the following contents need be the main categories for qualified energy managers to learn to acquire competencies to implement energy management.

- I. Basics concerning energy management and how to implement them
- II. Knowledge about the Energy Conservation Act and tasks as an energy manager
- III. Energy conservation technologies and policies of designated business operators
- IV. Basics of the energy field (picture of the energy field, basic theories, etc.)

“I” is the most important knowledge and competencies when energy management is actually implemented. “II” is required from the viewpoints of legal compliance. In addition, it forms the foundation for the whole Vietnam to exert the effects of Energy Conservation Act under the collaboration of each designated business operators for implementing energy conservation policies. “III” is the basic knowledge for concrete implementation of energy conservation. Note that it is not necessary to expect general qualified energy managers to know individual process technologies that are specific for

each manufacturing area. “IV” is a category required for qualified energy managers to be an expert of the energy management field. However, it is considered that if education about such field at a university and such is postulated, the knowledge just needs to be reinforced.

The focus of the cultivation of qualified energy managers in Vietnam is above-mentioned I-III, and it is preferable to acquire these competencies especially from practical point of view, considering the situation where the Energy Conservation Act has come to effect and the competencies to implement it need to be improved.

Methods to acquire these competencies are mainly classroom lectures and practice for “I” and “II”, and classroom lectures, practice and practical training, etc. at a training center for “III” and “IV”.

3. Categories to be leaned as an energy auditor

Energy auditors are human resources who implement energy audit required by the Energy Conservation Act, and therefore they need to have the knowledge and competencies concerning energy audit listed below:

- I. Development of various conditions required to start an energy audit
- II. Understanding and analyzing the current use of energy (including measurement technologies)
- III. Finding the possibility of improving energy use and improvement methods (the knowledge and competencies related to the key facilities and device fields that are generally subject to energy conservation)
- IV. Quantitative understanding of the potential to improve the use of energy
- V. Pointing out areas for improvement and improving methods concerning energy management
- VI. Preparation and explanation of audit reports required by the Energy Conservation Act

Methods to acquiring these competencies are classroom lectures and practice related to I-VI, and that for II-IV is practical training at a training center. It is also preferable to have audit practice at an actual plant or workplace too, for the trainees to acquire the skills to implement an audit and make a comprehensive summary, and also for the trainees’ skills to be verified.

4. Relationship between energy auditors and qualified energy managers

As mentioned in the previous section, energy audit usually includes indication of management state, areas for improvement and improvement methods about energy management, and therefore energy auditors preferably have auditing competencies on top of an experience of taking a training course for qualified energy manager or equivalent competencies as qualified energy managers. From this perspective, the proposed energy

auditor training course also includes categories for energy management to be conducted by designated business operators. This means that it is considered that the qualification of an energy auditor is positioned higher than that of a qualified energy manager.

5. Categorization of qualified energy managers and energy auditors by types

With respect to the examination and qualification frameworks, it is required to discuss whether or not to categorize qualified energy managers and energy auditors by types in relation to the duties imposed by the Energy Conservation Act. Areas of expertise becomes clearer by categorizing the qualifications, but it raises issues such as that the fields of activity of individual qualified energy manager and energy auditor gets narrower and that a judgmental decision will need to be made with respect to which field of expertise the designated business operator concerned falls into. For this reason, it is assumed that if the qualifications are to have different types, they will be divided by the field such as industries or buildings, rather than by the technology such as electricity or heat, because the former is relatively easier to make a judgmental decision.

On this front, the current picture in Vietnam shows that electricity and heat are not separated but the both are included in one training course. As for the division into industries and buildings, textbooks are prepared separately for energy management training, but the trainings are more industry-oriented because of the breakdown of attendees for the time being. The content of trainings aimed at energy managers of a building naturally includes some parts that are different from industry-related training, and therefore materials need to be made to include the contents of both courses by preparing common parts and noncommon parts between the two categories.

With regard to energy auditors who are required to have more expertise, the training course provides the common basic content for both electricity and heat, although each trainee can be better at electricity or heat depending on his/her technical background. Actual audit is, however, very likely to be conducted by more than one energy auditor who is good at the area of electricity or heat respectively, rather than a single auditor conducting both electricity and heat facilities on his/her own, depending on the field and facilities of the subject designated business operator. The current training course does not have division into electricity and heat or industries and buildings, and this system is considered appropriate as a training course targeting at qualification examinations.

III. Current Training Courses and Curriculums

Although details of the contents of trainings for qualified energy managers and energy auditors are reported separately in “Report on the Review of Theory Curriculums and Textbooks for “Establishment of Energy Management Training Center in Vietnam (Stage 2)” (draft), an outline of which is shown again below:

Separate training courses have been established respectively for energy management and energy audits. The durations of the trainings were initially planned to be 9 days consisting of 7 days of classroom lectures and 2 days of practical training for energy management training, and 13 days consisting of 11 days of classroom lectures and 2 days of practical training for energy audit training. However, a full set of equipment for practical training has not yet been installed at present in Ho Chi Minh, and the durations of trainings are 5 day consisting of classroom lectures only for the former, and 9 days of classroom lectures and 2 days of practical training (half a day each) for the latter. Both training courses cover common electricity and heat technologies and facilities and do not divide the course into categories such as industries and buildings, but the content is more industry-oriented.

The current training contents of the each course are shown in Table 1.

Table 1. Current Energy Management Training Course and Energy Audit Training Course

Schedule	Energy Management Training Course	Energy Audit Training Course
Day 1	Energy situations, laws and regulations on energy conservation, and energy management	Energy situations, laws and regulations on energy conservation, and energy audit
Day 2	Energy conservation for electrical installations and lighting	Energy conservation for electrical installations
Day 3	Energy conservation for pumps, fans, compressors, air conditioning and cooling systems	Energy conservation for lighting and motors
Day 4	Energy conservation for boilers and steam systems	Energy conservation for compressors
Day 5	Economical evaluation of projects	Energy conservation for pumps and fans
Day 6 (Sat)	Examination (half a day)	Practical training: Energy conservation for lighting, compressors, pumps and fans (half a day)
Day 7	-	Energy conservation for air conditioning and cooling systems
Day 8	-	Energy conservation for fuels and

		boilers
Day 9	-	Energy conservation for steam systems and furnaces
Day 10	-	Economical evaluation of projects
Day 11	-	Practical training: Boilers and steam systems (half a day)

Again, the following is a brief overview of the current picture of the both courses and comments on them:

1. Energy Management Training Course

The current training is a 5-day course consisting of classroom lectures only. As Table 1 shows, the breakdown of the 5-day lectures is 1 day spent for energy situation, laws and regulations on energy conservation and overall energy management; 2 days spent for energy conservation for electrical installations; 1 day spent for energy conservation for heat installations; and 1 day spent for economical evaluation of energy conservation projects. The content of the course is considered to be covering the basics to cultivate a qualified energy manager. However, it is suggested to review the time distribution and necessary items to be covered in the lectures. For example, 1 day is too long to spend for lectures on economical evaluation of energy conservation projects for the limited number of 5 days available

2. Energy Audit Training Course

The current energy audit training consists of 9-day classroom lectures and 2-day practical training (half a day each). As Table 1 shows, the contents of the 9-day classroom lectures are 1 day spent for energy situations, laws and regulations on energy conservation and overall energy audit; 5 days spent for energy conservation for electrical installations, 2 days spent for heat installations; and 1 day spent for economical evaluation of energy conservation projects. In addition, at practical skill training, half a day each is spent for practical training of electricity and heat respectively. The content of the course is considered to be covering the basics to cultivate an energy auditor. Once again, however, it is recommended to review the time distribution and necessary items to be covered in lectures by reconsidering the 1 day spent for lectures on economical evaluation of energy conservation projects. Furthermore, the current practical skill training is held in a laboratory with existing experimental facilities and miniature equipment made for audit trainings at a university where the training is held (HUST or EPU). Although it seems possible to learn the basics, the facilities are insufficient as practical skill training facilities for trainees to have practical experience, and installations of full scale practical skill training facilities are awaited.

IV. Positions of Training Courses and Required Competencies

It is important for energy management and energy audit training courses to cultivate as much as possible abilities and competencies that qualified energy manager and energy auditor are required to have under laws and regulations on energy conservation in Vietnam. It means that the training courses cultivate and produce qualified energy managers who independently build energy conservation framework and drive energy conservation for designated energy business operators stipulated and required by the laws and regulations on energy conservation in Vietnam, as well as energy auditors who audits such companies every three years and has leadership skills to drive appropriate energy conservation.

As mentioned in the chapter II “Cultivation of Qualified Energy Managers and Energy Auditors”, categories to be learned in each training course are summarized in Table 2.

Table 2: Categories to be Learned in Each Training Course

	Qualified Energy Manager Training	Energy Auditor Training
1	Basics concerning energy management and how to implement them	Development of various conditions required to start an energy audit
2	Knowledge about the Energy Conservation Act and tasks as an energy manager	Understanding and analyzing the current use of energy (including measurement technologies)
3	Energy conservation technologies and policies of designated business operators	Finding the possibility of improving energy use and improvement methods (the knowledge and competencies related to the key facilities and device fields that are generally subject to energy conservation)
4	Basics of the energy field (picture of the energy field, basic theories, etc.)	Quantitative understanding of the potential to improve the use of energy
5		Pointing out areas for improvement and improving methods concerning energy management
6		Preparation and explanation of audit reports required by the Energy Conservation Act

Also on this front, we proposed our views to MOIT about the positions of the both courses and competencies required by the both courses as shown in Exhibit 1, and highlighted that of the training courses and curriculums should be constructed based on them, to which we obtained basic consent during our second business trip in September 2013. Table 3 shows the views on the competencies required by the both courses.

Table 3: Positions of Qualified Energy Managers and Energy Auditors and Required Competencies

	Qualified Energy Manager	Energy Auditor
1. Positions of the both courses	Basic qualification for energy management	Qualification positioned higher than the qualified energy manager
2. Qualification category	National qualification	National qualification (renewed every 5 years)
3. Technology category	No categorization into heat and electricity or industries and buildings	No categorization into heat and electricity or industries and buildings
4. Required competencies	1. Understanding energy conservation policies and promotion activities	1. Understanding energy conservation policies and promotion activities
	2. Roles of qualified energy managers and understanding of energy management techniques (skills to prepare regular report, etc.) based on laws and regulations on energy conservation	2. Roles of qualified energy managers and understanding of energy management techniques based on laws and regulations on energy conservation
	3. Understanding and acquiring basic knowledge of major energy-consuming facilities using heat and electricity and their energy consumption policies	3. Understanding and acquiring basic knowledge of major energy-consuming facilities using heat and electricity and their energy consumption policies
		4. Roles of energy auditors and understanding of energy audit reports
		5. Cultivation of reading/analyzing skills of energy data and regular reports, etc. of designated energy company subject to an audit.
		6. Acquiring energy audit techniques and measurement technologies
		7. Efficiency evaluation of major

	Qualified Energy Manager	Energy Auditor
		energy consuming facilities
		8. Evaluation of technologies and economic performance of energy conservation policies
		9. Cultivation of problem extraction skills and problem solving skills

V. Consideration of Practical Training Textbooks and Curriculums

Practical training textbooks are supposed to be prepared and provided by the contractor of equipment procurement agreement. These textbooks are planned to include “understanding of energy conservation technologies, analysis of energy use, improvement methods and their selection, calculations of the quantity of improvement, actual measurement and audit, etc.” performed using practical training equipment. These points have been reflected in “Preparation of Practical Training Equipment (Preparation of Practical Training Equipment/Training Functional Specifications (draft))”.

The center has been providing energy conservation practical training and education courses for over 18 years in Japan to meet domestic demands using the equipment equivalent of what are to be provided with Vietnam under the recent equipment procurement agreement. The recent contents of the curriculums of the electricity course and heat course are shown in Table 4 and Table 5 respectively. To fully conduct these courses, a total of 8 days are required for electricity and 10 days for heat, making the total days required for lectures and practical training of electricity and heat 18 days, with extra 4-5 days needed to include general energy situations, laws and regulations on energy conservation, overall energy management and overall energy audit. With respect to this, MOIT’s intention is to make energy management course no longer than approximately 1 and half weeks and to make energy audit course less than 2 and half weeks. Therefore, the contents needed to be narrowed down considerably because the entire contents cannot be applied to the courses in Vietnam.

Table 4: Energy Conservation Practical Training and Education Course (Electricity Course)

Session No.	Item	Content
Session 1	Theme	Energy conservation policies for rotating equipment (lectures and practice)
	Training times	Twice in May and October , 2013 (2 days each, Day 1: 10:00-17:00, Day 2: 9:25-16:30, enrollment limit: 20)
	Purpose	1. To understand the characteristics and fundamental properties of rotating equipment, such as pumps, fans, air compressors. To understand the changes in characteristics during parallel operation, inverter-controlled operation, passing water through a bypass, etc.
		2. To train the skill to analyze operational state of rotating equipment commonly seen on site and to find a problem.
		3. To acquire the ability to quantify seriousness of a problem or a waste and effects of energy conservation improvement.

Session No.	Item	Content
	Curriculum	1. Energy conservation policies for pumps
		[Lecture] Lecture on the fundamental properties of pumps: Total pump head, efficiency, electric motor input and no-load loss
		[Practice] Explanation of performance test data and preparation of a performance curve
		[Lecture] A property curve of pumps on parallel operation: Parallel operation of pumps with the same capacity and parallel operation of pumps with different capacities
		[Practice] Preparation of a property curve of parallel operation
		[Lecture] Energy conservation policies for pumps: Aspects of structure and operation control, adjustment of the flow volume, changes in the number of rotations, adjustment of number of systems, etc.
		[Practice] Practice questions on pumps and explanation of practice questions
		2. Energy conservation policies for fans
		[Lecture] Lecture on the fundamental properties of fans: Pressure, efficiency, electric motor input and no-load loss
		[Practice] Explanation of performance test data and preparation of a performance curve
		[Lecture] A property curve of fans on parallel operation: Parallel operation of fans with the same capacity and parallel operation of fans with different capacities
		[Practice] Preparation of a property curve of parallel operation
		[Lecture] Energy conservation policies for fans: Aspects of structure and operation control, adjustment of the flow volume, changes in the number of rotations, adjustment of number of systems, etc.
		[Practice] Practice questions on fans and explanation of practice questions
		3. Energy conservation policies for air compressors
		[Lecture] Lecture on the fundamental properties of air compressors: Pressure efficiency, electric motor input, no-load loss and operation control
		[Practice] Changes in power during on-load/unload operations, and how to calculate an average power
		[Lecture] Energy conservation policies for air compressors: Reduction of the discharge pressure, inverter control, leakage cutdown, control

Session No.	Item	Content
		of number of systems, reduction of piping pressure loss, etc.
		[Practice] Trial calculations of power saving effects with a lowered discharge pressure: Quotation of practical training equipment
		[Lecture] Fluctuation of pressure and changes in power during inverter operation: Quotation of practical training equipment
		[Practice] Comparison between on-load/unload operations and inverter operation
		[Practice] Practice questions on air compressors and explanation of practice questions, etc.
Session 2	Theme	Energy conservation practice of pumps
	Training times	Twice in June and November , 2013 (2 days each, enrollment limit: 20)
	Purpose	1. Trainees themselves use practical training pumping system facilities for normal operation, inverter operation and operation with a cut impeller and summarize visualized operation data for the purpose of realizing no-load loss, changes in efficiency and effects of energy conservation policies.
		2. To operate with and without minimum flow passing water as commonly seen on site to quantify a problem and effects of energy conservation policies.
		3. To use practical training pumping system facilities to learn steps and precautions on a performance diagnosis method for pumps and a performance evaluation method.
	Curriculum	Day 1: 10:45-18:00
		[Lecture] Fundamental properties of pumps: Understanding a performance curve (total pump head, efficiency, electric motor input, number of rotations and no-load loss)
		[Practical Training] Practical training of fundamental properties: Flow volume, total pump head, pumps efficiency, electric motor input, number of rotations and no-load loss
		[Lecture] Energy conservation policies for pumps: Pressure by the discharge valve, etc. and practical training of operation with an adjusted flow volume
		[Practical Training] Practical training of adjusted operation with the discharge valve
		[Lecture] Energy conservation policies for pumps: Changes in

Session No.	Item	Content
		operating frequency by the inverter
		[Practical Training] Practical training of properties of inverter operation
		Day 2: 8:25-15:00
		[Lecture] Energy conservation policies for pumps: Effects of outside diameter modification on impeller (impeller cut)
		[Practical Training] Operational properties of pumps with a cut impeller. Practical training to see the effect.
		[Lecture] Energy conservation policies for pumps: Minimum flow stoppage
		[Practical Training] Practical training to see the effect of minimum flow stoppage
		[Lecture] Performance diagnosis methods for pumps
		[Practical Training] Performance diagnosis methods for pumps
		[Practical Training] Practice to find a problem
		[Lecture] Case examples of energy conservation and improvement
Session 3	Theme	Energy conservation practice for fans
	Training times	Twice in July and December 2013 (2 days each, enrollment limit: 20)
	Purpose	1. Trainees themselves use practical training fan facilities for normal operation, inverter operation and valve-adjusted operation and summarize visualized operation data for the purpose of realizing no-load loss, changes in efficiency and effects of energy conservation policies.
		2. To understand the key points in selecting a valve and a pipe diameter through practical training on pressure loss caused by different types of valves and that caused by different diameters of a pipe.
		3. To use practical training fan facilities to learn steps and precautions on a performance diagnosis methods and performance evaluation methods for fans.
	Curriculum	Day 1: 10:45-18:00
		[Lecture] Fundamental properties of fans: Understanding a performance curve (pressure, efficiency, electric motor input, number of rotations and no-load loss)
		[Practical Training] Practical training of the fundamental properties:

Session No.	Item	Content
		Flow volume, pressure, fan efficiency, electric motor input, number of rotations and no-load loss
		[Lecture] Energy conservation policies for fans: Practical training of adjusted operation using a discharge valve and an inlet valve
		[Practical Training] Practical training of adjusted operation using a discharge valve and an inlet valve
		[Lecture] Energy conservation policies for fans: Changes in operational frequency: Changes in the operating frequency by an inverter
		[Practical Training] Practical training of properties of inverter operation
		Day 2: 8:25-15:00
		[Lecture] Pressure loss in pipes
		[Practical Training] Practical training on a pressure loss in pipes caused by different sizes
		[Lecture] Pressure losses in valves
		[Practical Training] Practical training on a pressure loss in valves caused by different types
		[Lecture] Diagnosis methods of performance of fans
		[Practical Training] Practical training on diagnosis methods of performance of fans
		[Lecture] Precautions on energy conservation policies for fans and case examples of energy conservation improvement, etc.
Session 4	Theme	Energy conservation practice of air compressors
	Training times	Twice in August 2013 and January 2014 (2 days each, enrollment limit: 20)
	Purpose	1. Trainees themselves use practical training air compressor facilities for on-load/unload operations and inverter operation and summarize visualized operation data for the purpose of realizing changes in power and effects of energy conservation policies.
		2. To understand changes in the electric power consumption rate through practical trainings of changing the discharge pressure and used flow volume of an air compressor.
		3. To understand the strong correlation between the amount of leakage and the level of noise through practical training on them.
		4. To understand the key points in selecting the diameter of a pipe

Session No.	Item	Content
		through practical training on pressure losses caused by different inner diameter of hoses.
	Curriculum	Day 1: 10:45-18:00
		[Lecture] Fundamental properties of air compressors and on-load/unload operations
		[Practical Training] Practical training on on-load/unload operations
		[Lecture] Energy conservation policies for air compressors: Consistent pressure control by inverter control
		[Practical Training] Inverter operation
		Day 2: 8:25 - 15:00
		[Lecture] Flow of compressed air
		[Practical Training] Practical training on the leakage of compressed and the level of noise
		[Lecture] Pressure loss in pipes
		[Practical Training] Practical training on the pressure loss caused by different inner diameters of a hose
		[Lecture] Seeing various types of actual nozzles
		[Practical Training] Discharge amounts of different nozzles
		[Lecture] Understanding the current status of compressed air systems, energy conservation policies for compressed air systems, and other improvement case examples

Table 5: Energy Conservation Practical Training and Education Course (Heat Course)

Session No.	Item	Content
Session 1	Theme	Introductory energy conservation course for heat installations (lectures and practice)
	Training times	Twice in May and October FY 2013 (2 days each, enrollment limit: 20)
	Purpose	1. To understand the key points in heat energy conservation
		2. To understand combustion as a key point in heat energy conservation. <ul style="list-style-type: none"> • What is combustion? What is air ratio? How to improve air ratio and the effects thereof.
		3. To understand heat transfer as a key point in heat energy

Session No.	Item	Content
		conservation. <ul style="list-style-type: none"> 3 forms of heat transfer, calculation of heat transfer, etc.
		4. Trial calculation of energy conservation effects <ul style="list-style-type: none"> Making a hypothesis, calculation of energy conservation effects
	Curriculum	Day 1: Necessity of energy conservation – What is “combustion” as a key point in heat energy conservation?
		[Lecture] Necessity of energy conservation – Key points in heat energy conservation
		[Lecture] “Combustion” as a key point in heat energy conservation?
		[Practice] Calculation of air ratio, assumption of air ratio improvement amount
		Day 2: “Heat transfer” as a key point in heat energy conservation
		[Lecture] Heat transfer, as a key point in heat energy conservation: Calculation of heat transfer, example of calculation
		[Practice] Heat transfer calculation practice
		[Lecture] Trial calculation methods of energy conservation effects
		[Practice] Trial calculation practice of energy conservation effects, etc.
Session 2	Theme	Energy conservation practice course for heat installations
	Training times	Twice in June and November FY 2013 (2 days each, enrollment limit: 20)
	Purpose	1. To understand combustion calculation from the basics (combustion calculation terms, calculation of combustion)
		2. To understand the effects of air ratio, furnace pressure and exhaust heat recovery of heating furnace (influences, effects, etc. of air ratio, furnace pressure and exhaust heat recovery)
		3. Trial calculation of effects of energy conservation (seeing from several perspectives, trial calculation of the effects of energy conservation, etc.)
	Curriculum	Day 1: Practical training of combustion, changes in air ratio/furnace pressure, 10:45-18:00
		[Lecture] Calculation of combustion
		[Lecture] Combustion as a key point in heat energy conservation (2)
		[Practical Training] Influences of air ratio and furnace pressure in the furnace for practical training
		Day 2: Practical training on changing exhaust heat recovery,

Session No.	Item	Content
		8:25-15:00
		[Lecture] Exhaust heat recovery as a key point in heat energy conservation
		[Practical Training] Influences of exhaust heat recovery in a furnace for practical training
		[Lecture] Trial calculation methods of energy conservation effects
		[Practice] Trial calculation practice of energy conservation effects
Session 3	Theme	Energy conservation audit course for heat installations
	Training times	Twice in July and December , 2013 (2 days each, enrollment limit: 20)
	Purpose	1. To understand heat balance from the basics <ul style="list-style-type: none"> • Calculation of combustion (review), heat balance steps, how to summarize heat balance results
		2. To understand the information that can be obtained from the heat balance results <ul style="list-style-type: none"> • Purpose of energy conservation, energy conservation policies and their effects, etc.
	Curriculum	Day 1: Practical training of combustion, changes in air ratio/furnace pressure, 10:45-18:00
		[Lecture] Heat balance (steps, how to summarize)
		[Lecture] Calculations required for heat balance (calculation of combustion, etc.)
		[Practical Training] Practical training on heat balance using a combustion furnace
		Day 2: Practical training on exhaust heat recovery changes, 8:25-15:00
		[Practical Training] Practical training on heat balance using a combustion furnace (continued)
		[Practical Training] Practical training on searching for trouble of a combustion furnace
		[Lecture] Case study
Session 4	Theme	Energy conservation for combustion furnaces and their ancillary facilities
	Training times	Twice in September 2013 and January 2014 (2 days each, enrollment limit: 20)
	Purpose	1. To understand energy conservation by comprehending the whole

Session No.	Item	Content
		facility <ul style="list-style-type: none"> • Walk-through diagnosis, preparation of a piping system diagram, etc.
		2. To experience the measurement required for energy conservation. <ul style="list-style-type: none"> • Measurement of humidity, flow volumes, pressure, electric power, etc.
	Curriculum	Day 1: Practical training on facility diagnosis 1, 10:45-18:00
		[Lecture] How to use measuring instrument and key points in diagnosis
		[Practical Training] Practical training on facility diagnosis
		Day 2: Practical training on facility diagnosis 2, 8:25-15:00
		[Lecture] Trial calculation methods of energy conservation effects
		[Practical Training] Practical training on facility diagnosis, calculation of the effects
Session 5	Theme	Points for observation on steam system improvement
	Training times	Once in September 2013 (1 and half days, enrollment limit: 12)
	Purpose	Day 1: 13:00-17:00
		[Lecture] Steam and the Energy Conservation Act (key points in management standards, etc.)
		[Lecture] Basic knowledge of steam and correct ways to use steam (energy conservation of a boiler, improvement of steam dryness, power generation with steam, countermeasures against water hammer, etc.)
		[Lecture] Basic knowledge of a steam trap and the optimal usage (comparison of actuation and performance and selection of the best option for each purpose)
		[Demonstration] Demonstration of the lecture contents at a showroom
		Day 2: 9:00-16:00
		[Lecture] How to manage a steam trap
		[Practical Training] Practical training of a steam trap checkup (practical training on diagnosis)
		[Demonstration] Demonstration of steam-using devices (demonstration of comparison of heating performance, etc.)
		[Lecture] Types and their merits of drain/exhaust heat recovery
		[Lecture] Energy management methods

Session No.	Item	Content
		[Lecture] Presentation of other energy conservation and trouble examples
		[Practical Training] Practical training on energy conservation devices (drain/exhaust heat recovery devices)

VI. Proposal on the Review of Training Curriculums

The training curriculums need to be reviewed in terms of the contents of not only classroom lectures but also of practical trainings. Energy management trainings in particular currently do not include practical trainings. Therefore essentially, a practical skill training part will be added. For energy audit, a practical skill training of a total of 2 days (half a day each) is already included, although it is not very much, so that will be reviewed. The content will be, however, basically reviewed to make it correspond to the content of practical training equipment provided to PRET in Ho Chi Minh. Practical trainings themselves relate to the content of the training textbook that will be prepared by the provider of training equipment. Therefore, the content needs to be amended by the time the training textbook is provided (around November 2014) to link with the content of practical skill trainings.

1. Energy management training: The duration of the proposed training course is a total of 7 days, including the current 5 days of classroom lectures with additional 2 days of practical training; it will keep the same half a day examination as before. The purpose of the proposal is merely to change the training to make it capable of developing required competencies for qualified energy managers of a designated energy management company based on the laws and regulations on energy conservation, and the following was proposed in September and December 2013. The contents of the proposal made in September are shown in Exhibit 1, and the contents of the proposal made in December are shown in Exhibit 2. The duration of the both proposed courses is 7 days in total for classroom lectures and practical trainings, and a half-day examination. The proposal made in December based on the discussion made in September when the proposal was made is shown below. In the reply comment to the proposal, Mr. Quang, MOIT, asked if it is possible to shorten the 3 days, which is long in his view, spent for the lectures on laws and regulations on energy conservation, energy management and energy conservation policies to about 1 day. We have replied that although we would review it again, we would like to keep the proposal as a base because these are necessary contents to cultivate qualified energy managers. MOIT would like to review the whole training as they confirm the content of textbooks for practical skill training once they have been completed.

- ① Overall energy management: 3 days
- ② Electrical installations: 2 days
- ③ Heat installations: 2 days
- ④ Examination: 1 day (half a day)

Table 4: Energy Management Training (Last proposal to MOIT made on: December 12, 2013)

Schedule	Category	Main Content
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Day 1	Energy situations and laws and regulations on energy conservation	Energy situations in the world and Vietnam Laws and regulations on energy conservation in Vietnam Designated companies, qualified energy manager and energy audit
Day 2	Energy management system	Energy management system Regular reports and 5-year planning documents Economical evaluation method Standards of judgment and management manual (input of Japanese example)
Day 3	Energy conservation for electrical installations 1	Lecture and practical training on energy conservation for receiving and distributing electricity, lighting and pumps
Day 4	Energy conservation for electrical installations 2	Lecture and practical training on fans, compressors and air conditioning
Day 5	Energy conservation for heat installations 1	Lecture and practical training on fuels/combustion and heating furnace
Day 6	Energy conservation for heat installations 2	Lecture and practical training on boilers and steam systems
Day 7	Energy conservation policies and roles of a qualified energy manager	Energy conservation for main industries and buildings, practice of preparing a regular report, etc.
Day 8	Examination (half a day)	Examination based on the contents of the lectures

2. Energy audit training: The duration of the proposed training course is a total of 12 days, including the current 9 days of classroom lectures and 2 days of practical with additional 1 day to; it will keep the same half a day examination as before. The purpose of the proposal is merely to change the training to make it capable of developing required competencies for energy auditors, who perform an energy audit at energy management companies designated based on laws and regulations on energy conservation every 3 years, and the following was proposed in September and December 2013. The contents of the proposal made in September are shown in Exhibit 2, and the contents of the proposal made in December are shown in Exhibit 2. The duration of the both proposed courses is 12 days in total for classroom lectures and practical trainings, and a half-day examination. The proposal made in December based on the discussion made in September when the proposal was made is shown below. In the reply comment to the proposal, Mr. Quang, MOIT, expressed his view that 5 days is too long to spend for lectures on laws and regulations on energy conservation and lectures and such on energy management, energy audit and preparation of an audit report and asked if it is possible to make it much shorter.

We have replied that although we would review it again, we would like to keep the proposal as a base because these are necessary contents to train energy auditors. MOIT would like to review the whole training as they confirm the content of textbooks for practical training once they have been completed.

- ① Overall energy management: 5 days
- ② Electrical installations: 4 days
- ③ Heat installations: 3 days
- ④ Examination: 1 day (half a day)

Table 5 Energy Audit Training (Last proposal to MOIT made on: December 12, 2013)

Schedule	Category	Main Content
Day 1	Energy situations and laws and regulations on energy conservation	Energy situations in the world and Vietnam Laws and regulations on energy conservation in Vietnam Designated companies, qualified energy manager and energy audit
Day 2	Energy management system	Energy management system Regular reports and 5-year planning documents Economical evaluation method Standards of judgment and management manual (Input of Japanese example)
Day 3	Energy audit system	Energy audit procedures and methods Key points of energy conservation and audit for buildings Key points of energy conservation and audit for major industries
Day 4	Energy conservation for electrical installations 1	Lectures on energy conservation for receiving and distributing electricity, lighting and electric measurement, and practical training on lighting and electric measurement
Day 5	Energy conservation for electrical installations 2	Lectures on energy conservation for motors and pumps, and practical training on pumps
Day 6	Energy conservation for electrical installations 3	Lectures on fans and compressors and practical training on fans
Day 7	Energy conservation for electrical installations 4	Lectures on air conditioning and cooling systems and practical training on compressors
Day 8	Energy conservation for	Lecture and practical training on fuels/combustion

	heat installations 1	and heating furnace
Day 9	Energy conservation for heat installations 2	Lecture and practical training on heat balance and heat measurement
Day 10	Energy conservation for heat installations 3	Lecture on boilers and steam systems and practical training on steam traps
Day 11	Trial audit using training facility	How to proceed with energy audit for the overall facility Practical training on heat balance and preparation of an energy flow diagram Trial audit using training facilities (trouble shooting)
Day 12	Preparation of an audit report	The audit report form and requirements under laws and regulations on energy conservation Obtaining basic energy data at a designated energy company Utilization of regular reports, etc. of a designated energy company Audit report preparation practice based on the laws and regulations on energy conservation
Day 13	Examination (half a day)	Examination based on the contents of the lectures

VII. Conclusion

Energy management trainings and energy audit trainings in Vietnam started in fiscal 2011. This report has summarized the proposals on curriculum and textbooks for cultivating the competencies required for qualified energy managers and energy auditors in conformity with the laws and regulations on energy conservation in Vietnam by investigating, confirming and evaluating the curriculum for the trainings. The consideration took into account the planned practical training curriculum that uses training equipment. However, preparation of practical training textbooks, on which the actual practical training curriculum is going to be based, is outside the scope of this operation agreement, and is due to be separately provided around in November 2014 by the contractor of the equipment procurement agreement. Therefore, practical training curriculum and the entire training curriculum will need to be reviewed by taking into consideration the practical training textbooks. This report includes formulation of practical training curriculums as part of the review on the current situation. However, close opinion exchanges between parties concerned of MOIT and the contractor of the equipment procurement agreement, consideration and adjustment will continue toward 2015 to finalize the curriculum contents, and a separate final report will be compiled.

VIII. Supplemental Documents

1. Proposal on Qualification System and Training Courses of Energy Manager and Energy Auditor in Vietnam
2. Revised Proposal on Energy Manager and Energy Auditor Training Courses with Practical Equipment

ANNEX IV : Equipment Specification Description (Tentative Version)

Country Name: Vietnam **Subject : Training Equipment for Energy Management Training Center in Vietnam**

As of Aug. 23, 2013

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No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
1	General rules	1.1 Scope of application						
		This specification prescribes rules about the design, fabrication, transportation and installation of equipment for practical trainings for the purpose of cultivating instructors and holding energy conservation trainings for "Establishment of Energy Management Training Center in Vietnam (Stage 2)", a project implemented by Japan International Cooperation Agency (hereinafter abbreviated as "JICA").						
		The requirements written in this specification only indicate the minimum conditions to be fulfilled, and based on that the applicant for the contract shall prepare a technology proposal by complementing part of it, adding a new proposal, etc. and submit it.						
		After screening the technology proposal based on the following criterion, some applicants of the score of 50 point and more will be on bid tender.						
		Evaluation Item	Allocated Points					
		(1) Validity of basic policies and implementation structures of the bidder concerning the service of the project	20					
		(2) Validity/accuracy of equipment functions/scale and training content and implementation methods	40					
		(3) Experience/ability of the applicant and the operation chief & operation staff	40					
		1-2. Background and objectives						
		The Energy Management Training Center is going to be established in Vietnam for cultivating qualified energy managers and energy auditors.						
		Preparing useful equipment for practical trainings and cultivating training instructors who are proficiency in the theory and practice makes trainings effective for actual practice and contributes to the promotion of energy conservation in Vietnam.						
		1.3 Range of estimate						
		(1) Design and manufacture of equipment						
		(2) Transportation of equipment (Domestic, sea ship and Vietnam)						
		(3) Installation work of equipment at Vietnam						
		(4) Test run and adjustment of equipment						
		(5) Explanation of operation procedure for C/P						
		(6) Training for C/P (Training at EMTC or in Japan with equipment delivered or equivalent for total four times in 2014 and 2015)						
		(7) Drawings and Operation manuals (English and Japanese version)						
		(8) Training text (English and Japanese version)						
		1.4 Place of installation						
		(1) Location: Ho Chi Minh city, Vietnam						
		(2) Installation site: Plastic Rubber Technology and Energy Conservation Training Center (hereinafter abbreviated as "PRET)						
		(3) Layout: See Exhibit 1.						
		(4) Building: See Exhibit 2.						
		(5) Monthly average temperature: highest: 35 °C, lowest: 21°C						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		(6) Annual rainfall: 1,932 mm						
		(7) Altitude: 0.8 m						
		1.5 Utility						
		(1) Electric power supply: AC 380 V 50 Hz three phase (compatible), AC 220 V 50 Hz single phase (compatible) Three-phase four-wire power supply, capacity of distribution board: 170 kVA						
		(2) Fuel (LPG) Composition: Propane 70%, Butane 30% Calorific value: 45.7 MJ/kg						
		(3) Water (tap water) Criterion Analysis result						
		PH 6.5 to 8.5 7.13						
		Hardness < 300 20 mg/L						
		Chloride < 250 6.38 mg/L						
		Turbidity 0 0						
2	Equipment	2. Basic requirements of equipment						
		2.1 Outline Configuration of equipment in this facilities, Layout Figure shows attachment 1 for reference.						
		2.2 Equipment configuration The system consists of the following equipment for the energy conservation trainings of utility facilities which forms a foundation for promoting energy conservation in the industry fields. Each equipment shall provide functions required for practicing the learning content specified respectively. Consumables and spare parts required for the three years after delivery shall also be included.						
		(1) Combustion furnace facility for practical trainings						
		(2) Steam trap facility for practical trainings						
		(3) Pump facility for practical trainings						
		(4) Fan facility for practical trainings						
		(5) Compressed air facility for practical trainings						
		(6) Lighting facility for practical trainings						
		(7) Power supply box						
		(8) Equipment for training						
		(9) Measuring instruments for energy auditing						
		2.3 Common specifications of facilities						
		(1) Equipment shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.						
		(2) Facilities shall be in a compact configuration so that the entire facilities can be easily understood.						
		(3) The layout of equipment and configuration of devices shall be made for easy operation and measuring.						
		(4) The device configuration shall be suitable for trainings for problem finding and energy conservation measures.						
		(5) Practical functions shall be provided so that what has been learned in a practical training can be applied to actual equipment on site.						
		(6) The ways to manage and use measuring instruments can be mastered.						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		(7) Facilities shall be easy to maintain and check.						
		(8) Facilities shall be able to be started up and shut down quickly for trainings.						
		(9) Equipment is handled directly by trainees for operation and training, so sufficient attention shall be paid to safety including burn injury, gas leaks, electric shock, etc.						
		(10) As a countermeasure against an emergency of flooding, electrical appliances shall be placed 30 cm or more above the floor.						
		(11) Each controlling board shall have sockets (15 A x 2) for 100 V for measuring instruments.						
		2.4 Training Content						
		In the every training, energy consumption, energy saving amount, energy reduction cost and CO2 reduction amount are calculated. And with the visualization of the EE & C results, the training will get more effective results.						
		And then including followings, the concrete training contents will be proposed in the technical proposal.						
		(1) Combustion furnace facility for practical trainings						
		1) Comprehensive practical trainings for Energy Auditing can be provided.						
		2) Detailed heat balance can be calculated.						
		3) Adjustment of the air ratio and fuel-saving effects can be mastered.						
		4) Fuel-saving effects from exhaust heat recovery can be mastered.						
		5) Trainees can understand the heat release loss from the furnace body.						
		6) Consistent data processing can be performed with measuring instruments, data loggers and computers.						
		(2) Combustion burner facility for practical trainings						
		1) Change of combustion flame can be understood by combustion air adjustment.						
		2) Optimum combustion can be recognized by the flame condition.						
		(3)Explosion facility for practical trainings						
		1) Explosion limits of gas fuel will be mastered						
		2) A explosion will be confirmed visually.						
		(4) Steam trap facility for practical trainings						
		1) Comprehensive practical trainings for Energy Auditing can be provided.						
		2) The structure and elements of steam traps can be mastered.						
		3) The method to select the best trap for the intended purpose can be mastered.						
		4) Judgment of steam trap work, way of check and maintenance of steam traps will be mastered.						
		5) Basic improvement technic way in steam system will be mastered.						
		(5) Pump facility for practical trainings						
		1) Comprehensive practical trainings for Energy Auditing can be provided.						
		2) Practical trainings for Energy Auditing in whole water delivery system can be provided.						
		3) Performance of the pump can be confirmed.						
		4) Characteristics and energy conservation effects of a cut impeller can be confirmed.						
		5) Characteristics and energy conservation effects of inverter control can be confirmed.						
		6) Energy conservation effects of discharge valve control can be confirmed.						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		7) Consistent data processing can be performed with measuring instruments, data loggers and computers.						
		(6) Fan facility for practical trainings						
		1) Comprehensive practical trainings for Energy Auditing can be provided.						
		2) Practical trainings for energy conservation auditing of the entire blower system can be provided.						
		3) Performance of the fan can be confirmed.						
		4) Energy conservation effects of damper control can be confirmed.						
		5) Energy conservation effects of inverter control can be confirmed.						
		6) Consistent data processing can be performed with measuring instruments, data loggers and computers.						
		(7) Compressed air facility for practical trainings						
		1) Comprehensive practical trainings for Energy Auditing can be provided.						
		2) Practical trainings for energy conservation auditing of the entire compressed air systems can be provided.						
		3) Energy conservation effects of changing the compressor discharge pressure can be confirmed.						
		4) Electric power and pressure during unload/on-load running can be compared and confirmed.						
		5) Energy conservation effects of inverter control can be confirmed.						
		6) The leakage quantity can be measured and energy conservation effects can be confirmed.						
		7) Consistent data processing can be performed with measuring instruments, data loggers and computers.						
		(8) Lighting facility for practical trainings						
		1) Comprehensive practical trainings for Energy Auditing can be provided.						
		2) Efficiency of various lighting devices can be measured.						
		2.5 Configuration of main equipment in practical training facilities						
		Specifications of main equipment will be mentioned in technical proposal.						
		Measurements equipment, supplied material and accessories will be included.						
		(1) Combustion furnace in practical trainings						
		1) Combustion furnace (burning capacity: approx. 800 MJ/h x 1)						
		2) Fan						
		3) Exhaust heat recovery device (combustion air preheating)						
		4) Cooling tower						
		5) Piping						
		6) Chimney						
		7) Electric controlling board (including the inverter)						
		8) Instrumentation devices						
		9) Measuring instruments, data processing devices and computers						
		10) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)						
		(2) Combustion burner in practical trainings						
		1) Burner (Burning capacity: approx. 400 MJ/h)						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		2) Piping						
		3) Halved burner model						
		(3) Explosion facilities in practical trainings						
		1) Gas explosion facilities in practical trainings						
		2) Ignitor						
		(4) Steam trap facility for practical trainings						
		1) Steam trap facility for the practical training (including each types of traps)						
		2) Pressured pump						
		3) Boiler (0.5 t/h, approx. 0.6 MPa, Vietnamese display, compliant with Vietnamese boiler standards)						
		4) Boiler water treatment device						
		5) Drain recovery system						
		6) Piping						
		7) Chimney						
		8) Instrumentation devices, Measuring instrument						
		9) Electric controlling board						
		10) Halved steam trap model						
		11) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)						
		(5) Pump facility for practical trainings						
		1) Radial flow pump (0.4 m ³ /min, approx. 30 m)						
		2) Pump with a cut impeller						
		3) Motor						
		4) Water tank						
		5) Piping						
		6) Electric controlling board (including the inverter)						
		7) Instrumentation devices						
		8) Measuring instruments, data processing devices and computers						
		9) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)						
		(6) Fan facility for practical trainings						
		1) Fan (30 m ³ /min, approx. 6 kPa)						
		2) Motor						
		3) Piping						
		4) Electric controlling board (including the inverter)						
		5) Instrumentation devices						
		6) Measuring instruments, data processing devices and computers						
		7) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)						
		(7) Compressed air facility for practical trainings						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		1) Screw compressor (1 m3/min, approx. 0.7 Mpa)						
		2) Inverter compressor (same capacity as the one mentioned above)						
		3) Air tank						
		4) Piping						
		5) Electric controlling board						
		6) Instrumentation devices						
		7) Measuring instruments, data processing devices and computers						
		8) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)						
		(8) Lighting facility for practical trainings						
		1) Various lighting devices (include Japanese and Vietnam devices)						
		2) Power distribution board						
		3) Measuring instrument						
		(9) Power supply box						
		1) Transformer						
		2) Breaker						
		(10) Supplies for training						
		Operation manual shall be in English and Japanese.						
		1) FM receivers (40 receivers/ RD-660Z, 2 microphones/ RD-650Z, batteries)	PANASONIC					
		2) Tool sets (2 sets of service kit for industrial machines)						
		(11) Measuring instruments for energy						
		English display is preferred for measuring instruments and the operation manual shall be in English and Japanese.						
		1) Electrical power loggers : PW3360-20 x 2 sets	HIOKI					
		Clamp-on sensor : 500A×6 pcs、 50A×6 pcs						
		Accessories : Carrying case, Magnet adapter, SD memory card, AC Power code(C)						
		2) Clamp tester : 3280-10 x 2 sets	HIOKI					
		3) Radiation thermometer : 53005 x 2 sets	YOKOGAWA					
		4) Temperature logger : TR-71Ui x 2 sets	T&D					
		5) Illuminance, humidity and temperature logger : TR-74Ui-H x 2 sets	T&D					
		6) CO2, temperature and humidity logger : TR-76Ui-H x 2 sets	T&D					
		7) Digital camera : WG-3 x 2 sets	PENTAX					
		[Accessories] : AC adapter kids, Compact tripod, SDHC memory card						
		8) Infrared thermography	Chino					
		CPA-E40, 2 sets						
		9) Oxygen meter for combustion management	New Cosmos Electric					
		XP-3180E, 2 sets						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		10) Portable ultrasonic flow meter, 2 sets	Fuji Electric					
		Portaflow-C, FSCS20B2-10E, Printer, Recorder 10pcs						
		Detector/ FSSC1CC1-BY,						
		11) Power supply quality analyzer, 2 sets	HIOKI					
		PW3198-90 with software, Clamp-on sensor 9669, current 1000A, 3 pcs						
		Above mentioned manufacturers are brands for reference, and equivalent or better products are also acceptable.						
3	Transportation	3. Transportation						
		Manufactured equipment, etc. shall be packed as required and transported to PRET through domestic transportation, ocean shipping and Vietnamese domestic transportation.						
		3.1 Internal transport in Japan						
		3.2 Marine transport						
		3.3 Internal transport in Vietnam						
4	Installation work	4. Local installation work						
		4.1 Installation work of equipment						
		Equipment transported to PRET shall be installed at specified places. The building the equipment installed in is already exists. Modifications to the existing building such as a foundation and plumbing pit of large facilities and a through-hole in the building, etc. is in the scope of PRET's work, and the contractor shall submit drawings required to installation upon the completion of detailed design.						
		4.2 Test run and adjustment of equipment						
		Facilities shall be tested and adjusted their operations to check their normal performance after installation work. After the work, C/P will be explained operation procedure with manuals and training text, etc.						
		(1) Combustion furnace facility for practical trainings						
		(2) Combustion burner for practical trainings						
		(3) Explosion test facility						
		(4) Steam trap facility for practical trainings						
		(5) Pump facility for practical trainings						
		(6) Fan facility for practical trainings						
		(7) Compressed air facility for practical trainings						
		(8) Lighting facility for practical trainings						
5	研修	5.1 Training						
		By using the delivered equipment and equivalent, C/P will be trained in a practical way for EE&C. The training place will be in Vietnam, but training in Japan will be approved.						
		Transportation and accommodation fee of C/P will be out of scope.						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		(1) Period of training: two to three weeks						
		(2) Number of trainee : around ten to fifteen						
		(3) Training times : four times in 2014 and 2015						
		(4) Candidate of the facility						
		1) Combustion furnace facility for practical trainings						
		2) Combustion burner for practical trainings						
		3) Explosion test facility						
		4) Steam trap facility for practical trainings						
		5) Pump facility for practical trainings						
		6) Fan facility for practical trainings						
		7) Compressed air facility for practical trainings						
		8) Lighting facility for practical trainings						
6	Drawings	6. Drawings						
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):						
		(1) Facility layout plan						
		(2) Outline drawing						
		(3) Flow diagram						
		(4) Electric control diagram						
		(5) Instrumentation flow diagram						
		(6) Operation manual						
		(7) Practical training textbook						
		(8) Operation and maintenance management manual						
		(9) List of consumables and spare parts						
7	Others	7. Others						
		7.1 Technical Proposal						
		Followings will be mentioned in the proposal.						
		(1) Organization of the project implementation						
		1) Structure (include strategist)						
		2) Name and experience of engaged experts						
		3) Special note						
		(2) Equipment specification						
		1) Name of manufacture						
		2) Capacity						
		3) Outline of specification						
		4) Mechanical Flow drawing						
		5) Instrument Flow diagram						
		6) Measurement equipment (Name of Manufacturer and type)						

No.	Equipment Name	Specification	Manufacture name	Quantity	Quotation Price			remarks
							Adoption	
		7) Special note						
		(3) Training contents						
		1) Concreate training item on each facility						
		2) Shaped and considered items on training contents						
		3) Special note						
		(4) Training						
		1) Outline of the training facilities						
		2) Contents of the training						
		3) Period of training						
		4) Special note						
		(5) Experience, knowledge and information for this project						
		1) Delivered records for EE&C training facility						
		2) EE&C training records						
		3) Knowledge and information of EE&C						
		4) Special note						

Equipment Specification Description (Completed Version)

(Equipment Specification Appendix 1)

2013.09.14

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
1	General rules	1-1. Scope of application		
		This specification prescribes rules about the design, fabrication, transportation and installation of equipment for practical trainings for the purpose of cultivating instructors and holding energy conservation trainings for "Establishment of Energy Management Training Center in Vietnam (Stage 2)", a project implemented by Japan International Cooperation Agency (hereinafter abbreviated as "JICA").		
		The requirements written in this specification only indicate the minimum condition to be fulfilled, based on which the applicant for the contract shall prepare a technology proposal by complementing part of it, adding a new proposal, etc. and submit it.		
		1-2. Background and objectives		
		The Energy Management Training Center is going to be established in Vietnam for <u>cultivating qualified energy managers and energy auditors</u>		
		Preparing useful equipment for practical trainings and cultivating training instructors who are proficiency in the theory and practice makes trainings effective for actual practice and contributes to the promotion of energy conservation in the		
		1-3. Place of installation		
		(1) Location: Ho Chi Minh city, Vietnam		
		(2) Installation site: Plastic Rubber Technology and Energy Conservation Training Center (hereinafter abbreviated as "PRET")		
		(3) Layout: See Exhibit 1.		
		(4) Building: See Exhibit 2.		
		(5) Monthly average temperature: highest: 35 °C, lowest: 21°C		
		(6) Annual rainfall: 1,932 mm		
		(7) Altitude: 0.8 m		
		1-4. Utility		
		(1) Electric power supply: AC 380 V 50 Hz three phase (compatible), AC 220 V 50 Hz single phase (compatible), Three-phase four-wire power supply, capacity of distribution board: 170 kVA		
		(2) Fuel (LPG)		
		Composition: Propane 70%, Butane 30%, Calorific value: 45.7 MJ/kg		
		(3) Water (tap water) Criterion Analysis result		
		PH 6.5 to 8.5 7.13		
		Hardness < 300 20 mg/L		
		Chloride < 250 6.38 mg/L		
		Turbidity 0 0		
		1-5. Equipment configuration		
		The system consists of the following equipment for the energy conservation trainings of utility facilities which forms a foundation for promoting energy conservation in the industry fields. Each equipment shall provide functions required for practicing the learning content specified respectively. Consumables and spare parts required for the three years after delivery shall also be included.		
		(1) Combustion furnace facility for practical trainings		
		(2) Steam trap facility for practical trainings		
		(3) Pump facility for practical trainings		
		(4) Fan facility for practical trainings		
		(5) Compressed air facility for practical trainings		
		(6) Lighting facility for practical trainings		
		(7) Power supply box		
		(8) Equipments for training		
		(9) Measuring instruments for energy auditing		

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
1	General rules	1-6. Common specifications of facilities for practical trainings		
		(1) Equipment shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.		
		(2) Facilities shall be in a compact configuration so that the entire facilities can be easily understood.		
		(3) The layout of equipment and configuration of devices shall be made for easy operation and measuring.		
		(4) The device configuration shall be suitable for trainings for problem finding and energy conservation measures.		
		(5) Practical functions shall be provided so that what has been learned in a practical training can be applied to actual equipment on site		
		(6) The ways to manage and use measuring instruments can be mastered.		
		(7) Facilities shall be easy to maintain and check.		
		(8) Facilities shall be able to be started up and shut down quickly for trainings.		
		(9) Equipment is handled directly by trainees for operation and training, so sufficient attention shall be paid to safety including burn injury, gas leaks, electric shock, etc.		
		(10) As a countermeasure against an emergency of flooding, electrical appliances shall be placed 30 cm or more above the floor.		
		(11) Each controlling board shall have sockets (15 A x 2) for 100 V for measuring instruments.		
		(12) Each controlling board shall be earthed (grounding resistance: 4 Ω or less).		
		(13) Computers mentioned in the equipment configuration column in the numbers 2, 4, 5 and 6 shall have the following specifications:		
		Type: notebook		
		CPU: latest version of Pentium 2.8 GHz or more		
		HDD: 200 GB or more		
		Monitor: 17 inches or more, color		
		Keyboard: English		
		OS: Windows 7 or newer (English version)		
		Power supply: AC 220 V, 50 Hz, single phase (plug type C compatible)		
		Mouse: optical mouse		
		Interface: USB x 4 or more		
		Accessories: operation manual (English), a full set of standard accessories		
		1-7. Transportation		
		Manufactured equipment, etc. shall be packed as required and transported to PRET through domestic transportation, ocean shipping and Vietnamese domestic		
		See Exhibits "Service Operation Guidelines", "Packing Requirements" and "Transportation Requirements".		
		1-8. Local installation work		
		(1) Installation work of equipment		
		Equipment transported to PRET shall be installed at specified places under the instruction of technician mentioned in (3) by using local installation contractor.		
		The building the equipment installed in is already exists.		
		Modifications to the existing building such as a foundation and plumbing pit of large facilities and a through-hole in the building, etc. is in the scope of PRET's work, and the contractor shall submit drawings required to installation upon the completion of detailed design.		
		(2) Test run and adjustment of equipment		
		Facilities shall be tested and adjusted their operations to check their normal performance after installation work.		
		(3) Dispatch of a technician		
		Some technician shall be dispatched for installation work for smooth operation of the work.		
		See Exhibits "Service Operation Guidelines" and "Requirements for Dispatching a Technician".		
2	Combustion furnace facility for practical trainings	2-1. Specification outline: Purposes of equipment	Specially-designed item	1 set
		The facility is for the comprehensive energy conservation training of combustion and heat installations and shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.		
		2-2. Training content to be delivered with the facility		
		(1) Comprehensive practical trainings for Energy Auditing can be provided.		
		(2) Detailed heat balance can be calculated.		
		(3) Adjustment of the air ratio and fuel-saving effects can be mastered.		
		(4) Fuel-saving effects from exhaust heat recovery can be mastered.		
		(5) Trainees can understand the heat release loss from the furnace body.		

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity	
2	Combustion furnace facility for practical trainings	(6) Trainees can check the changes in the flame shape by adjusting the amounts of air and gas using an open burner.			
		(7) The optimal combustion can be mastered from flame shapes.			
		(8) Consistent data processing can be performed with measuring instruments, data loggers and computers.			
		2-3. Specification: Equipment configuration			
		Facility shall be designed and made to satisfy the purpose of equipment and the training content mentioned above.			
		It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc.			
		Main constitutive equipment is listed below:			
		(1) Combustion furnace (burner capacity: approx. 800 MJ/h x 1)		1	
		(2) Open burner (burner capacity: approx. 400 MJ/h x 1)		1 set	
		(3) Fan (for the combustion air of the combustion furnace burner or open burner)		1	
		(4) Exhaust heat recovery device (used for exhaust heat recovery of the combustion furnace exhaust gas and combustion air preheating)		1 set	
		(5) Water cooling jacket and cooling tower (for cooling combustion furnace heating heat)		1 set	
		(6) Piping (gas, air, water, exhaust gas, etc.)		1 set	
		(7) Chimney (made of steel)		1 set	
		(8) Electric controlling board (including the inverter of the fan (3))		1	
		(9) Instrumentation devices (instrumentation devices required for conducting an effective training)		1 set	
		(10) Measuring instruments, data processing devices and computers (measuring instruments required for conducting an effective training, and processing and visualizing collected data are needed.)		1 set	
		(11) Halved burner model (with each part color-coded)		1	
		(12) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)		1 set	
		2-4. Drawings			
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):			
(1) Facility layout plan		5 copies each			
(2) Outline drawing		5 copies each			
(3) Flow diagram		5 copies each			
(4) Electric control diagram		5 copies each			
(5) Instrumentation flow diagram		5 copies each			
(6) Operation manual		5 copies each			
(7) Practical training textbook		5 copies each			
Corresponds to the preparation of a practical training textbook for the technology transfer service of "Service Operation Guidelines".					
(8) Operation and maintenance management manual		5 copies each			
(9) List of consumables and spare parts		5 copies each			
3	Steam trap facility for practical training	3-1. Specification outline: Purposes of equipment	Specially-designed item	1 set	
		The facility is for the comprehensive energy conservation training of steam and steam traps and shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.			
		3-2. Training content to be delivered with the facility			
		(1) Comprehensive practical trainings for Energy Auditing can be provided.			
		(2) The structure and elements of steam traps can be mastered.			
		(3) The method to select the best trap for the intended purpose can be mastered.			
		(4) The way to judge the quality of steam traps and to check and manage them can be mastered.			
		(5) The basic remedial technologies for steam processes can be mastered.			
		3-3. Specification: Equipment configuration			
		The facility shall be designed and made to satisfy the purpose of equipment and training content mentioned above.			
		It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc.			
		Main constitutive equipment is listed below:			
		(1) Steam trap facility for the practical training (including 4 or more types of traps)		1 set	
		(2) Pressured pump for water injection (injects water into the device and drains steam)		1	
		(3) Boiler (0.3 t/h, approx. 0.6 MPa, English display, compliant with Vietnamese boiler standards)		1	
		(4) Boiler water treatment device (for water supply to the boiler)		1 set	
		(5) Drain recovery system (for recovering and transferring produced drain)		1 set	
		(6) Piping (gas, water, steam, exhaust gas, discharged water, etc.)		1 set	
		(7) Chimney (made of steel)		1 set	

Number	Equipment Name	Specification	Reference Brand	Quantity		
			(Manufacture name, etc.)			
3	Steam trap facility for practical training	(8) Instrumentation devices (instrumentation devices required for conducting an effective training)		1 set		
		(9) Measuring instrument (steam trap diagnostic device x 5)		5		
		(10) Electric controlling board (for the water injection pump and drain recovery system)		1 set		
		(11) Halved steam trap model (must be the same types and number as the steam trap (1) with each part color-coded)		1 set		
		(12) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)		1 set		
		3-4. Drawings				
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):				
		(1) Facility layout plan		5 copies each		
		(2) Outline drawing		5 copies each		
		(3) Flow diagram		5 copies each		
		(4) Electric control diagram		5 copies each		
		(5) Instrumentation flow diagram		5 copies each		
		(6) Operation manual		5 copies each		
		(7) Practical training textbook		5 copies each		
		Corresponds to the preparation of a practical training textbook for the technology transfer service of "Service Operation Guidelines".				
		(8) Operation and maintenance management manual		5 copies each		
		(9) List of consumables and spare parts		5 copies each		
		4	Pump facility for practical trainings	4-1. Specification outline: Purposes of equipment	Specially-designed item	1 set
				The facility is for the comprehensive energy conservation training of pumps and shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.		
4-2. Training content to be delivered with the facility						
(1) Comprehensive practical trainings for energy conservation auditing can be provided.						
(2) Practical trainings for energy conservation auditing of the entire water delivery system can be provided.						
(3) Performance of the pump can be confirmed.						
(4) Characteristics and energy conservation effects of a cut impeller can be confirmed.						
(5) Characteristics and energy conservation effects of inverter control can be confirmed.						
(6) Energy conservation effects of discharge valve control can be confirmed.						
(7) Consistent data processing can be performed with measuring instruments, data loggers and computers.						
4-3. Specification: Equipment configuration						
The facility shall be designed and made to satisfy the purpose of equipment and training content mentioned above.						
It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc						
Main constitutive equipment is listed below:						
(1) Radial flow pump (0.4 m ³ /min, approx. 30 m)				1		
(2) Pump with a cut impeller (a pump of the same spec as the pump (1) with a cut impeller)				2		
(3) Motor (the drive motors of the pumps (1) and (2) of the same capacity)				1 set		
(4) Water tank (including the water tank for the water delivery system and water supply and discharge pipes to/from the water tank)				1 set		
(5) Piping (water)				1		
(6) Electric controlling board (including the inverter for the radial flow pump (1))				1 set		
(7) Instrumentation devices (instrumentation devices required for conducting an effective training)		1 set				
(8) Measuring instruments, data processing devices and computers (measuring instruments required for conducting an effective training, and processing and visualizing collected data are needed.)		1 set				
(9) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)						
4-4. Drawings						
The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):						
(1) Facility layout plan		5 copies each				
(2) Outline drawing		5 copies each				
(3) Flow diagram		5 copies each				
(4) Electric control diagram		5 copies each				
(5) Instrumentation flow diagram		5 copies each				
(6) Operation manual		5 copies each				
(7) Practical training textbook		5 copies each				
Corresponds to the preparation of a practical training textbook for the technology transfer service of "Service Operation Guidelines".						
(8) Operation and maintenance management manual		5 copies each				
(9) List of consumables and spare parts		5 copies each				

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
5	Fan facility for practical trainings	5-1. Specification outline: Purposes of equipment	Specially-designed item	1 set
		The facility is for the comprehensive energy conservation training of fans and shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.		
		5-2. Training content to be delivered with the facility		
		(1) Comprehensive practical trainings for energy conservation auditing can be provided.		
		(2) Practical trainings for energy conservation auditing of the entire blower system can be provided.		
		(3) Performance of the fan can be confirmed.		
		(4) Energy conservation effects of damper control can be confirmed.		
		(5) Energy conservation effects of inverter control can be confirmed.		
		(6) Consistent data processing can be performed with measuring instruments, data loggers and computers.		
		5-3. Specification: Equipment configuration		
		The facility shall be designed and made to satisfy the purpose of equipment and training content mentioned above.		
		It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc.		
		Main constitutive equipment is listed below:		
		(1) Fan (30 m ³ /min, approx. 6 kPa)		1
		(2) Motor (the drive motor of the fan (1))		1
		(3) Piping (air)		1 set
		(4) Electric controlling board (including the inverter of the fan (1))		1
		(5) Instrumentation devices (instrumentation devices required for conducting an effective training)		1 set
		(6) Measuring instruments, data processing devices and computers (measuring instrument required for conducting an effective training, and processing and visualizing collected data are needed.)		1 set
		(7) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)		1 set
		5-4. Drawings		
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):		
		(1) Facility layout plan		5 copies each
		(2) Outline drawing		5 copies each
		(3) Flow diagram		5 copies each
		(4) Electric control diagram		5 copies each
		(5) Instrumentation flow diagram		5 copies each
		(6) Operation manual		5 copies each
		(7) Practical training textbook		5 copies each
		Corresponds to the preparation of a practical training textbook for the technology transfer service of "Service Operation Guidelines".		
		(8) Operation and maintenance management manual		5 copies each
		(9) List of consumables and spare parts		5 copies each
6	Compressed air facility for practical trainings	6-1. Specification outline: Purposes of equipment	Specially-designed item	1 set
		The facility is for the comprehensive energy conservation training of compressed air systems and shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for learning specific methods to promote energy conservation.		
		6-2. Training content to be delivered with the facility		
		(1) Comprehensive practical trainings for energy conservation auditing can be provided.		
		(2) Practical trainings for energy conservation auditing of the entire compressed air systems can be provided.		
		(3) Energy conservation effects of changing the compressor discharge pressure can be confirmed.		
		(4) Electric power and pressure during unload/on-load running can be compared and confirmed.		
		(5) Energy conservation effects of inverter control can be confirmed.		
		(6) The leakage quantity can be measured and energy conservation effects can be confirmed.		
		(7) Consistent data processing can be performed with measuring instruments, data loggers and computers.		

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
6	compressed air facility for practical trainings	6-3. Specification: Equipment configuration		
		The facility shall be designed and made to satisfy the purpose of equipment and training content mentioned above.		
		It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc.		
		Main constitutive equipment is listed below:		
		(1) Screw compressor (1 m3/min, approx. 0.7 Mpa)		1 set
		(2) Inverter compressor (same capacity and manufacturer as the one mentioned above)		1 set
		(3) Air tank (receiver tank, header tank)		1 set
		(4) Piping (air)		1 set
		(5) Electric controlling board (including the inverter of (2))		1
		(6) Instrumentation devices (instrumentation devices required for conducting an effective training)		1 set
		(7) Measuring instruments, data processing devices and computers (measuring instruments required for conducting an effective training, and processing and visualizing collected data are needed.)		1 set
		(8) Panel showing a flow diagram of facilities for the practical training (both in Vietnamese and English)		1 set
		6-4. Drawings		
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):		
		(1) Facility layout plan		5 copies each
		(2) Outline drawing		5 copies each
		(3) Flow diagram		5 copies each
		(4) Electric control diagram		5 copies each
		(5) Instrumentation flow diagram		5 copies each
(6) Operation manual		5 copies each		
(7) Practical training textbook		5 copies each		
		Corresponds to the preparation of a practical training textbook for the technology transfer service of "Service Operation Guidelines".		
		(8) Operation and maintenance management manual	5 copies each	
		(9) List of consumables and spare parts		
7	Lighting facility for practical trainings	7-1. Specification outline: Purposes of equipment		1 set
		The facility is for the comprehensive energy conservation training of lighting and shall be an educational facility for practical trainings that is easy to understand for trainees, and practical and effective for		
		7-2. Training content to be delivered with the facility		
		(1) Comprehensive practical trainings for energy conservation auditing can be provided.		
		(2) Efficiency of various lighting devices can be measured.		
		7-3. Specification: Equipment configuration		
		The facility shall be designed and made to satisfy the purpose of equipment and training content mentioned above.		
		It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc		
		Main constitutive equipment is listed below:		
		(1) Various lighting devices (7 or more kinds of lighting devices that are commonly used in Vietnam and 2 or more kinds of more efficient Japanese lighting device must be included.)		1 set
		(2) Power distribution board (Individual distribution circuit for each lighting device and a terminal to measure the power of each lighting device at the same time is required.)		1
		(3) Measuring instrument (illuminometer x 5, wattmeter x 1)		1 set
		7-4. Drawings		
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):		
		(1) Facility layout plan		5 copies each
		(2) Outline drawing		5 copies each
		(3) Flow diagram		5 copies each
		(4) Electric control diagram		5 copies each
(5) Operation manual		5 copies each		
(6) Practical training textbook		5 copies each		
		Corresponds to the preparation of a practical training textbook for the technology transfer service of "Service Operation Guidelines".		
		(7) Operation and maintenance management manual	5 copies each	
		(8) List of consumables and spare parts		

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
8	Power supply box	8-1. Specification outline: Purposes of equipment		1 set
		This is a power supply box that supplies power to facilities for practical trainings Numbers 2-7.		
		8-2. Specification: Equipment configuration		
		The facility shall be designed and made to satisfy the purpose of equipment and training content mentioned above.		
		It shall also include everything required for conducting an effective training such as measuring instruments, installation materials, accessories, etc.		
		(1) Transformer (required transformer)		1 set
		(2) Breaker (for power supplies to the facilities Number 2-7, including one spare for the future use)		
		8-3. Drawings		
		The following drawings shall be attached to the delivered equipment (in Japanese and English, 5 copies each):		
		(1) Facility layout plan		5 copies each
(2) Outline drawing		5 copies each		
(3) Single-wire system diagram		5 copies each		
9	Supplies for training	9-1. Specification outline: Purposes of equipment		
		The following supplies are used for training, and ones with right specifications must be delivered.		
		Operation manual shall be in English and Japanese.		
		(1) FM receivers (2 microphones, 40 receivers, etc.)		1 set
		1. Wireless microphones	Panasonic	2
		[Specifications] Intended use: used as audio guidance during a training	RD-M650 or	
		Number of channels: approx. 6 channels	UNI-PEX	
		Power supply: dry-cell batteries and rechargeable batteries	WM-C301	
		[Accessories] Microphone: tiepin type or a headset x 1		2
		Charger: charger x 1		1 set
		Operation manual x 1		2 copies
		2. Wireless receiver		40
		[Specifications] Intended use: used with the microphones (1)-1.	Panasonic / RD-660	
		Number of channels: approx. 6 channels	or	
		Power supply: dry-cell batteries and rechargeable batteries	UNI-PEX / WR-C301	
		[Accessories] Earphones: ear-hook headphones x 40		40
Charger: charger x 1		1 set		
Operation manual x 1		2 copies		
(2) Tool sets		2 sets		
[Specifications] Intended use: used for daily maintenance of facilities for practical	Tone / C25			
Configuration: service kit for industrial machines (approx. 70 tools)	or			
in a wall-hanging type storage box with a shutter	Kyoto Tool / MK81A			
10	Measuring instruments for energy conservation auditing	10-1. Specification outline: Purposes of equipment		
		The following measuring instrument are taken to and used for an energy conservation audit at an external factory, etc., and therefore ones with right specifications must be delivered.		
		English display is preferred for measuring instruments and the operation manual shall be in English and Japanese.		
		(1) Electrical power loggers		2
		[Specifications] Measurement wires: single-phase 2-wires, 3-phase 3-wires, 3-phase 4-wires	HIOKI / PW3360-20	
		Measured items: voltage, current, power, power factor, electric energy, frequency		
		Voltage range: AC 600 V	YOKOGAWA / CW120	
		Accuracy: voltage $\pm 0.3\%$, current $\pm 0.3\%$, power $\pm 0.3\%$ rdg.		
		[Accessories] Voltage cords (set of 4) x 1		2 sets
		AC adapter (100 V to 240 V, 50/60 Hz, plug type C compatible) x 1		2
USB cable x 1		2		
Operation manual x 1		2 copies		
Measurement guide x 1		2 copies		
SD memory card (2 GB or more) x 1		2		
Carrying case x 1		2		

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
10	Measuring instruments for energy conservation auditing	[Special Accessories]		
		Clamp-on sensor x 3: primary current: AC 500 A output voltage AC 1 mV/A		6
		Clamp-on sensor x 3: primary current AC 50 A output voltage AC 10 mV/A		6
		(2) Clamp tester		2
		[Specifications] AC current: 41 to 1000 A, accuracy: $\pm 1.5\%$ rdg. DC voltage: 0.4 to 600 V, accuracy: $\pm 1.3\%$ rdg. AC voltage: 4 to 600 V, accuracy: $\pm 2.3\%$ rdg. Resistance: 419 Ω to 41 M Ω , accuracy: $\pm 2\%$ rdg. Power supply: batteries	HIOKI / 3280-10 or YOKOGAWA / CL130	
		[Accessories] Operation manual x 1		2 sets
		Carrying case x 1		2 sets
		(3) Radiation thermometer		2
		[Specifications] Range of measured temperature: -30 to 600°C Detecting element: thermopile Emissivity correction: switchable Measured range of visual field: 30 ϕ 1000 mm (33:1) Measurement position check: laser beam Memory function: Data can be processed with a computer. Power supply: batteries	YOKOGAWA / 53006 or Chino / IR-TAP	
		[Accessories] Operation manual x 1		2 copies
		Carrying case x 1		2
		(4) Temperature logger		2
		[Specifications] Range of measured temperature: -10 to 110°C Sensor: thermistor Precision: average $\pm 0.3^\circ\text{C}$ Number of channels: approx. 2 channels Recording capacity: 8000 data x approx. 2 channels Power supply: batteries	T&D / TR-71Ui or Omron / ZN-THX21-S	
		[Accessories] Accompanying sensor x 2		4
		USB cable x 1		2
		Software x 1		2 sets
		Operation manual x 1		2 copies
		(5) Illuminance, humidity and temperature logger		2
		[Specifications] Range of illuminance measured: 0 LXh to 90 MLxh Integrated value display range: 0 LX to 130 kLx Illuminance precision: $\pm 5\%$ Range of temperature measured: -30 to 80°C Temperature precision: $\pm 0.3^\circ\text{C}$ Range of humidity measured: 0 to 99% RH Humidity precision: 0.1% RH Recording capacity: 8000 data x approx. 4 channels Power supply: batteries	T&D / TR-74Ui-H or Espec Mic / RS-13L	
		[Accessories] Illuminance sensor x 1		2
		Temperature and humidity sensor x 1		2
		USB cable x 1		2
		Software x 1		2 sets
		Operation manual x 1		2 copies

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
10	Measuring instruments for energy conservation auditing	(6) CO2, temperature and humidity logger		2
		[Specifications] Range of measured CO2: 0 to 9999 ppm	T&D / TR-76Ui-H	
		CO2 precision: ± 50 ppm + $\pm 5\%$ of reading	or	
		Measurement resolution: minimum 1 ppm	Espec Mic / THCO2	
		Range of temperature measured: -30 to 80°C		
		Temperature precision: ± 0.3 °C		
		Range of humidity measured: 0 to 99% RH		
		Humidity precision: 0.1% RH		
		Recording capacity: 8000 data x approx. 3 channels		
		Power supply: batteries and power supply adapter		
		[Accessories] Temperature and humidity sensor x 1		2
		AC adapter (100 V to 240 V, 50/60 Hz, plug type C compatible) x 1		2
		USB cable x 1		2
		Software x 1		2 sets
		Operation manual x 1		2 copies
		(7) Digital camera		2
		[Specifications] Effective pixels: approx. 16 megapixels	PENTAX / WG-3	
		Lens focal length: 4.5 to 18 mm (35 mm equivalent focal length: approx. 25 to 100 mm)	or	
		F number: approx. F 2.0 to F4.9	Nikon / COOLPIX P310	
Zoom: optical 4x, digital 2x or more				
Shooting mode: An interval timer shooting mode is essential.				
Recording media: built-in memory approx. 70 MB and SDHC memory card 4 GB or more				
External interface: USB				
[Accessories] AC adapter (100 V to 240 V, 50/60 Hz, plug type C compatible) x 1		2		
Strap x 1		2		
USB cable x 1		2		
Operation manual x 1		2 copies		
[Special accessories]				
Compact tripod x 1		2		
(8) Infrared thermography		2		
[Specifications] Detection element: Uncooled microbolometer	Chino / CPA-E40			
Number of elements: 160 x 120 pixels or more	or			
Range of temperature measured: Range 1: -20 to 120°C, Range 2: 0 to 650°C	testo / 875i			
Precision: the larger value of $\pm 2\%$ of reading or ± 2 °C				
Recording medium: memory card (approx. 2 GB)				
External interface: USB				
Power supply: batteries and power supply adapter				
[Accessories] AC adapter (100 V to 240 V, 50/60 Hz, plug type C compatible) x 1		2		
Strap x 1		2		
USB cable x 1		2		
Software x 1		2 sets		
Operation manual x 1		2 copies		
Carrying case x 1		2		
(9) Oxygen meter for combustion management	New Cosmos Electric	2		
[Specifications] Detection subject gas: oxygen in the combustion exhaust gas	/ XP-3180E			
Gas intake method: automatic intake	or			
Detection principle: diaphragm galvanic cell	testo / 310			
Range of measurement: 0 to 25% vol%				
Precision: $\pm 0.3\%$ vol%				
Power supply: batteries				
[Accessories] Cooling drain filter set x 1		2		
Cooling pipe x 1		2		
Spare filter x 2		4		
Operation manual x 1		2 copies		
Carrying case x 1		2		
[Consumables] Filter x 5		5		

Number	Equipment Name	Specification	Reference Brand (Manufacture name, etc.)	Quantity
10	Measuring instruments for Energy Auditing	(10) Portable ultrasonic flow meter	Fuji Electric	2
		[Specifications] Operational fluid: homogeneous liquid that admits an ultrasound wave such as water, warm water, alcohol, etc. Operational pipe inner diameter: φ 13 to 6000 mm	/ FSCS10B2-10E	
		Temperature of measured fluid: -40 to +200°C	or	
		Range of fluid velocity measured: 0 to ±32 m/s	Tokyo Keiki / UFP-20	
		Precision: ±1.0% of rate		
		Survey line: propagation time lag method		
		Recording medium: SD card memory (256 MB or more)		
		[Accessories] Detector (for small diameter, including a mounting belt) x 1		2
		Power supply adapter (100 V - 240 V, 50/60Hz, plug type C compatible) x 1		2
		Analog input/output cable x 1		2
		SD memory card (256 MB or more) x 1		2
		USB cable x 1		2
		Software x 1		2 sets
		Operation manual x 1		2 copies
		Carrying case x 1		2
		(11) Power supply quality analyzer	HIOKI	2
		[Specifications] Measurement wires: Single-phase 2-wire, 3-phase 3-wire, 3-phase	PW3198-90	
		Voltage range: 600 Vrms, transient measurement: 6 kV peak	or	
		Current range: AC 500 mA to 5 kA	Kyoritsu	
		Power range: 300 W to 3 MW	6310	
		Precision: voltage ±0.1%, current ±0.2%, power ±0.2%		
		Measurement functions: voltage, current, power, voltage unbalance rate, current unbalance rate power factor, high-order harmonic, total harmonic distortion factor, etc.		
		Recording medium: SD memory card (2 GB or more)		
		Power supply: batteries and AC adapter		
		[Accessories] Voltage cords (set of 8) x 1		2 sets
		AC adapter (100 V to 240 V, 50/60 Hz, plug type C compatible) x 1		2
		Battery pack x 1		2
		USB cable x 1		2
		Operation manual x 1		2 copies
		Measurement guide x 1		2 copies
		[Special accessories] SD memory card (2 GB or more) x 1		2
		Clamp-on sensor x 3: primary current: AC 1000 A output voltage: AC 0.5 mV/A		6
		Above mentioned manufacturers are brands for reference, and equivalent or better products are also acceptable.		

Exhibit 1 Equipment Layout Plan (draft)

2013.10.10

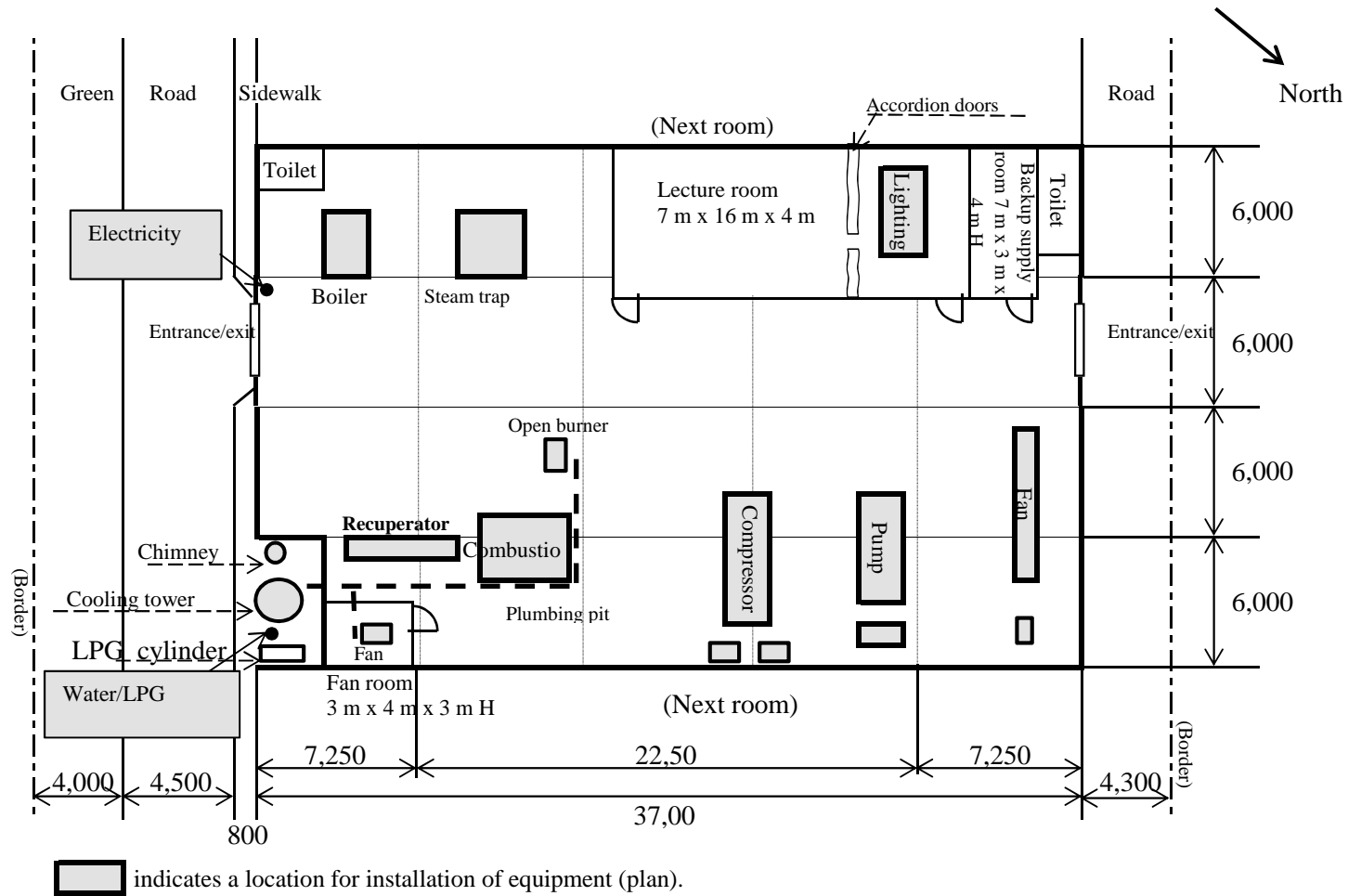
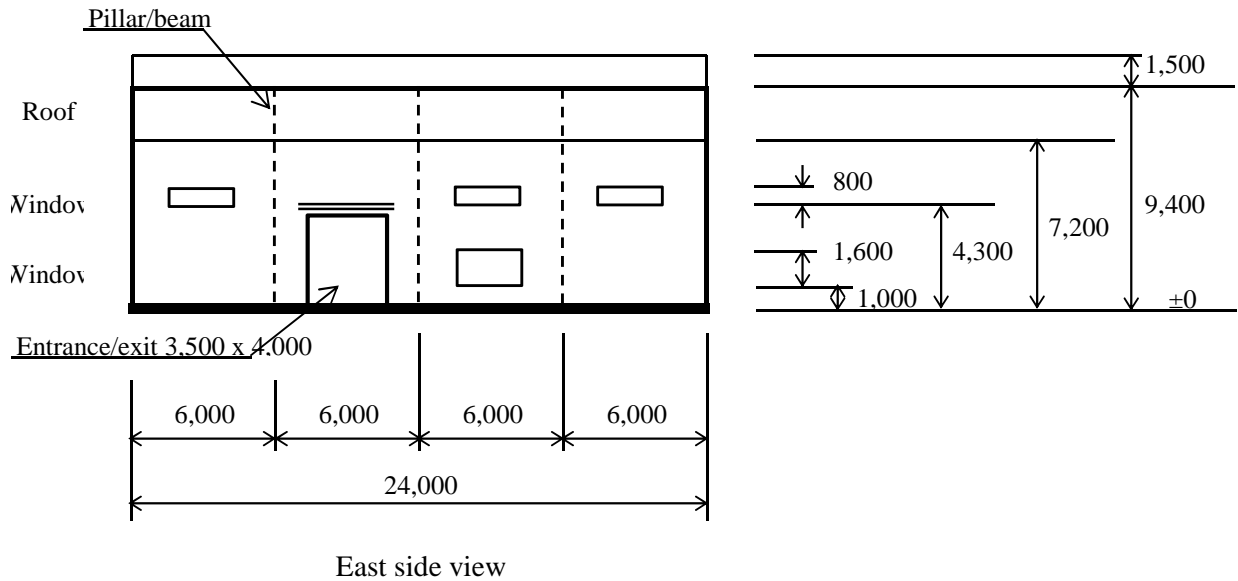
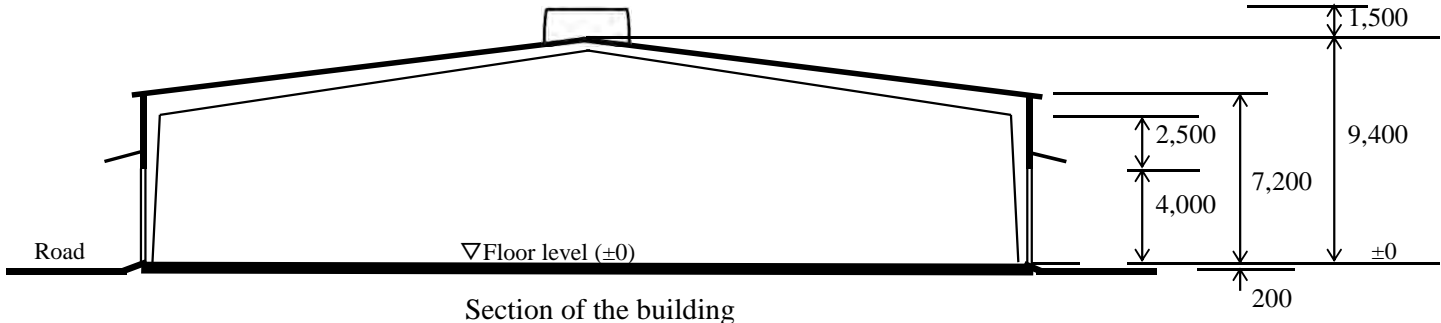


Exhibit 2 Building Diagram

2013.10.10



Human Resource Cultivation and Equipment Procurement concerning the Establishment of Energy Management Training Center in Vietnam (Stage 2)

Breakdown of Technology Evaluation Points (draft)

Evaluation Item		Allocated Points	Basic Points	Additional points
1	[Validity of experience/ability and implementation structures of the bidder concerning the service of the project]	15	5	10
	Essential			
	(1) Is the business experience (experience in the similar type of service) of the company sufficient? (1 or 2 must be fulfilled.)	5	5	
	1. Energy conservation training service (one or more project)			
	2. Production of facilities for an energy conservation practical training (one or more facility)			
	Additional points			
	(2) Other appreciable experience and such (3.4 points x 3, rounded down to the nearest whole number)	5		5
	1. Overseas experience in delivering a facility for a practical training for energy conservation (one or more project)			
	2. Experience in providing an energy conservation training to foreigners (3 or more times)			
	3. Others			
	Additional points			
	(3) Are there sufficient personnel/structures for implementing this project? (2.0 points x 5)	5		5
	1. Is the service management structure sufficient?			
	2. Is the transport structure sufficient?			
	3. Is the installation work structure sufficient?			
	4. Is the test run and adjustment structure sufficient?			
	5. Is the training structure sufficient?			
2	[Validity/accuracy of equipment functions/scale and training content and implementation method]	145	5	140
	Additional points			
	Basic policy for implementing the service	4		4
	Essential			
	(1) Compliance of equipment for practical trainings with the basic specifications	5	5	
	Optional			
	(2) Ingenuity in specifications of equipment for practical trainings	60		60
	1. Combustion furnace facility for practical trainings (1.4 points x 11, rounded down to the nearest whole number)			15
	<ul style="list-style-type: none"> • Exhaust heat recovery amount can be adjusted in three levels. • Heat transfer and heat loss can be measured. • Low excess air combustion and high excess air combustion can easily be made with an open burner. • The fuel flow rate and the air flow rate can be adjusted and checked with an open burner. • The configuration allows easy data collections. • The device configuration allows an easy installation of measuring instruments required for heat balance. • The configuration allows trouble shooting. • The furnace pressure can be adjusted. • There is a fresh air intake hole. • Measuring instruments are allocated together to make it easy to read data. • Others 			
	2. Steam trap facility for practical trainings (1.7 points x 6, rounded down to the nearest whole number)			10
	<ul style="list-style-type: none"> • Trainees can understand the operating principle of steam traps. • Steam trap operation judgment tests can be performed. • The configuration allows trouble shooting. • Steam trap back pressure behaviors can be tested. • Impact of outer wind and rain on the steam trap can be tested. • Others 			
	3. Pump facility for practical trainings (1.2 points x 9, rounded down to the nearest whole number)			10
	<ul style="list-style-type: none"> • Changes in electric power, flow rate and pressure by controlling the number of revolutions can be measured. • Changes in electric power, flow rate and pressure by valve control can be measured. • Changes in characteristics caused by a cut impeller can be measured. • Serial operation and flow rating pressure characteristics of a pump can be measured. • The configuration allows trouble shooting. • Electric power saving effects by minimum flow rate adjustment can be measured. • Flow rate control by PID control can be practiced. (P: proportional action, I: integral action, D: derivative action) • The configuration allows easy data collections. • Others 			

	4. Fan facility for practical trainings (1.2 points x 9, rounded down to the nearest whole number)		10
	<ul style="list-style-type: none"> • Changes in electric power, flow rate and pressure by controlling the number of revolutions can be measured. • Changes in electric power, flow rate and pressure by damper control can be measured. • Differences in the pressure loss caused by a different discharge pipe diameter can be measured. • <u>The configuration allows trouble shooting.</u> • Differences in the pressure loss caused by the type of valves can be measured. • Flow rate control by PID control can be practiced. (P: proportional action, I: integral action, D: derivative action) • The number of drive V belts and changes in the shaft power can be measured. • The configuration allows easy data collections. • Others 		
	5. Compressed air facility for practical trainings (1.3 points x 8, rounded down to the nearest whole number)		10
	<ul style="list-style-type: none"> • Differences in the pressure loss caused by a different discharge pipe diameter can be measured. • Changes in power, flow rate and pressure by controlling the number of revolutions can be measured. • Electric power and pressure during unload/on-load running can be measured. • The quantity of compressed air leakage can be measured. • <u>The configuration allows trouble shooting.</u> • Differences in the amount of air used by each type of blow nozzle can be confirmed. • The configuration allows easy data collections. • Others 		
	6. Lighting facility (1.0 point x 5)		5
	<ul style="list-style-type: none"> • Electric power and luminance of each lighting equipment can be measured. • The latest highly efficient lighting equipment is included in the configuration. • <u>The configuration allows easy data collections.</u> • Electric power saving effects can be confirmed. • Others 		
Optional			
(3)	Ingenuity in practical skills trainings	60	60
	1. Technology transfer/training in general (0.5 point x 11, rounded down to the nearest whole number)		5
	<ul style="list-style-type: none"> • Understanding is built up in step-by-step trainings from a beginner to advanced levels. • Understanding is built up through trainings of a class size where individual coaching is possible. • Lectures to take and contents to learn are made clear. • <u>Practical trainings to take and contents to learn are made clear.</u> • Combination of lectures and practical trainings are well thought out to make learning effective. • Appropriate and specific coaching is given to individuals according to their level of understanding. • Each trainee is made to prepare a presentation material. • Each trainee makes a presentation and gets individually rated using points. • Rating points and point allocation are made clear. • Those who doesn't reach the passing point makes the presentation again for re-evaluation. • Others 		
	2. Combustion furnace practical trainings (1.0 point x 11, maximum 10 points)		10
	<ul style="list-style-type: none"> • Problems and an improvement plan are considered from the heat balance results, and a measure is taken on the facility for practical trainings to check the effect • Energy conservation effects by preheating air for combustion is checked through practical training. • The difference in fuel consumption of low excess air combustion and high excess air combustion is confirmed. • Trainees master how to handle measuring instruments. • Trainees master how to handle data collection devices. • Trainees acquire capabilities to apply what is learned to actual equipment through trouble shooting. • The difference between low excess air combustion and high excess air combustion is visually checked with an open burner. • The need and impact of furnace pressure adjustment is confirmed. • Flame shapes are checked with an open burner by changing the amount of primary and secondary airs. • An appropriate air ratio can be decided by observing the flame. • Others 		
	3. Steam trap practical trainings (1.2 points x 9, rounded down to the nearest whole number)		10
	<ul style="list-style-type: none"> • Trainees understand the operating principle of steam traps. • A steam trap operation judgment test is performed. • Quality of a steam trap is judged. • Trainees master how to handle measuring instruments. • Trainees understand the characteristics, functions and performance of various kinds of steam traps and selection of the most suitable model for the intended use. • <u>Steam traps back pressure behavior is tested.</u> • Impact of outer wind and rain on the steam trap is tested. • Trainees understand the characteristics of steam and correct ways of using it. • Others 		

Optional				
	4. Pump practical trainings (1.0 point x 11, maximum 10 points)			10
	<ul style="list-style-type: none"> • Changes in electric power, flow rate and pressure by controlling the number of revolutions are measured. • Changes in electric power, flow rate and pressure by valve control are measured. • Changes in characteristics (similarity rule) by a cut impeller are measured. • Serial operation and flow rating pressure characteristics of a pump is measured. • Trainees master how to handle measuring instruments. • Trainees master how to handle data collection devices. • <u>Trainees acquire capabilities to apply what is learned to actual equipment through trouble shooting.</u> • Electric power saving effects by minimum flow rate adjustment is measured. • Flow rate control by PID control is practiced. (P: proportional action, I: integral action, D: derivative action) • Trainees master how to operate and maintain pumps. • Others 			
	5. Fan practical trainings (1.0 point x 11, maximum 10 points)			10
	<ul style="list-style-type: none"> • Changes in electric power, flow rate and pressure by controlling the number of revolutions are measured. • Changes in electric power, flow rate and pressure by damper control are measured. • Differences in the pressure loss caused by different the discharge pipe diameter are measured. • Trainees master how to handle measuring instruments. • Trainees master how to handle data collection devices. • <u>Trainees acquire capabilities to apply what is learned to actual equipment through trouble shooting.</u> • Differences in pressure loss caused by different types of valves is measured. • Flow rate control by PID control is practiced. (P: proportional action, I: integral action, D: derivative action) • The number of drive V belts and changes in the shaft power is measured. • Trainees master how to operate and maintain fans. • Others 			
	6. Compressed air system practical trainings (1.2 points x 9, rounded down to the nearest whole number)			10
	<ul style="list-style-type: none"> • Changes in electric power, flow rate and pressure by controlling number of revolutions are measured. • Electric power and pressure during unload/on-load running are measured. • The quantity of compressed air leakage is measured. • Trainees master how to handle measuring instruments. • Trainees master how to handle data collection devices. • <u>Trainees acquire capabilities to apply what is learned to actual equipment through trouble shooting.</u> • Differences in the pressure loss caused by different the discharge pipe diameters are measured. • Differences in the amount of air used by each type of blow nozzle are confirmed. • Others 			
	7. Lighting practical trainings (1.0 point x 5)			5
	<ul style="list-style-type: none"> • Electric power and luminance of each type of lighting device are measured. • Trainees master how to handle measuring instruments. • <u>Trainees master how to handle data collection devices.</u> • The energy conservation effects of the latest highly efficient lighting equipment are confirmed. • Others 			
(4)	Proposals concerning role sharing between qualified energy manager trainings and energy auditor trainings (2.5 points x 2, rounded down to the nearest whole number)	4		4
	1. Existence of proposals concerning role sharing between qualified energy manager trainings and energy auditor trainings			
	2. Proposal of qualified energy manager trainings and energy auditor trainings that take into account the Vietnamese legal			
(5)	Ingenuity in an equipment operation/maintenance management manual (2.5 points x 2, rounded down to the nearest whole number)	4		4
	1. Existence of proposal on ingenuity in an equipment operation/maintenance management manual			
	2. Proposal on an equipment operation/maintenance management manual that takes into account the technology transfer to Vietnamese instructors and staff.			
(6)	Ingenuity in practical training textbooks, etc. (2.5 points x 2, rounded down to the nearest whole number)	4		4
	1. Existence of proposals on ingenuity in practical training textbooks, etc.			
	2. Proposals on practical training textbooks, etc. that take into account technology transfer to Vietnamese instructors and trainees.			
(7)	Validity of the staff planning for the operation of technology transfer.	4		4

3	[Experience/ability of the operation chief and operation staff]	40	0	40
	Optional			
	(1) Experience/ability of an operation chief (operation chief/energy conservation practical training (electricity/heat))	20		20
	1. Experience in similar services (1.0 point x 5) • Experience in instructing energy conservation trainings • Experience in designing/producing/installing facilities for energy conservation practical trainings • Experience in operation/maintenance management of facilities for energy conservation practical trainings • Experience in energy conservation auditing • Other experience			
	2. Operational experience in the subject country, neighboring regions or similar regions (1.0 point x 1)			
	3. Experience/ability as an operation chief (2.0 points x 1)			
	4. Language skills (2.0 points x 1)			
	5. Other degrees, qualifications, etc. (1.0 point x 1) • Qualified energy manager's license, etc.			
	(2) Experience/ability of operation staff (energy conservation practical trainings (heat/electricity))	10		10
	1. Experience in similar services (1.0 point x 5, maximum 4 points) • Experience in instructing energy conservation trainings • Experience in designing/producing/installing facilities for energy conservation practical trainings • Experience in operation/maintenance management of facilities for energy conservation practical trainings • Experience in energy conservation auditing • Other experience			
	2. Operational experience in the subject country, neighboring regions or similar regions (1.0 point x 1)			
	3. Language skills (2.0 points x 1)			
	4. Other degrees, qualifications, etc. (1.0 point x 1) • Qualified energy manager's license, etc.			
	(3) Experience/ability of operation staff (energy conservation practical trainings (equipment operation and management))	10		10
	1. Experience in similar services (1.0 point x 5, maximum 4 points) • Experience in instructing energy conservation trainings • Experience in designing/producing/installing facilities for energy conservation practical trainings • Experience in operation/maintenance management of facilities for energy conservation practical trainings • Experience in energy conservation auditing • Other experience			
	2. Operational experience in the subject country, neighboring regions or similar regions (1.0 point x 1)			
	3. Language skills (2.0 points x 1)			
	4. Other degrees, qualifications, etc. (1.0 point x 1) • Qualified energy manager's license, etc.			
Total technical evaluation points		200	10	190

**Report on Qualification and
Examination System
for
the Energy Management Training
Center Project
in
Vietnam**

February 17, 2015

**JICA Energy Management Training Center Project
Team**

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I. Purpose of the Report

Japan International Cooperation Agency (JICA)'s Project for Establishment of Energy Management Training Center (stage 2) has actually started from July 2013, and Energy Conservation Center, Japan (ECCJ) has been entrusted to conduct a part of this JICA EMTC Project from July 2013, and to conduct a study on the qualification and examination system for energy managers and energy auditors related to Energy Management Training Center.

As the Memorandum of Understanding (MOU) on this Project for Establishment of Energy Management Training Center has been mutually exchanged between both government of Vietnam and Japan in February 28th, 2013, and establishment of examination system and qualification system of Energy Manager and Energy Auditor is referred to as one of the activities related to the training course.

The training for Energy Manager and Energy Auditor is closely related to the EEC Law No. 50/2010 which was enacted in January 2011 and the relevant Decrees. And the qualification for the execution of the task which is defined in the EEC Law, through the study of the necessity and the method for the qualification, should function based on the study and systematization by the Ministry of Industry and Trade (MOIT).

The qualification mentioned above is related to the attendance and completing of the training course carried out by Energy Management Training Center. Therefore, it will be necessary to study the basic direction for the relationship between the training and the qualification, and the examination to be done for those who have attended and have completed the training course from the aspects of this project..

On the other hand, those aspects are issues of the study in the WG which was organized in order to discuss and establish the curriculum, textbook and others to be used in the training courses in the Energy Management Training Center.

This report will provide the output of study on the above mentioned matters, especially the basic direction, for the purpose to support the activities of WG, and hence to provide useful information for the reviewing of the system of qualification by Vietnamese Government (MOIT). And the output of this report should reflect the content of the discussion in the WG so far.

II. Referenced Information in the Study in the Report

In order to implement this baseline survey, the following information is referred to as the key information.

1. The Law of Energy Efficiency and Conservation (No. 50/2010, enacted in January 2011) and the relevant Decrees and Circulars related to Energy Manager and Energy Auditor for the execution of the Law.

2. The curriculum and the textbook for the Training Center which is under the discussion by the WG, not yet finalized, will be referred as material of the current stage.
3. Information such as the number of designated enterprises in the EEC Law and the number of training participants both for Energy Manager course and Energy Auditor course. That kind of information in the Baseline Survey Report is available. The information on the number of training participants is that the number of participants and passing the exam for two training courses, which started in 2011, and including future plan of training number, in Hanoi and Ho Chi Minh, collected through the Ministry of Industry and Trade (MOIT) and relevant organization.
4. The generally established concept and view on the role, competency and task of Energy Manager and Energy Auditor, and also the Japanese system of the Energy Conservation Law and the legal qualification system, are used as additional reference information.

III. Legislative Formulation and Role of Energy Manager and Energy Auditor

1. Energy Efficiency and Conservation Law

The Energy Efficiency and Conservation Law (Note1) consists of the following Chapters.

(Note1) Law on Energy Efficiency and Conservation, June 2010

Enacted January 2011, Law No. 50/2010/QH12

(Chapter)

- 1: General Provisions
- 2: Energy Efficiency and Conservation in Industrial Production
- 3: Energy Efficiency and Conservation in Construction and Public Lighting
- 4: Energy Efficiency and Conservation in Transportation
- 5: Energy Efficiency and Conservation in Agricultural Production
- 6: Energy Efficiency and Conservation in Service Activity and Households
- 7: Energy Efficiency and Conservation in the Investment Projects, and in Agencies, Units Using State Budget
- 8: Energy Efficiency and Conservation in Designated Energy Using Units
- 9: Management over Energy Consuming Equipment and Machinery
- 10: Measures for Promotion
- 11: Responsibility of State Management over Energy Efficiency and Conservation
- 12: Implementation Provisions

Among them, especially Chapter 8 is related to Energy Manager and Energy Auditor. In Chapter 8, there are articles such as Article 32 (Designated Energy Using Unit), Article 33 (Obligations of Designated Energy Using Units), Article 34 (Energy Audit in Designated Energy Using Units), Article 35 (Requirement and Task of Energy Manager in Designated Energy Using Units).

2. Government Decree No. 21/2011/ND-CP on Detailed regulations and implementation measures of the Law on Energy Efficiency and Conservation
 - (1) Definition of designated energy using unit: enterprises and factories in industry, agriculture, transportation, consuming more 1,000 TOE, and construction works consuming more than 500 TOE
 - (2) Obligation of designated energy using unit: assignment of Energy Manager, provision of periodical report(yearly), provision of mid-term plan(every five years), receiving energy audit and its report(every three years)

3. The Government Decree No. 73/2011/ND-CP on Regulating administrative breaches against energy conservation and efficient use

4. Prime Minister Decision No. 1294/QĐ-TTg on Issuing the list of Designated energy-using units in year 2011

Name and energy consumption of 1,190 potential designated enterprises are listed, whose annual energy consumption is equal to and more than 1,000 TOE for production facilities in industry, agriculture, transportation, and 500 TOE for construction works used as offices and houses.

5. Energy Management System

The following articles regulates on energy management system. Base on those articles, Energy Manager with qualification certified should conduct main function as is required for designated energy consuming units. Also Energy Auditor with qualification certified should conduct energy audits. Actual conditions on qualification for Energy Manager and Energy Auditor are regulated by MOIT.

 - (1) Article 33 (Obligations of Designated Energy Using Units)

 - (2) Article 34 (Energy Audit in Designated Energy Using Units)

 - (3) Article 35 (Requirement and Task of Energy Manager in Designated Energy Using Units)

6. MOIT Circular No. 39/2011/TT-BCT on Regulation of training, certification for energy manager and energy auditor
 - (1) Article 4 (Conditions to be admitted as a training establishment of energy manager and energy auditor)

an organization founded as regulations of the Law to meet condition requirement on the following

 - ① facility

- a) classroom to meet the requirements and other teaching facilities
- b) practice facility about heat system, pump system, fan system, compressed air and lighting system
- c) to be well-equipped with energy audit
- ② lectures

(2) Article 7 (conditions for candidates of the training course)

(3) Article 8 (organization of training)

(4) Article 9 (conditions to take the examination for certificate)

(5) Article 10 (issue and recognition of the certificate)

(6) Article 12 (revoke certificate for energy auditor)

The required conditions for qualification regulated by The EEC Law and related decrees are described in Table1. The qualification system has the following characteristics.

- a) Completion of the training course and success in the examination is the regular condition for qualification.
- b) To be a candidate for the training course or to take examination, a certain level of degree is required and also work experience is required to be a candidate of the training course for an energy auditor. That indicates that a qualified person is supposed to have a certain level of technological background.
- c) Conditions for an energy auditor is more severe than conditions for an energy manager. This indicates that an energy auditor is supposed to have higher technological expertise.
- d) Revoke is made possible in the circular for an energy auditors in case of using certificate for improper purpose. This may come from ensuring reliability of the certificate, where an energy auditor may work outside of the enterprise he/she belongs to, while an energy manager works within the enterprise he/she belongs to.

Table 1. Conditions for Qualification for Energy Manager and Energy Auditor

	Energy Manager	Energy Auditor
Issue of certificate	<ol style="list-style-type: none"> 1. Pass the examination organized by MOIT (national-wide certificate) 2. Have certificate of energy manager issued by foreign/international organization with mutual agreement recognized in Vietnam 	<ol style="list-style-type: none"> 1. Pass the examination organized by MOIT (national-wide certificate) 2. Have certificate of energy Auditor issued by foreign/international organization with mutual agreement recognized in Vietnam
Conditions for the Candidates of the Training course	<p>College degree (or equivalent) on energy specialty or related technical (in the field of industrial production, construction works, business service)</p> <p>Intermediate level technical certificate or higher (in the field of transportation, Agricultural production)</p>	<p>University degree or higher on the major of energy or related engineering and three-year working experience in the field of energy</p>
Conditions to take the examination	<ol style="list-style-type: none"> 1. Completing the training course 2. <ol style="list-style-type: none"> a) Graduated from university or higher with the major of energy management b) Completing the training course on energy management organized by international organizations recognized in Vietnam 	<ol style="list-style-type: none"> 1. Completing the training course 2. <ol style="list-style-type: none"> a) Graduated from university or higher with the major of energy audit b) Completing the training course on energy audit organized by international organizations recognized in Vietnam
Revoke certificate	/	<p>Revoke in case of using certificate for improper purpose for energy auditors</p>

IV. Function and Role of the Training Center of the Project

Circular NO. 39 clearly states that the training establishment should have practice facility. So it is necessary to conduct practical training using the above facility together with lectures.

On the other hand, after the enactment of the EEC Law, as it becomes mandatory to assign the energy manager in the designated enterprises and designated enterprises shall conduct the energy audit once in every three year and submit its report to MOIT, the needs for energy auditors and energy audit companies has been much increased, so it is required to establish the training system and qualification system both for energy manager and energy auditor immediately. So MOIT has prepared the training curriculums and textbooks both for the energy managers and energy auditors with the support of DANIDA and other experts, and has started the training and qualification system from 2011, however, this training system for both courses has been carried out only by lectures, without practical training.

Under the above circumstance, it has been requested to Japan to prepare the training course with practical training curriculum and related facilities, who has a lot of similar experiences in other countries, so Japan has decided to participate with this project to provide both soft and hard contents on this training and qualification system for both courses. The Training Center which will be established, is able to realize effectively the training courses which supposed in Circular 39.

As a reference, data in the past and future plan on the training is shown in the Table 2 (reference from the Baseline Report). And according to the Decision No. 1427, planned number of training and certification by 2015 is indicated such as 2,500 for energy management in industries and buildings and 200 for energy audit.

After the Training Center of this project, the training courses will shift to the training courses of the Training Center, which realizes practical training. It is necessary to promote toward the full utilization of the Training Center and its function.

Table 2. Number of Actual and Planned Certified Energy Managers and Energy Auditors
(Source: MOIT & Decision 1427*)

	2011	2012	2013	2014	2015	Up to 2015 target
EM in Industries	90	410	110			2,000*
Hanoi (North of VN, not only Ha Noi)	(50)	(170)	(80)			
HCMC (South of VN, not only HCMC)	(40)	(240)	(30)			
EM in Buildings		70				500*
Hanoi		(40)				

HCMC		(30)				
Energy Auditors		90				200*
Hanoi		(51)				
HCMC		(39)				

V. Qualification/Examination System for Energy Manager and Energy Auditor

1. Relationship between the Training Center and the System of Qualification and Examination

The Purpose of the Training Center is to bring up Energy Manager and Energy Auditor in the system of the EEC Law, which leads to qualification, and finally effectively contributes to progress of the EEC Law and related energy policy. Therefore the training courses and the qualification certified through the completion of courses and success in the examination, should have appropriate basis on the EEC Law and related decrees.

On the other hand, as mentioned before, Circular 39 is already enacted. Hence, with respect to the Training Center and the qualification system, it is considerable that a completely new circular is enacted or strengthen and supplement related to the content of Circular 39 are made.

On this regard, the WG (Qualification & Examination team) (Note 2) discussed in the first meeting (January, 2015) and agreed that a completely new circular is not required because of the existence of current Circular NO.39 which provides the basis for the programs of the Training Center, while considering the curriculum and the textbook, appropriate reflection to qualification and examination should be promoted, and also in case that it is necessary to supplement the contents of circular NO.39 or supplement of some public announcement, study and proposal of them should be promoted.

(Note 2) Formation of the WG

The WG consists of Professors and Experts of Vietnam whom MOIT assigned, advises from Japan and managing members of the WG. The first meeting was held in January 2015 and there will successive meeting until August 2015 for the study of the following theme.

- (1) Review of the curriculum and the textbook, modification and making additional papers/draft if necessary (Gr.A)
- (2) Study of items to be reflected to the public system of qualification and examination (Gr.B)

2. Relationship between qualifications of Energy Manager and Energy Auditor

The subject of the task of the Energy Manager and that of Energy Auditor are closely related but they are different. There will be three options in understanding the competency and qualification of Energy Manager and Energy Auditor.

- (1) Qualifications for Energy Manager and Energy Auditor should be parallel based on the

difference. This understanding leads to the different qualifications.

- (2) Competency for Energy Auditor is different from in high level compared to competency for Energy Manager from the aspect of expertise. In the case that this understanding is adopted, even if the curriculum of the courses and the qualification is separated for Energy Manager and Energy Auditor, to some extent, the curriculum and examination for qualification may be common, and additional programs with high expertise may be applied for Energy Auditor especially.
- (3) Competency for Energy Auditor includes competency for Energy Manager and hence the qualification for Energy Auditor is upper than the qualification for Energy Auditor. In the case that this understanding is adopted, the qualification for Energy Auditor may be limited for persons with Energy Manager qualification.

In Vietnam, the qualification based on the current Circular No.39 is done separately for Energy Manager and Energy Auditor, but on the other hand, higher degree and tasking experience in the field of energy, are imposed for Energy Auditor as the condition for candidate for training course. That indicates that the concept of (2) above is applied. Also, the expert members of WG support that.

As a reference, in the case of Japan, there is no legal qualification for Energy Auditor, but a qualification of energy auditing competency is made by ECCJ (The Energy Conservation Center, Japan) and this qualification is based on the concept of (2) above. The concept of (3) above is applied in India.

The curriculums of the Training Center under study currently separated each for Energy Manager and Energy Auditor. The length of the course for Energy Auditor is longer and the in the practical training is enriched more with study of energy improvement subjects and investigation of countermeasures in the model equipment than the course of Energy Manager. This curriculum is also based on the concept of (2) that is currently adopted in Vietnam.

Additionally as a note, energy audit is not a process of energy management, but it is necessary for Energy Auditor to review the energy management situation of the object site. Therefore Energy Auditor should have necessarily the competency of grasping energy management situation.

3. Method to acquire Energy Manager/Energy Auditor competency required

As an example for reference, the comparison of the role and the competency requirement for Energy Manager and Energy Auditor is shown in the below Table 3, which is made by ECCJ.

The items listed in Table 3 such as current status review of energy consumption, formulation of energy management organization, energy management in operation and maintenance, extraction of energy saving points, planning of energy efficiency improvement actions and management of implementation, are important knowledge and capability for energy management with the important legislative role in the EEC Law. Also Familiarity to the EEC Law and related decrees is necessary from the viewpoint of achieving the role of Energy

Manager defined in the EEC Law and that will be the basis for the factories and the business sites in Vietnam to develop the promoting power and pursuing the achievement in the EEC Law.

Energy Managers are not to be expected generally to have specific technologies that are proper to different industrial fields. Those technologies should be taken by the technological learning and technical experiences.

Energy Auditor should have competency for energy audit; grasping the whole structure of energy consumption, reviewing energy management process and at the same time, competency of selection available technologies based on the technical expertise, extraction of improvable points, planning of improvement measures, estimation of the saving volume of energy consumption, evaluation of investment efficiency and priority, proposal and reporting. Also management skill and personality to manage energy audit are required.

The above competency will be acquired by the following methods. Among them, ②~④ are supposed to be realized in the Training Center curriculum.

- ① Technological learning and technical experiences.
- ② Lectures and exercise in the Training Center
- ③ Practice using model equipment
- ④ Moreover, as Energy Auditor, training practice of energy audit at an actual site.

Table 3. Comparison of the Role and the Competency Requirement for Energy Manager and Energy Auditor

○Role

	Energy Manager	Energy Auditor
role	<ul style="list-style-type: none"> • implementation and promotion of energy management (grasping current status, establishment of management organization, daily improvement, execution of investment project) • execution of legal obligation in the EEC Law 	<ul style="list-style-type: none"> • review of energy consumption and making of improvement measures (grasping current status with the support from Energy Manager) • selection of available Technology, extraction of Improvement points, planning of countermeasures • proposal and advice
standpoint	internal	External or external viewpoint
fundamental elements to execute the role	<ul style="list-style-type: none"> • execution of energy management (technology, organization, planning of improvement measures, management of project) • execution of requirements by the EEC Law 	<ul style="list-style-type: none"> • supervise and advise on the execution of the items in the left column
		<ul style="list-style-type: none"> • implementation of audit procedure

		<ul style="list-style-type: none"> • proposal for improvement and investment, general plan and report
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○Competence Requirement

	Energy Manager	Energy Auditor
competency	<ul style="list-style-type: none"> • competency for implementation and promotion of energy management grasping and analyzing current consumption status, establishment of management organization energy management in operation and maintenance extraction of management points planning of improvement measures management of project implementation • knowledge on the EEC Law and related decrees 	<ul style="list-style-type: none"> • supervise and advise on the energy management process
		<ul style="list-style-type: none"> • grasping the whole structure of energy consumption • selection available technologies based on the technical expertise • extraction of improvable points, • planning of improvement measures • estimation of the saving volume of energy consumption • evaluation of investment efficiency and priority • proposal and reporting • management personality and skill to manage energy audit

4. Necessity of Practical Training Using Model Equipment

The task of Energy Manager, Energy Auditor requires technological expertise and capability of knowing energy saving theme of actual energy consuming facility and considering countermeasures for them. It is generally considered that the above capability of analysis is required more for Energy Auditor than Energy Manager as was referred in subsection 2.

Practical training is important grow the basis for the above capability, hence in the Training Center, practical training is supposed to be an indispensable program. Basic practical training using model equipment is to be implemented in the curriculum and energy audit exercise practice for Energy Auditor at an actual factory or site is to be participated which raise the

energy audit capability over the achievement of the basic practical training.

In Circular NO.39, a training establishment is required to have practice facility about heat system, pump system, fan system, compressed air and lighting system.

From these facts, in evaluating Energy Manager and Energy Auditor competence, it should be considered as one of evaluation items if practical training was completed successfully not, and if sufficient capability was obtained through practical training.

VI. Considerations on Qualification/Examination for Energy Manager and Energy Auditor

1. Type of Energy Manager and Energy Auditor

The factories and sites subject to energy management extend to wide area of industry and building/business sites. Therefore it should be checked if there should be types of Energy Manager training and qualification.

In the qualification on Energy Manager which was executed so far in Vietnam, there have been no types, such as electricity/thermal, industrial field/building field. This meets to the fact that the EEC Law regards energy management and energy audit as important, while no referring to type and fields in the qualification of Energy Manager and Energy Auditor.

Unified qualification system with no distinguished fields has the following characteristics.

① Suitable to Unified capacity building

Practical training using model equipment which is to be implemented in the Training Center, is supposed to have unified, no field-wise program. This meets to a unified qualification.

② Advantages for the promotion regarding the EEC Law

If the qualification is divided to fields, correspondence of the qualification to the obligation of tasks to be promoted will be complicated. So the unified qualification system is beneficial for the policy promotion in the energy field.

③ Aspect of Expertise

If the expertise field for each Energy Manager is expressed as the type of qualification, it is beneficial that fitness to some task assignment is easily discriminated.

Considering the above points comprehensively, regarding the advantages ① and ② as important, no type setting within Energy Manager or Energy Auditor is most recommendable system. As for expertise, in the stage of task assignment, it is possible to consider task experience and study specialty. WG members also support the system of no type setting.

The above situation is fit for both of Energy Manager and Energy Auditor, but expertise of Energy Auditor is higher than Energy Manager, hence fitness to job assignment may more be differentiated, which means consideration on ③ is required more. The fact that in the EEC Law, task experience is required for Energy Auditor is understood from this aspect.

2. Reference Information on the Type in Japan

As a reference, in Japan, in the past, there were two types, Thermal Energy Manager and Electrical Energy Manager. An intensive energy consuming factory is required to assign Thermal Energy Manager or/and Electrical Energy Manager depending on the type of energy, thermal and/or electrical intensively consumed. But from the consideration of putting more importance on whole energy, the qualification was unified to Energy Manager in 2005 through the amendment of Energy Conservation Law. But in the examination, consideration on expertise has continued as thermal subjects and electrical subjects can be selected in the application. Also in some examination subject, some questions are selective questions of specific fields.

On the industry and building, the qualification system of Japan has no discrimination. But the main area of bringing up and assignment of Energy Manager is actually industry. On consideration of this situation, Energy Conservation Law has a system such that in building area, persons who attended the designated lecture, can be assigned as Energy Manager of simplified type without Energy Manager national qualification.

As above, in Japan, currently the qualification is unified as Energy Manager license, which supports the recommendation in previous subsection. Also in the subject of examination, if some academic subjects are employed other than the subject for practical training, it may be considerable to use selective subjects or questions based on different expertise.

3. Formation of Execution of Qualification

The training is done by the Training Center, but the qualification is a national system in the EEC Law. Evaluation of competency and examination should be done under a unified standard for homogeneity and stability of qualification level.

As the formation of execution, two ways of unified execution are considerable, MOIT itself or trusted organization. In the below Note 3, the formation in Japan is explained as an example.

(Note3)

In Japan, under the accreditation and supervision by the government (METI), on the requirement of Energy Conservation Law, ECCJ executes the arrangement, making of questions and decision of success/failure. A committee with people of experience or academic standing is formulated to make questions and to make decision of success/failure through the activity of committee members and the committee meeting

Examination Committee :

to decide the subjects for examination, to make questions, to evaluate the answer, to decide success/failure and to evaluate the properness of the questions.

Secretariat :

to carry out the examination, to hold the committee meeting, to compile the questions, to collect the answers and to communicate on success/failure.

Currently the examination for qualification is executed by MOIT. And expertise is ensured through participation of people of experience or academic standing. This formation is basically to meet the necessary conditions and is to continue also after the start of the Training Center.

4. Renewal of Certification

Circular NO.39 does not include the renewal of certification for Energy Manager and Energy Auditor. But on the occasion of the Training Center which establishes the full system of training, it is worth studying to adopt the renewal of certification in order to bring up the expertise continuously. That issue was raised in the second meeting of WG (February 10, 2015) and will be studied further mainly by the WG members of Vietnam.

VII. Recommendations for Qualification/Examination System from the Aspect of the Training Center

1. Subjects and Items for Evaluation and Examination for Qualification

Subjects for examination should consist of fundamental knowledge for energy consumption and practical technology for promotion of energy efficiency and conservation, where the latter should reflect the programs of the Training Center.

The programs currently supposed to be included in the training curriculum of the Training Center are as follows for Energy Manager and Energy Auditor. As for each type of equipment and as for practical training, more specific details are covered for Energy Auditor than for Energy Manager.

(Energy Manager)

- (1) Energy policy and the EEC Law of Vietnam
- (2) Energy management system
- (3) Electrical equipment (electrical power distribution system, lighting, motor and pump, fan, air compressor, air conditioning, measurement equipment)
- (4) Thermal equipment (combustion, furnace, boiler and steam system)
- (5) Energy efficiency and conservation measures and task to be promoted by Energy Manager

(Energy Auditor)

- (1) Energy policy and the EEC Law of Vietnam
- (2) Energy management system
- (3) Energy Audit (procedure and methodology, energy conservation in buildings, energy conservation in factories)
- (4) Electrical equipment (electrical power distribution system, lighting, motor and pump, fan, air compressor, air conditioning, refrigeration, measurement equipment)
- (5) Thermal equipment (combustion, heat balance calculation, furnace, boiler and steam

system)

(6) Matters to implement energy audit, calculation of effect of countermeasures, report making)

Subjects and items for examination on paper are recommended to reflect the above program of the training as for practical technology for promotion of energy efficiency and conservation and questions are recommended to reflect the items actually done in the training course on the basis of the textbook. Detailed items are to be studied in the WG together with the WG study on the curriculum. Fundamental items to be reflected might be announced publicly by some additional circular if necessary.

Fundamental knowledge may not be limited to the items to be actually presented in the training course but should be the items covered by the textbook.

As a reference, Subjects and type of questions used in the Japanese Energy Manager examination are explained in Note 4. Those subjects contain academic fundamental theory, which has some difference in the situation from Vietnamese case.

(Note 4 Energy Manager Examination in Japan)

- ① type of examination : examination on paper
- ② type of question: answering by selection, calculation question, others
- ③ subjects

subject1: management of energy, general technology and law & regulations

subject2: fundamental theory of heat and flow (thermal area)

fundamental theory and knowledge of electricity and power(electrical area)

subject3: fuel and combustion(thermal area)

electrical equipment and devices(electrical area)

subject4 (includes selective questions on specific fields):

heat using equipment and its management(thermal area)

application of electricity and power(electrical area)

2. Reflections from Practical Training Program

Practical training is an important matter for capacity building. The Training Center is equipped with model facility for the training of practice and practical training using that is to be implemented in the training courses. As for Energy Auditor, an energy audit exercise at an actual site will be implemented also.

Circular 39 says that the training establishment should have practice facility about heat system, pump system, fan system, compressed air and lighting system, which indicates the importance of practical training.

Therefore the following items are recommended to be reflected to actual way of execution,

through the study in the WG, and fundamental items to be announced publicly by some additional circular or another method.

- ① (reflection to the examination for Energy Manager and Energy Auditor)
Use of questions on extraction of energy saving points and countermeasures
- ② (reflection to the qualification for Energy Manager and Energy Auditor)
Completion of practical training with practice
- ③ (reflection to the qualification for Energy Auditor)
 - a) To provide energy audit report by the exercise at an actual site after the qualification certified
 - b) To report to the government on the contents and results of some energy audits made using the certification of the qualification

VIII. Conclusion

In this report, as for Energy Manager and Energy Auditor, concepts and conditions of the EEC Law and related decrees were reviewed, and then actual description in them on bringing up and qualification was resumed. Energy Manager and Energy Auditor have an important role in the EEC Law and policy.

Secondly, related to the Training Center with model equipment for practical training, development of the current qualification and examination system was considered. The current system has been already functioning and that system includes items to be able to support the utilization of the Training Center. Therefore as conclusion, fundamentally on the basis of the current system, the programs, curriculums and practical trainings, which will implemented in the Training, is recommended to be reflected to the qualification and examination.

Actual items to be reflected should be studied in the WG. Expectedly, based on the study ongoing in the WG, appropriate items are to be reflected to the system and its execution, hence by this, bringing up and qualification of Energy Manager and Energy Auditor will be further developed, which leads to contribute the progress and the effect of the EEC Law and the related EEC.