

**The Study on Master Plan  
for  
Energy Conservation and Effective Use  
in  
the Socialist Republic of Viet Nam**

**Final Report  
(Executive Summary)**

**December 2009**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**ELECTRIC POWER DEVELOPMENT CO., LTD.**

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### **Abbreviation**

AC	Air Conditioner
AFD	French Development Agency
BAU	Business as Usual
CDM	Clean Development Mechanism
CFL	Compact Fluorescent Lamp
CO <sub>2</sub>	Carbon Dioxide
DANIDA	Danish International Development Assistance
DB	Database
DOIT	Department of Industry and Trade
DOST	Department of Science and Technology
DSM	Demand Side Management
EC	Energy Conservation
ECC	Energy Conservation Center
EE&C	Energy Efficiency and Conservation
EEREP	Energy Efficiency and Renewable Energy Project
ENERTEAM	Energy Conservation Research and Development Center
EPP	Efficiency Power Plant
EPU	Electric Power University
EVN	Electricity of Vietnam
GDP	Gross Domestic Product
GEC	Global Environment Center
GHG	Green House Gas
HCMC	Ho Chi Minh City
HRD	Human Resource Development
HUT	Hanoi University of Technology
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency
MMU	Multi Meter Unit
MOC	Ministry of Construction
MOCST	Ministry of Culture, Sport and Tourism
MOET	Ministry of Education and Training
MOI	Ministry of Industry
MOIC	Ministry of Information and Communication
MOIT	Ministry of Industry and Trade
MOJ	Ministry of Justice
MOST	Ministry of Science and Technology
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
NEDO	New Energy and Industrial Technology Development Organization
NEEP	The National Energy Efficiency Program
NTP-RCC	National Target Program to respond to Climate Change
ODA	Official Development Assistance
PA	Policy Action
PDCA	Plan, Do, Check and Action

SEDP	Socio Economic Development Plan
TSL	Two-Step Loan
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
VDB	Vietnam Development Bank
VND	Vietnam Dong

## **Executive Summary**

### **(Proposal to Implement Optimal Program for Promoting EE&C in Vietnam)**

Since July 2008, when the Study started, the Study Team has held dozens of discussions and exchanged much information with the counterpart, Ministry of Industry and Trade (MOIT) and related organizations. Taking into consideration these processes, a summary of the major results of analysis, confirmed issues, direction to be targeted and proposals for optimal EE&C promotion are described as follows;

#### **1. Outline of Basic Research**

Basic research was conducted to focus on 9 issues below;

- (1) Data collection and analysis on Vietnamese economic situation and energy supply and demand
- (2) Vietnamese legal framework and inter-organization structure which had been enacted and formulated in the past
- (3) Interim overview of the progress of National Strategic Program on EE&C (Includes some of another programs)
- (4) Present condition on energy consumption data collection mechanism
- (5) Present condition to promote EE&C in national level and local level
- (6) Education and Training scheme for EE&C
- (7) Activities of international and domestic organizations in support of EE&C
- (8) On-site and questionnaire survey on industries and commercial buildings to understand the current conditions of EE&C implementation
- (9) On the basis of the information above, clarification of the current condition and issues to be solved for promoting EE&C

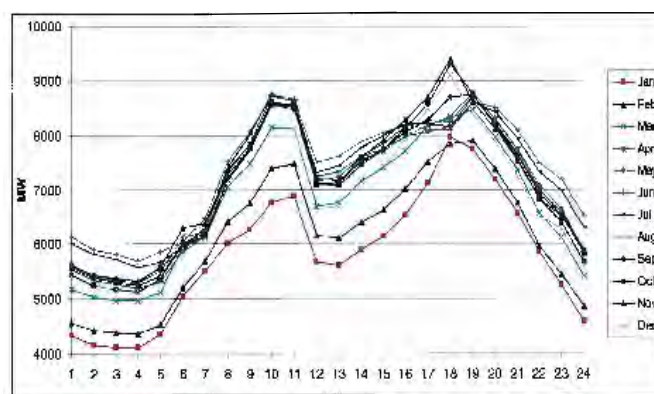
The key information collected and issues clarified to be solved through the Study are described below:

(→ : issues to be solved)

- (1) GDP growth are expected to be 5-8% and national energy consumption growth are expected to be 10-15%/ year.
- (2) Electricity supply deficit in the evening becomes an urgent and major issue (Refer Figure 1). And in urban area peak hours is moving to daytime cause of increasing cooling demand in buildings.

- (3) Electricity tariff has been politically and historically set at a lower level than realistic cost. So people's incentive to reduce energy expenditure is so small that it is hard to promote EE&C.

→ **To formulate a countermeasure for this distortion is the biggest issue**



**Figure 1 EVN Daily Load Curve**

- (4) Fuel switching from oil to cheaper coal is on-going in generation, but several of the construction of planned power plants are delaying. It takes 4-5 years to complete the construction of power plant, So the electricity shortage after 2013 becomes a big concern.
- (5) In the legal framework under the EC Law which is expected to be enforced in July 2010, Vietnamese government is mainly focus on designated factories, buildings and transport enterprises program, certified energy manager program and standard and labeling program

→ **However the inter organizational structure has not been decided, and the practical tools and materials to operate the program has not been prepared yet. This becomes an urgent issue.**

- (6) The labeling programs for magnetic ballasts, street lightings and T8 lamp have been finalized as the first such program in Vietnam. And from now on MOIT has a plan to formulate labeling programs on CFLs, electronic ballasts, refrigerators, air conditioners, fans and water heaters, whose energy consumption is increasing rapidly. And it is investigated to change from enforcement label to comparative one and from voluntary to mandatory.
- (7) The major programs drawn up, proposed and supported by international organizations are as follows:

UNIDO: International energy manager program (ISO50001 basis) 2009-2013

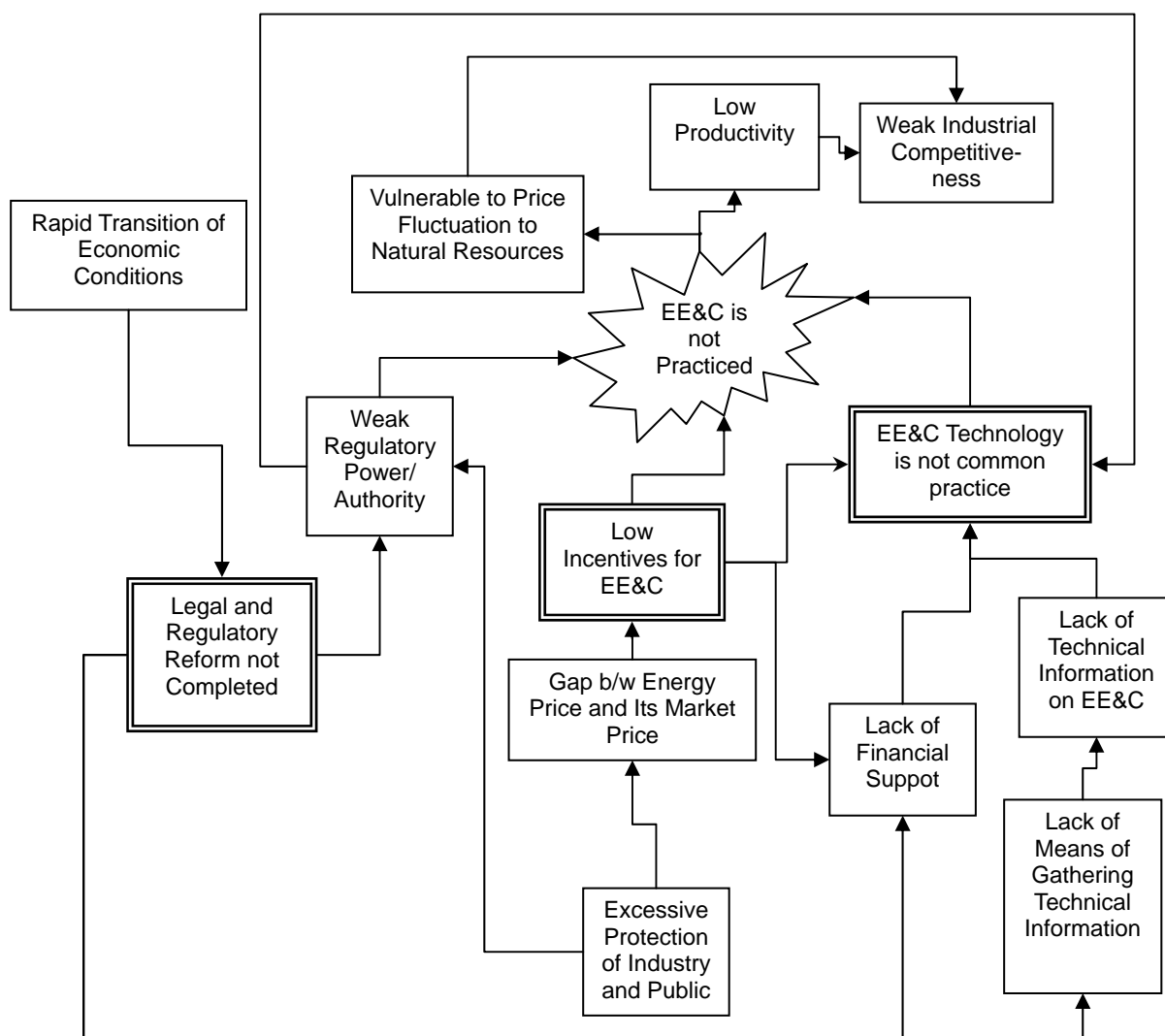
UNDP: International labeling program 2009-2013

DANIDA: Implementation of energy management system supporting programs

2009-2015

→ **Functional linkage among these international organizations is an indispensable issue for Vietnamese EE&C.**

(8) On the basis of on-site and questionnaire surveys, the state of the implementation of EE&C practices in factories and buildings was analyzed. The key obstacles for EE&C were identified as follows. The interrelations among the constraints are also shown in Figure 2



**Figure 2 Problem Structure Analysis  
(Analysis of the Constraints of EE&C Promotion in Vietnam)**

- 1) Lack of (quantitative) evidence-based management
- 2) Apathy and lack of interest in EE&C (especially in top management)
- 3) Lower electricity price compared with international market price

- 4) Lack of regulation to promote EE&C
- 5) Hardship to access useful technical information
- 6) Improper facility design and equipment
- 7) Insufficient standards in operations and procedures
- 8) Improper maintenance
- 9) Insufficient understanding of production process and facilities

→ **Practical countermeasures to breakthrough these 9 issues should be formulated**

(9) Outline of results of market research and analysis on electricity supply and demand are described as follows:

- 1) Conversion from incandescent lamps to CFLs has the quite comprehensive effect of achieving not only EE&C but also electricity peak cut, financial benefits for users and reduction of generating cost.

→ **Promoting CFL dissemination in rural area is a quite promising countermeasures for EE&C**

- 2) EE&C potential in cooling is the largest in commercial buildings

→ **Promoting high efficiency air conditioners and chillers is also promising. A major issue to be clarified is the dissemination speed (scenario) of the inverter type**

- 3) **Formulating programs to promote EE&C equipments' implementation and labeling programs for TVs and refrigerators before their full scale spread is an effective countermeasure to mitigate the future growth of electricity consumption.**

- 4) **The EE&C potential of introducing high efficiency motors is quite large.**

## **2. Proposal of Roadmap (Master Plan) and Action Plans**

On the basis of the results of the Study, the “Basic Strategy for Promoting EE&C” was figured out in Figure 3.

In this strategy three strategic fields, namely “Enhancement of Awareness and Consciousness of EE&C”, “Strengthening Support from the Government”, and “Enforcing Rules and Regulations” are focused. **The final goal to be targeted is not “regulation” and “support” but self reliant EE&C activity of users should be understood.**



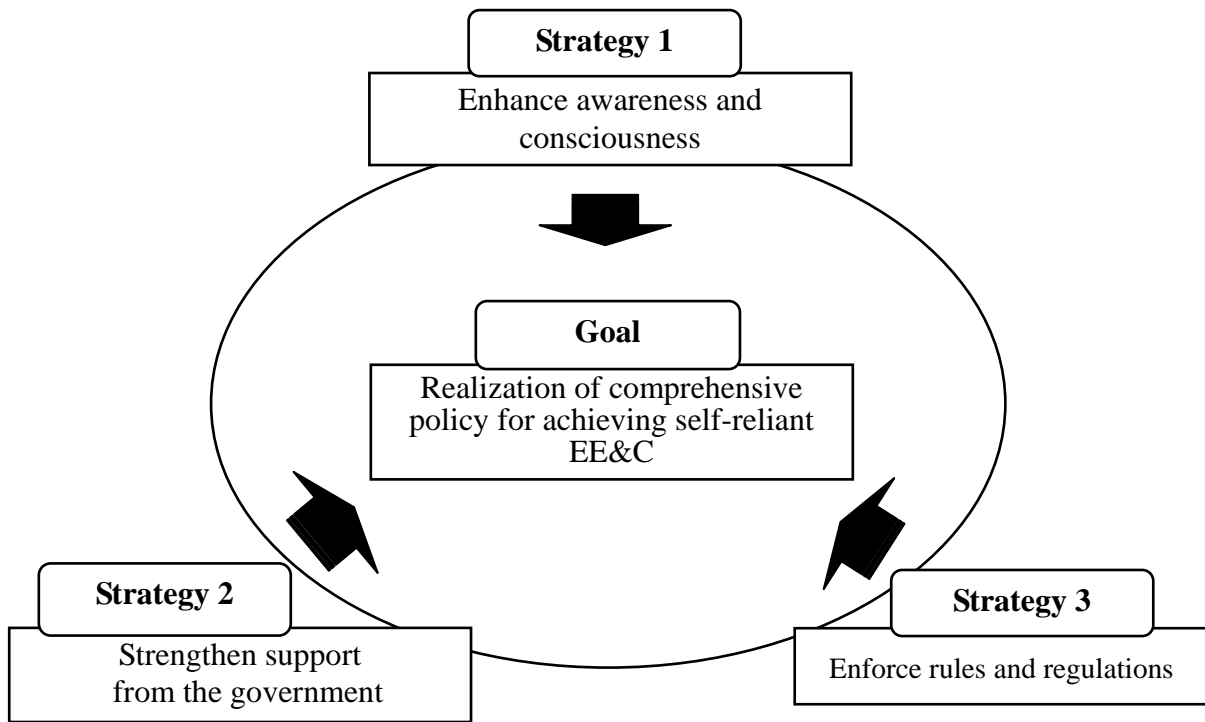


Figure 3 Basic Strategy for Promoting EE&C

Considering the present Vietnamese condition and expected supports from international donors, the proposed roadmap and master plan are illustrated. And prioritized short term issues are summarized as action plan. The procedure of analysis and proposal is shown in Figure 4.

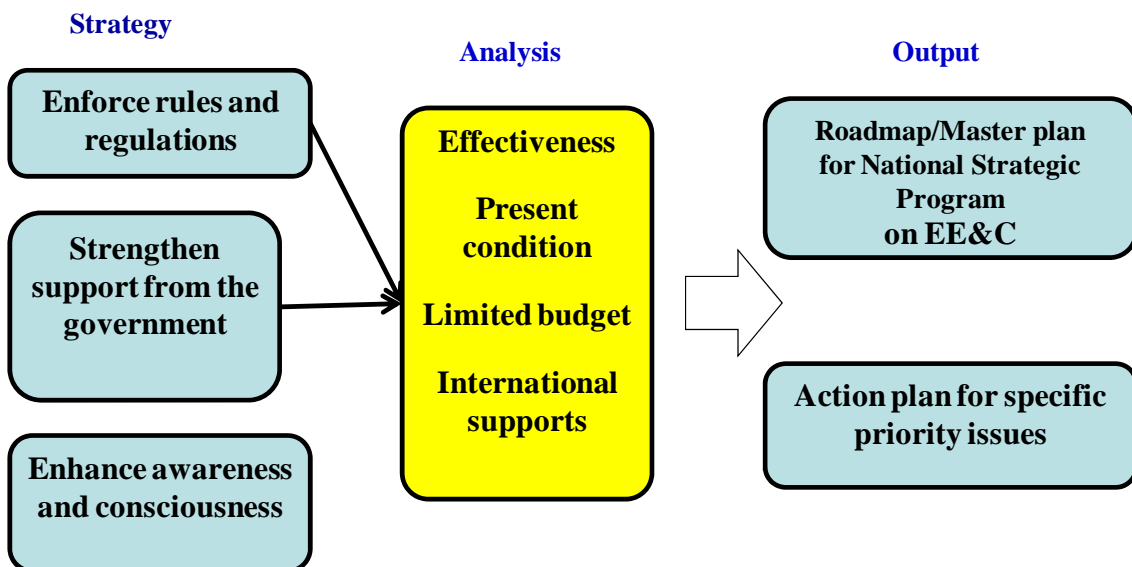


Figure 4 Flow of the Analysis and Proposal

Basic grounds for proposed programs under roadmap and master plans are as follows:

- ✓ From Japanese experiences by introducing energy management system and steadily operating it (applying the PDCA cycle), at least 5 % EE&C can be achieved. Vietnamese government should continue and accelerate the preparation and enactment for legal frame work of national certified energy manager program. And also Government should strongly focus on awareness program for governmental organizations and private companies about the merit of introducing energy management system.
- ✓ Following up the labeling program on magnetic ballast, street lighting and T8 lamp, it is quite effective to formulate next labeling programs on ACs, TVs, water heaters and refrigerators etc. and go into steady operation, which will be sure to be spread in the near future in Vietnam, before their popularization. There are several failures in other countries without controlling the energy efficiency criteria on these electric appliances. But introduction of labeling program (awareness) is not sufficient to achieve the targeted EE&C level. Appropriate transmission of information for consumers, manufacturers and retailers, mandatory label & MEPS and incentive and disincentive program which has a strong linkage to electricity DSM measures should be formulated in parallel.
- ✓ Compared with Japan and surrounding countries, national budget and other resources available for EE&C activity per capita and GDP in Vietnam is quite small. In order to achieve the national target of EE&C level, it is necessary to invest at least several times larger financial resources. And to achieve the target, firstly road map (total figure) for EE&C promotion should be prepared. Then to secure the budget needed, functional and also technical support from eligible international supporting programs (organizations) should be formulated.

Until 2015 utilizing financial and technical assistance from various donors, the government should concentrate on 1) formulating national energy manager certification program and introducing the target setting agreement program with designated factories, buildings and transport enterprises, 2) disseminate labeling program of selected electric appliances and 3) accelerating DSM measures in electricity. Employing these priority measures, 5-10% EE&C is achievable, while the programs do not require much financial resource.

DSM in electricity is an effective and speedy measure to promote EE&C and is an effective measure to reduce the electricity peak demand when applying an appropriate electricity tariff mechanism (e.g. raising the lower price of coal and gas for electricity generation.) The expected benefit is not only achieving EE&C, but also mitigating peak demand

- ✓ For promoting EE&C in building and transportation, not only enforcement of EC Law but also these measures are considered to be quiet effective;
  - 1) Controlling the rapidly increasing demand by newly construction (especially enhancement of the application of building code)
  - 2) Early establishment of master plan on national transportation. And under this master plan especially introduction of public transportation and modal shift is considered to be quite

effective.

And the overview of roadmap and master plan of each program under National Strategic Program, which reflects the direction of recommended priority programs, is summarized in Table 1.

As far as the analyzed sectors of this study, more significant EE&C could possibly be achieved by investment of larger scale to replace existent equipment with energy-efficient one. EE&C of respective sectors could be achieved in the following ways:

- ✧ Iron & steel: over 10% EE&C by introducing high-efficiency reheating furnace would be possible. (Utilizing NEDO model project result)
- ✧ Textile: 20% EE&C mainly through heat recovery in dyeing process would be possible. (Utilizing NEDO model project result)
- ✧ Food: EE&C is expected by introducing heat recovery system like VRC (Vapor Re-Compression) system. (Utilizing NEDO model project result)
- ✧ Cement: It looks promising to convert the kiln into rotary kiln (-2020).
- ✧ Building: roughly 50-60% of electricity demand comes from cooling and 20% from lighting. So introducing high efficient chilling system (especially inverter type) and electronic ballast for lighting are the highest priority programs. In the middle term the desiccated air conditioning will be able to achieve over 10% EE&C.
- ✧ Two-Step Loan (low interest loan) which will be disbursed by JICA this year would be an effective option for the introduction of promising but costly EE&C technologies which have been implemented as NEDO's pilot projects or study etc. As a first stage, utilizing the project financing loan using ODA from international financial institutions like JICA, ADB and the World Bank will be functional, but as a next stage Vietnamese self financial mechanism shall be formulated.,

To realize EE&C investment, not only 1) formulating low interest loan mechanism, but 2) dissemination of effective technologies and loan scheme and 3) reinforcement of the skill of engineers who propose and design the EE&C project shall be done.

Especially regarding EE&C engineer, unfortunately the eligible engineering firms are quite limited in Vietnam. The capacity development program for EE&C engineers shall be prepared in parallel as a middle term issue.

**Table 1 Summary of EC Roadmap and Master Plan (Abstract)**

Group	Program	Contents	Items to be confirmed	2010-2012	2013 -2015	2016-
<u>Group 1</u> Legal framework	Program 1	State Administration (MOIT)	EC Law and Decrees	Enforcement		Amendment
			Electricity Tariff Revision		To market price	
			ECC (central and local)		Establishment of the Central EC Agency	
			Energy Manager (examination, accreditation, training)	National Training Center JICA expert	2,000 managers or more	Enforcement
			Another doners' support	Training materials DANIDA	Training materials DANIDA	
			EC data collecting mechanism	Pilot Program	Full fledged operation	Full fledged operation
<u>Group 2</u> Awareness raising	Program 2	Awareness raising (MOIT)	Focus on specified Projects Effective Priority Program Design	\$200,000	ditto	ditto
	Program 3	National education (MOET)	Endorsement of Programs(MOET) Financial Support (MOF)	Enhancement	Enhancement	Enhancement
	Program 4	Pilot campaign for household" (MOIT)	Rural CFL Home appliances (AC, refrigerator, heater) (MOIT) Financial Mechanism Linkage to DSM	Program design  Pilot projects	Implementation  Enforcement	Implementation  Enforcement
<u>Group 3</u> Promotion of high efficiency equipments	Program 5	Energy performance standards and Labeling scheme (MOST/MOIT)	UNDP/BRESL - METI/methodology (Nov. 2008-)	UNDP TA for testing model	UNDP	
			Calibration	Calibration Voluntary	Calibration Mandatory	Calibration Mandatory
			Endorsement or Standards and Labeling should be amended once every 3 to 5 years	Endorsement	Comparative	Comparative
	Program 6	Technical assistant for domestic energy efficiency product manufacturers (MOST)	Not only manufactures but also retailers (MOIT)	5 cases done	5 cases	5 cases
<u>Group 4</u> Energy efficiency in manufacturer	Program 7	Establishment of management model (MOIT)	Target Setting Agreement under the EC Law UNIDO (ISO50001, energy audit, training)	Enforcement UNIDO	Operation UNIDO	Operation
	Program 8	Assistance for energy efficiency in production line (MOIT)	JICA TSL (\$45 mil) NEDO model projects Other donors	Disbursement TA  	Vietnamese Loan TA Implementation	Vietnamese Loan TA
<u>Group 5</u> Energy efficiency in building	Program 9	Establishment of management model (MOC)	Target Setting Agreement under the EC Law Building Code	Enforcement Enforcement	Operation Enforcement	Operation Enforcement
	Program 10	Creation and promotion of energy efficiency building model (MOC)	EE&C building award ECO building Financial mechanism	Enforcement Promotion Program design	Operation Implementation	Operation Implementation
<u>Group 6</u> Energy efficiency in transport	Program 11	Minimizing fuel consumption and decrease of emission (MOT)	Target Setting Agreement under the EC Law Mater plan for natinal transportation (modal shift and city planning)	Enforcement	Operation	Operation
			Shift to public transportation (Inter city; bus/LNG, LPG Inner city; railway, maritime)	Preparation for introduction of Shinkansen, railways	Bus (LPG, CNG, Hybrid, electricity, biofuel)	Enhancement Introduction of Shinkansen
Budget				VND40 billion	----	VND400 billion
Energy consumption			Comparing to BAU	----	-5%	----

Outline of the proposal for major issues (action plans) are described below:

- (1) Certified energy manager program, designated factories, buildings and transport enterprises program and related training mechanism

To establish and operate certified energy manager and designated factories, buildings and transport enterprises (target setting agreement) programs, the packaged sub programs and organization structure shown in Figure 8 should be formulated.

Strong leadership of MOIT, Establishment of national steering committee which consists of intellectuals from industry, government and academy, and shall be a decision making body on standard and competency of the programs, establishment and operation of national EE&C training center and establishment of related legal framework are the major tasks to be managed by central government.

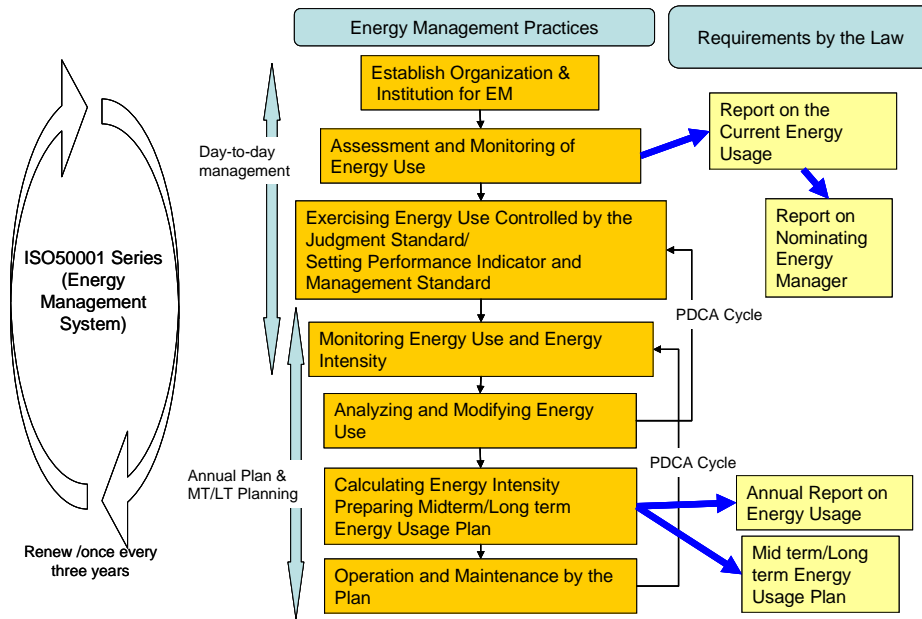
Besides the local governments are expected to manage the programs which have been authorized in the central government. Regarding the role, responsibility and functional linkage of local government and ECC, program management and awareness should be handled separately.

Regarding the training for certified energy managers, the competency standard shall be decide by MOIT (steering committee). As the first stage eligible universities such as HUT and EPU shall be in charge of it and as the second stage local ECCs which will have been educated by the universities shall also be in charge of it.

To formulate the training programs, the functional linkage and support from international cooperation agency such as JICA, DANIDA and UNDO etc is indispensable for documentation of curriculum, strengthening of auditing skill and support for introduction of ISO50001 (energy management), etc.

Figure 5 shows the flow of the EC Law and the concept of ISO50001 management.

There exist no difference in PDCA cycle operation in energy management, but it should be understood that the EC Law regulates, besides ISO is an operating system.



**Figure 5 Deference between the EC Law and ISO50001**

(2) Establishment of energy data collection mechanism

The purpose to establish energy data collecting mechanism is (1) getting and supplying the information of energy production and consumption, (2) promoting EE&C through the submission of “Periodical Report” and “5 years EE&C plan” from designated factories, buildings and transport enterprises, and finally contributing the reduction of energy cost and GHG (especially CO<sub>2</sub>.)

Vietnamese government is preparing to formulate a mandatory program that the designated factories, buildings and transport enterprises whose annual energy consumption excess the defined criteria should submit the documents above mentioned. Utilizing WEB system which is proposed by the Study Team is shown in Figure 6. The flow of energy data collecting between GSO and related ministries is shown in Figure 7.

At the first stage, both paper application and web application shall be introduced. And gradually web application ratio shall be increased. Data analysis software, mechanism to utilize and publish the analyzed information, data server and back up system etc shall be prepared and financial source and human resource shall be secured.

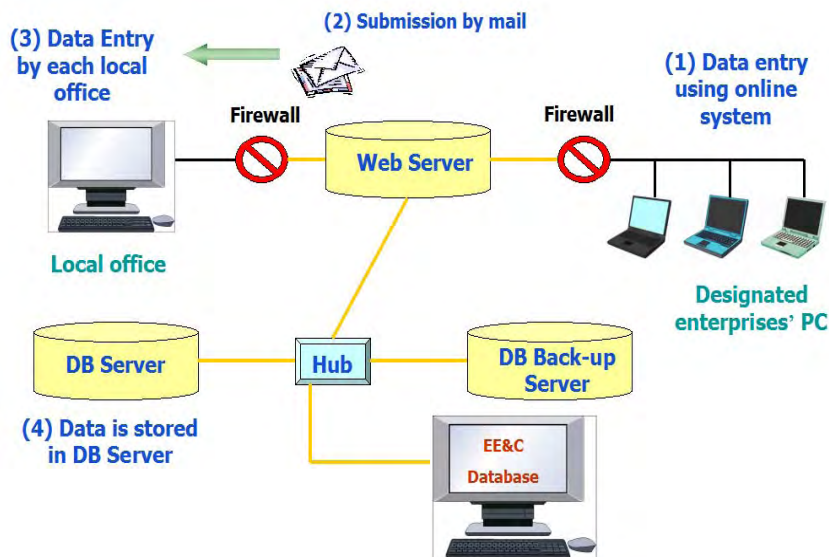


Figure 6 Network of Energy Data Collection Mechanism (draft)

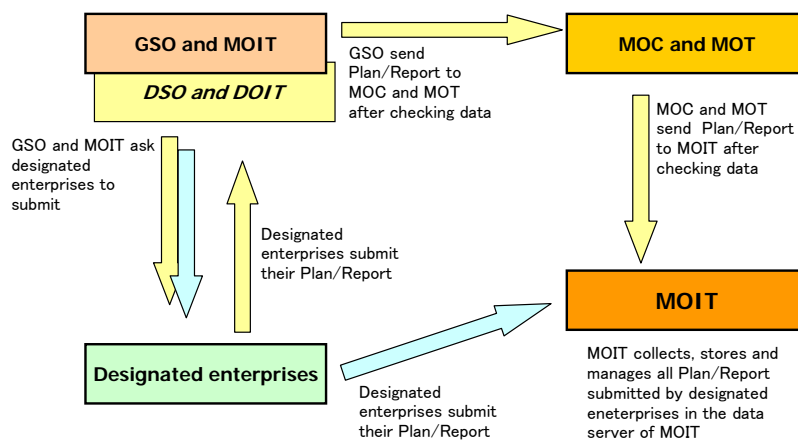


Figure 7 Flow of Energy Data Collecting Mechanism

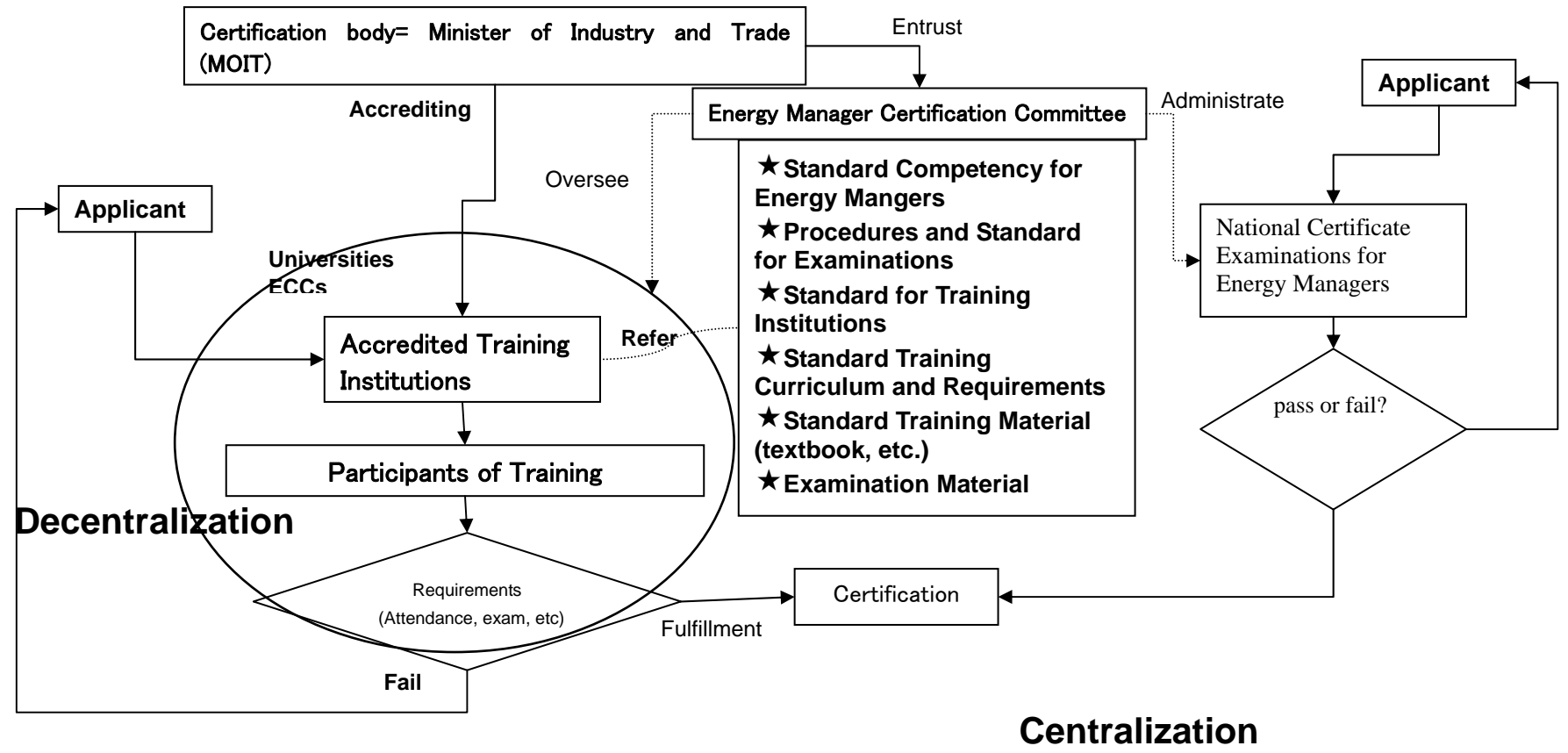


Figure 8 Framework of Certified Energy Manager Program Operation



(3) Establishment of standard and labeling and related electricity DSM program

Table 2 shows the progress to formulate energy standard and labeling. It is quite effective to formulate standard and labeling program. But introduction of mandatory labeling program (regulation) is not sufficient to achieve the targeted EE&C level. Awareness program for consumers, manufacturers and retailers, and incentive and disincentive program which has a strong linkage to electricity DSM measures should be formulated in parallel.

**Table 2 Progress of Standard and Labeling Program Implementation**

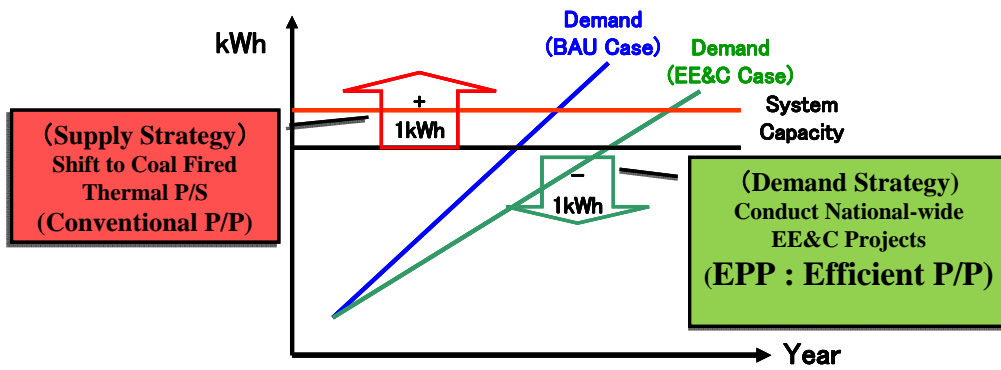
voluntary ← | → mandatory

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
T8 fluorescent lamp	F									
	F									
CFL			F							
Street lamp			F							
			F							
Electric ballast			F							
Magnetic ballast	F									
	F									
Air conditioner		F								
Electric fan		F								
Refrigerator		F								
Electric water heater			F							
Solar water heater			F							
3-phase motor	F									
Washing machine										
Electric rice cooker										
Other home appliances (*)										
Equipments for commercial use(*)										
Equipments for industrial use(*)										
Materials(*)										
Renewable enegies(*)										

Standard  
Labeling

Note: F means completion

Especially the promising spread of refrigerators, ACs, TVs and water heating heaters are worth being prepared the subsidy and/or low interest loan program (incentive mechanism). In this context ODA low interest loan from international cooperation agency like JICA can be a useful option To formulate nation wide EE&C appliances distributing project, mitigation for tight electricity supply and demand which is worth constructing big coal thermal power plant can be achieved in shorter time. (Refer Figure 9)



Source: IEA

Figure 9 Two Measures to Answer the Shortage of Electricity Supply

(4) Inter Organization Structure between Central and Local Government

The role and responsibility between central and local government, firstly the central government shall prepare the EC Law and related legal frame work, and following this the local government shall operate the procedure which has been defined in the law.

ECC shall have the role and responsibility to supplement the local government to promote EE&C and will be the responsible organization for awareness.. And the mechanism how to develop ECCs expertise should be programmed by the leadership of MOIT.

To complete EE&C effectively in shorter time, it is indispensable to reinforce the function, resource and budget of MOIT. (Figure 10)

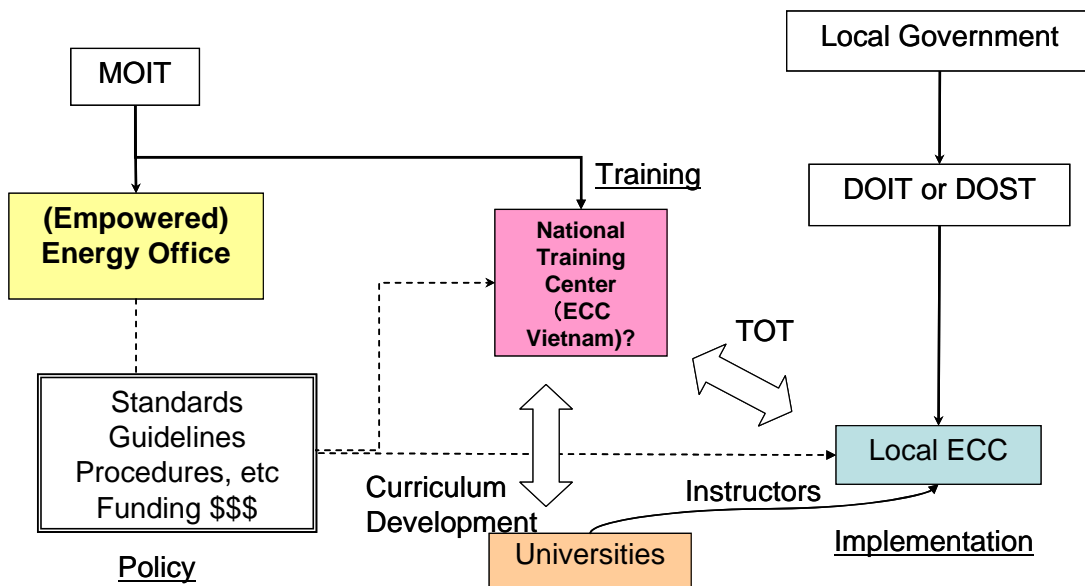


Figure 10 Proposal of Establishing ECCV which supplement and strengthen MOIT

(5) Financial Support Program for promoting EE&C

To improve the efficiency of production line, it is effective to enhance the energy management and to introduce the high efficient equipments. And especially financial program to support the implementation of EE&C equipment is quite important.

JICA and Vietnamese government are preparing to establish a financial support mechanism to implement EE&C equipments. That is an ODA two-step low interest loan program, MOF is the borrower, Government of Japan is the lender (through JICA). VDB borrows from MOF and provides to industrial investors. The loan scheme is shown in Figure 11. The Energy Efficiency Equipment List for loan application will be prepared to make the loan assessment easier

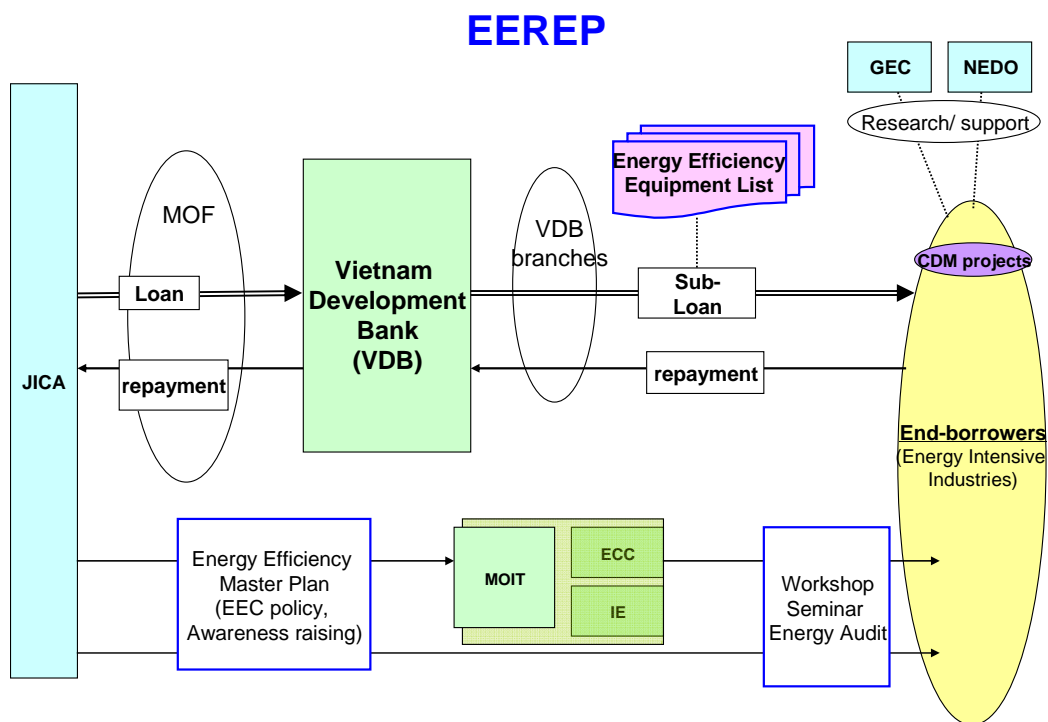


Figure 11 JICA Loan Mechanism for EE&C

JICA also has a plan to formulate Support Program to Respond Climate Change (SP-RCC) in Vietnam jointly with the international donors such as AFD (France). Vietnamese government established the “National Target Program to respond to climate change” (NTP-RCC; Prime Minister’s Decision 158, December 2008). This program intends to accelerate the implementation of the Policy Action (PA) for the major issues under 3 major pillars as follows:

- (1) Mitigation (promoting renewable energy and energy efficiency, forestry and agriculture management, waste management and promoting CDM projects etc.),
- (2) Adaptation (improvement of water quality and quantity, irrigation management, integrated coastal management and fishery, disaster prevention etc), and

- (3) Cross-cutting (storage of basic data for climate change and promoting research, establishing financial mechanism, mainstreaming climate change issues into Socio-Economic Development Plan (SEDP) and awareness raising and HRD, etc.)

Together with the TSL scheme mentioned above, it is expected that these financial support mechanism work for promoting EE&C in Vietnam.