The Republic of Turkey

Ministry of Environment and Urbanization

Data Collection Survey on Efficient Energy Management of the Public Building in Turkey

Final Report

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Japan International Cooperation Agency

Electric Power Development Co., Ltd.

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ABBREVIATION

AC	Air Conditioner
AFD	French Development Agency
APF	Annual Performance Factor
ASEAN	Association of Southeast Asian Nations
BEMS	Building Energy Management System
BEP	Regulation on Building Energy Performance
BEP-TR	Building Energy Performance – Turkish (Software name)
BTU	British Thermal Unit
C/P	Counter Part
CASBEE	Comprehensive Assessment System for Built Environment Efficiency
CEB	Council of Europe Development Bank
CEC	Coefficient of Energy Consumption
CFL	Compact Fluorescent Lamp
COP	Co-efficient of Performance
CTF	Clean Technology Fund
DBJ	Development Bank of Japan
DSI	General Directorate of State Hydraulic Works
DSM	Demand-Side Management
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECCJ	Energy Conservation Center, Japan
ECTT	Energy Conservation Target Tool
EDMC	Energy Data and Modeling Center
EE	Energy Efficiency
EE&C	Energy Efficiency Improvement & Conservation
EECB	Energy Efficiency Coordination Board
EEP	Energy Efficiency Project
EIB	European Investment Bank
EIE	General Directorate of Electrical Power Resources Survey and Development Administration (Elektrik Isleri Etüt Idaresi Genel Müdürlügü)
EMRA	Energy Market Regulatory Authority
En-Ver	Regulation on Efficiency Utilization of Energy Sources and Energy （Enerji Kaynaklarının ve Enerjinin Kullanımında Verimliliginin Arttırılmasına Dair Yonetmelik）
EPC	Energy Performance Certificate
ESCO	Energy Service Company
ESUM	Energy Specific Unit Management
EU	European Union
EVD	Accredit Certification Energy Service Company (Enerji Verimliligi Danismanligi)
EVK	Law on Energy Efficiency（Enerji Verimlilig Kanunu）
FCO	Foreign Commonwealth Office
FS	Feasibility Study
FSL	Fire Service Law
GDP	Gross Domestic Product
GDRE	General Directorate of Renewable Energy
GEF	Global Environmental Facility
GHG	Green House Gas

GIZ	German Agency for International Cooperation
GOT	Government of Turkey
GW	Gigawatt
HASP	Heating, Air-conditioning and Sanitary Engineering Program
HPC	High Planning Council
HVAC	Heating, Ventilating, and Air Conditioning
IBRD	International Bank for Reconstruction and Development
ICA	International Copper Association
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IEEJ	Institute of Energy Economics, Japan
IFC	International Finance Corporation
IFI	International Financial Institutions
IMSAD	Association of Turkish Building Material Producers
IPA	Instrument for Pre-Accession
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
ISKID	Air Conditioning & Refrigerating Association
ISO	International Organization for Standardization
ITU	Istanbul Technical University
IZODER	Association of Heat, water, Noise and Fire Isolators
JaGBC	Japan Green Build Council
JBIC	Japan Bank for International Cooperation
JERI	Japan Economic Research Institute Inc.
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JPOWER	Electric Power Development Co., Ltd.
KfW	The German Development Bank
KOE	Kilogram of Oil Equivalent
KOSGEB	Small and Medium Industry Development Organization
LED	Light Emitting Diode
MDB	Multilateral Development Bank
MENR	Ministry of Energy and Natural Resources
METI	Ministry of Economy, Trade and Industry in Japan
MIPD	Multi-annual Indicative Planning Document
MIV	Monitoring Inspection and Verification
MLIT	Ministry of Land, Infrastructure, Transport and Tourism in Japan
MMO	Chamber of Mechanical Engineer Center (CMEC)
MOD	Ministry of Development（former SPO (State Planning Organization)）
MOEF	Ministry of Environment and Forestry
MOEU	Ministry of Environment and Urbanization
MOF	Ministry of Finance
MOH	Ministry of Health
MONE	Ministry of National Education
MOPWS	Ministry of Public Works and Settlement
MOSIT	Ministry of Science, Industry and Technology
MV	Medium Voltage
MW	Megawatt
NCCC	National Communication on Climate Change
NECC	National Energy Conservation Center
NEDO	New Energy and Industrial Technology Development Organization

O&M	Operation & Maintenance
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
OJT	On the Job Training
PAL	Perimeter Annual Load Factor
PDCA	Plan Do Check & Act
PF	Power Factor
PM	Prime Ministry
PMU	Project Management Unit
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
SCOP	Seasonal Energy Efficiency Ratio (heating)
SEEF	Sustainable Energy Financing Facilities
SEER	Seasonal Energy Efficiency Ratio (cooling)
SMBC	Sumitomo Mitsui Banking Corporation
SME	Small and Medium Size Enterprise
SPF	Seasonal Performance Factor
SPO	State Planning Organization
STL	Seasonal Thermal Load
TA	Technical Assistance (Capacity Development)
TEDAS	Turkish Electricity Distribution Company
TEIAS	Turkish Electricity Transmission Company
TKB	Development Bank of Turkey (Türkiye Kalkınma Bankasi)
TOE	Tonne of Oil Equivalent
TOKI	Housing Development Administration (Toplu Konut İdaresi Başkanlığı)
TOU	Time of Use
TPES	Total Primary Energy Supply
TRY	Turkish Lieasi
TSE	Turkish Standards Institution
TSKB	Industrial Development Bank of Turkey (Türkiye Sınai Kalkinma Bankası A.Ş.)
TSL	Two Step Loan
TTMD	Turkish Society of HVAC and Sanitary Engineers
TUBITAK (TÜBITAK)	Scientific and Technical Research Council of Turkey
TurSEEF	Turkish Sustainable Energy Financing Facility
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
UT	Undersecretariat of Treasury
VRF	Variable Refrigerant Flow
WB	World Bank
ZEB	Zero Emission Building

Executive Summary

Executive Summary (Recommendations for Promoting EE&C in Buildings)

Since August 2011, when the Study started, the Study Team has held dozens of discussions and exchanged much information with the counterpart, Ministry of Environment and Urbanization (MOEU), and related organizations. Taking into consideration these processes, a summary of recommendations for functional Energy Efficiency Improvement & Conservation (EE&C) promotion for buildings is described as follows.

1. Integrated Strategy Package Needed for Promoting EE&C

In order to promote EE&C effectively, three strategies, which are shown in Figure 1 should be implemented at the same time. In Turkey some rules and regulations have been enacted, however structured and comprehensive awareness and support programs have not been formulated enough. It is needed to enhance the programs focusing on awareness and governmental support **(Refer to 2.3.1)**.

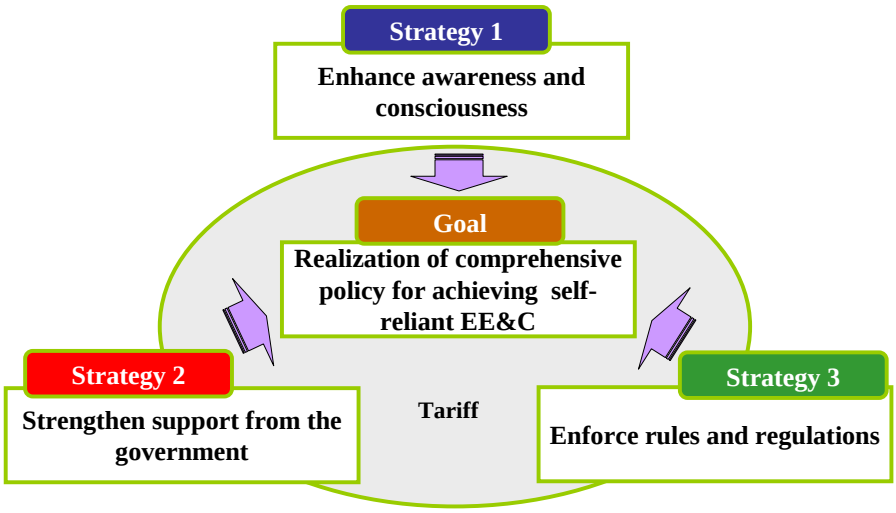


Figure 1 Integrated Strategy Needed for Promoting EE&C

In the light of above mentioned integrated strategy, the key issues and potential measures to increase effectiveness of EE&C in Turkey initially defined by the Study Team are as follows;

(1) Enhance Awareness and Consciousness

1) Obligation to display energy efficiency performance on energy consuming products

2) Structuring and utilization of database for energy consumption on buildings and equipments

3) Establishment of an organization focusing on awareness and dissemination for EE&C

4) Investigation and discussion on the recommended room air temperature

(2) Strengthen Financial Support Mechanism

1) Establishment of policy-based finance program, which has been the most effective in Japan

2) Utilization of a part of tax on fuel as a financial source for EE&C (referring Japanese Special Account)

(3) Evaluation Method of Energy Conservation

1) Establishment of simplified evaluation method for middle and small sized buildings (e.g. Japanese Point Method)

2) Recommendation for establishing Turkish sustainable building standard

Turkish Government has a plan to issue the licenses for all the buildings of commercial, service, and luxury residences with 10,000m^2 or more of floor areas. Besides in Urban Transformation Law, it is stipulated to keep not only energy efficiency but also earthquake resistance for the target buildings. Referring these backgrounds and the existing typical assessment tools for sustainable building, CASBEE (Japan), LEED (US), and BREEAM (UK), the following measures were recommended for MOEU to introduce.

a) Standard should be applicable for all buildings.

b) Evaluation of building quality, incl. earth quake resistance, should be included.

c) Linkage with BEP-TR, Turkish assessment tool for insulation and EE&C performance, should be ensured.

d) Introduction (applicable) to local governments is necessary.

2 Recommendations through Energy Audits

The Study Team conducted energy audits for 2 buildings from the list of MOEU's 100 Buildings Project jointly with the EVD (Accredit Certification Energy Service Company) Association in Turley (from November to December 2012) **(Refer to 2.3.2)**.

(1) Recommendations for DSI Buildings and EM Hospitals

Table 1 shows the summary of EE&C recommendations.

Table 1 Summary of EE&C Recommendations for DSI Buildings and EM Hospital

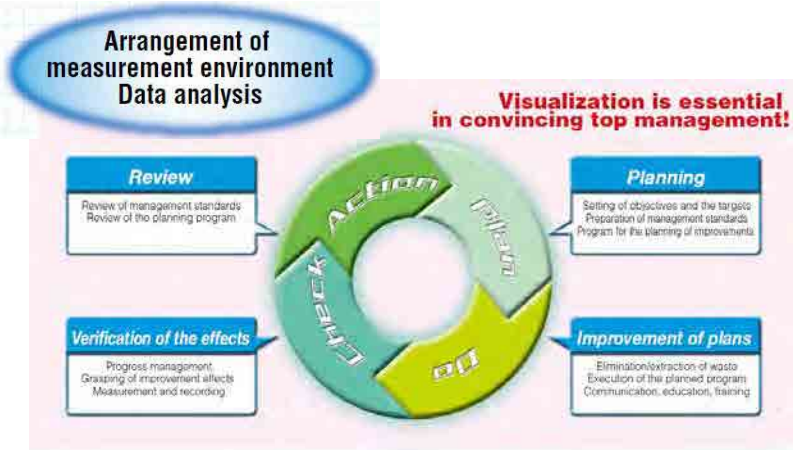
Measures	DS Buildings	EM Hospital
Zero cost	Formulating PDCA cycle, target setting based on data	
	Efficient operation of boiler (time and units)	
	Reduction of night time electricity consumption based on daily load curve	
	Open/close operation of blinds and windows	
		Reduction of fresh air for AC
		Utilizing motionsensor in wash rooms
Small investment	Insulation for valves	
	Adjustment of boiler air ratio	
	Introduction of electronic ballast	
	Insulation for pipes	
	Introduction of room temperature control system	
	Replacement of hot water circulation pumps	
	Introduction of motion sensor in wash rooms	
Large investment	Insulation for waidows and walls	Introduction of heat recovery HVAC system
	Introduction of heat recovery ventilation system	

1) Common items for DSI Buildings and EM Hospital

At first ZERO cost measures (management and more effective operation) are strongly recommended to apply.

a) Formulation of PDCA cycle

Through Target setting (Referring data), everybody's participation, discussion for energy and cost saving periodically (formulating PDCA cycle), 5 % saving is expected to be achieved. Figure 2 shows images of PDCA cycle.



Source：Energy Conservation for Hospital, ECCJ

Figure 2 Formulation of PDCA Cycle to Promote Energy Conservation

b) Optimization of boiler operation (Later start operation, reduction of operating units)

c) Window operation

- Establishment of the rule for window opening and room air temperature setting
- At winter peak time, by closing blinds, 0.5W/m^2 energy can be saved. It means about TRY 3.0 reduction/y/m^2.

And in winter time a lot of officers are feeling hot and open windows to adjust room air temperature. To avoid these in-efficient manners, the introduction of controlling technologies and efforts to realize suitable room air temperature is needed.

Besides introduction of heat recovery mechanical ventilation equipment (HEX) is worth being considered.

2) Recommendations for DSI Buildings

In DSI Buildings i) there is huge (16%) potential by ZERO cost energy conservation (management and operation improvement), ii) there is largest potential by improvement of insulation, and iii) including ZERO cost measures, simple payback period for recommended measures (mix) is around 6 years, and iv) EE&C potential is estimated as 27 - 47%.

The problem of DSI Buildings is evidently the lack of insulation for windows and walls.

This means heat loss and money loss through windows and walls. It is estimated that the energy (money) loss through windows and walls of DSI buildings is TRY 456,000/y. And accumulated amount since 1969 is TRY 18,000,000 (present value equivalent).

3) Recommendations for EM Hospital

In EM Hospital i) there is huge (30%) potential by ZERO cost energy conservation (management and operation improvement), ii) there is largest potential by reduction of fresh air intake, and iii) including ZERO cost measures, simple payback period for recommended measures (mix) is around 1 - 3 years, and iv) EE&C potential is estimated as 28 - 38%.

The problem of EM Hospital is evidently that as for air conditioning and ventilation, 100％ all fresh air intake and exhaust, no recovery system has installed. It is equivalent to heat or cool air and to throw the gained energy away outside.

(2) Recommendations for Turkish Government

Referring the above analyzed energy audit result; recommendations for Turkish Government are summarized as follows. By breaking through them, the potential of ZERO cost EE&C can be expanded.

1) Enhancing EVD's capacity development by On the Job Training (OJT) is a high priority issue (Soft technology, lack of experiences).

   a) Proposal based on measured data

      e.g. Improving boiler operation
      Adjustment of boiler air ratio
      Proposal based on daily electricity load curve

   b) Proposal based on cost benefit analyses

   c) Proposal to implement heat recovery HVAC system

2) Suitable room air temperature should be realized.

   a) Many people are feeling hot in winter time (Opening window).

   b) Temperature control system has not been implemented.

3) Night time electricity consumption should be reduced.

   In Japan stand-by & IT (server, PC, etc.) electricity is dominant.

3. Target Technologies in Turkish Government Buildings

Considering the hearing result from related technical organizations, EVDs, the findings from energy audits, economically feasible typical technologies, which are applicable for Turkish public buildings, are summarized below **(Refer to 2.3.3)**.

a) External wall and roof insulation (e.g. EPS for walls and XPS for roofs)

b) Pair glass (with low-e glass and insulated sash)

c) Inverter technology for air conditioning (incl. Variable Refrigerant Flow (VRF))

d) Insulation for heating pipes and valves

e) Heat recovery ventilation

f) Inverter technology for pumps and fans

g) Hot water supply by solar heat

h) Heat pump system

4. Recommendations from Field Test of Room Air Conditioners

Field test for room air conditioners was carried out from end of July 2012 to early January 2013 at Istanbul Technical University. The result of the field test was shared with MOEU and the relevant organizations in the seminar, which was held in Ankara on 30th January 2013. In the seminar, the energy saving advantage of inverter ACs was shown by actual data, and the necessity of introducing

Seasonal Performance Factor (SPF), which will be issued as new ISO16358 this year, was recognized. Four recommendations from this field test are as follows **(Refer to 2.3.4)**.

a) In this field test, conducted by using two air conditioners which are both ranked as "A" class in Turkish labeling classification, inverter type showed 20 - 30% more efficiency than non-inverter one. This difference cannot be evaluated in the present Turkish labeling standard. And the necessity to introduce new evaluation method like SPF was suggested.

b) This field test was conducted in the limited period, in which the peak period for heating was not included especially. For the improvement of analysis accuracy, further data collecting and analysis should be needed.

c) In accordance with ISO 16358 to be issued this year, air conditioner's field test should be carried out in other regions to collect and analyze the data based on the regional characteristics, since Turley has various meteorological conditions. Considering meteorological conditions, Turkey should prepare to introduce SPF.

d) In Turkey, it is useful to introduce SPF as an improved evaluation method for air conditioners' energy efficiency. And the dissemination of inverter air conditioner should be accelerated.

5. Project Scheme for Energy Efficiency Retrofitting in Government Buildings

The Study Team had discussions and collected related information to illustrate a functional implementation scheme on the "Project for Energy Efficiency Retrofitting of Central Government Buildings". Figure 3 shows the proposed scheme, with due considerations to (i) size of sub-projects varies, but majorities are small ones, (ii) not many government organizations have so far become serious about energy saving **(Refer to 2.4.2).**

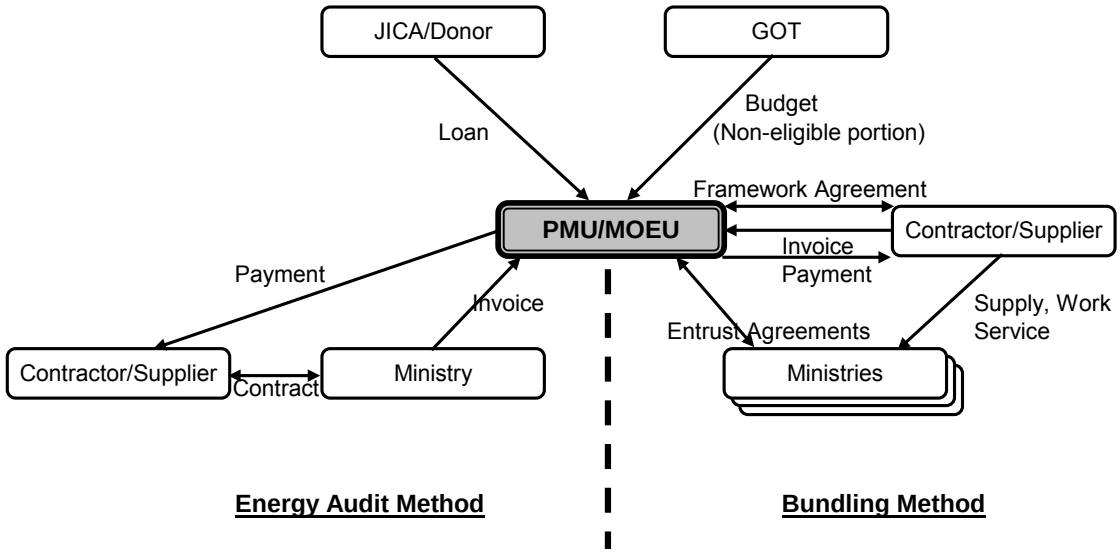


Figure 3 Project Scheme for Energy Efficiency Retrofitting in Government Buildings

The Project has several important features as follows;

- Utilization of two implementation methods (Energy Audit Method and Bundling Method)
- Establishment of a powerful Project Management Unit (PMU) with implementation authorities and enforcement tools
- Structuring framework agreement for a large-number of small-scale sub-projects in consistent with Turkish Law
- Implementation of sub-project by PMU for other ministries by delegation of authority to PMU
- Evaluation of tender not by price of bids, but selecting the economically most advantageous tender by taking into account the factor other than price
- Purchasing only high energy efficiency equipment by using energy labeling regulations

As project preparations for implementation, the following activities are recommended to be carried out in 2013;

- Project formation and preparation of project proposal (including energy audits under 100 Building Projects and under other programs)
- Obtain approval at Energy Efficiency Coordination Board (EECB) as the Project to implement an action of No. SP-06/ST-01/A-01 of Energy Efficiency Strategy Paper
- Obtain approval for the Project from the High Planning Council (HPC) as inter-ministerial government priority project
- Obtain approval under Public Investment Program
- Amendment of relevant sections for framework agreement in Public Procurement Law
- Negotiation with JICA/donor agencies for project loan
- Budgeting (in bulk) as capital investment project in multi-year

6. Turkish Governmental Needs for JICA's Next Technical Assistance Program

The Study Team had several meetings with MOEU and related organizations focusing on the candidates of JICA's next technical assistance programs. The candidates of JICA's next technical assistance program, which were requested by Turkish Government and effective to implement, and in which Japanese technologies contribution is considered to be large, are as follows **(Refer to 2.4.2 (6))**.

Theme No1: Establishment of sustainable buildings assessment tool.

Based on SP-02 "To reduce energy demand and carbon emissions of the buildings; to promote sustainable environment friendly buildings using renewable energy sources", Energy Efficiency Strategy Paper 2012-2023, Responsible ministry: MOEU

Theme No2: Capacity development for EE auditors, EVD association.

Based on SP-01 "To reduce energy intensity and energy losses in industry and service sectors", Energy

Efficiency Strategy Paper 2012-2023, Responsible ministry: Ministry of Energy and Natural Resources (MENR)

Theme No3: Capacity development for Energy efficiency standard.

Based on SP-03 "To provide market transformation of energy efficient products", and SP-07 "To strengthen institutional capacities and collaborations, to increase use of state of art technology and awareness activities, to develop financial mechanism except public financial institutions". Energy Efficiency Strategy Paper 2012-2023, Responsible ministry: Ministry of Science, Industry and Technology (MOSIT)

Chapter 1

Introduction

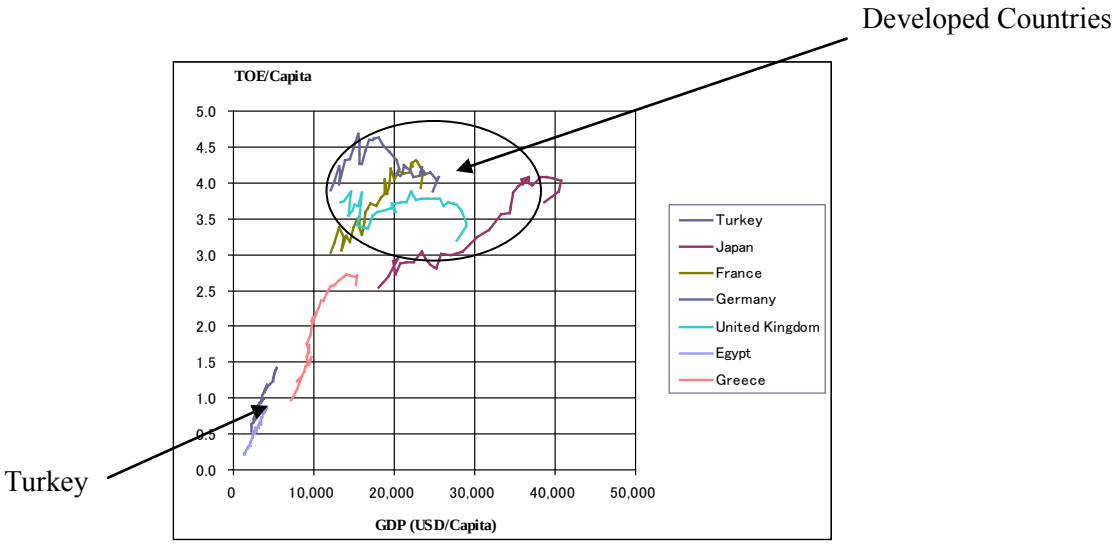
Chapter 1 Introduction

1.1 Background of Study

Turkey has a population of 73 million and is the number-one developing country in Middle East. GDP growth rate in 2010 was 8.9% in reflections of the rapid population growth and the strong increase in domestic demand in recent years.

Figure 1.1-1 shows that the GDP level of Turkey is still developing, as compared with developed countries. The GDP in Turkey continues to develop and surely the energy consumption will be expected to increase further.

The growth in economy and the increase of energy demand pose a risk for the energy security of Turkey's government. The energy import ratio becomes 73% in 2010, and Energy Efficiency Improvement and Conservation (hereinafter referred to as "EE&C") becomes an important pillar of the energy policy together with Renewable Energy (hereinafter referred to as "RE"), hydro power, and nuclear power. In this context, Law on Energy Efficiency (hereinafter referred to as "EVK") was established in April, 2007. And EE&C in industry sector improved so much. However, EE&C implementation in residential, commercial and public sectors, which occupies 40% of the total energy consumption, is yet on the way. EE&C implementation of buildings, which has the second biggest potential of EE&C after the industry sector, is the next target to be tackled.



Source: Prepared by JPOWER from IEA 2010 Data

Figure 1.1-1 History of GDP and Energy Consumption per Capita

1.2 Purpose of Study

With the above mentioned background, Ministry of Environmental and Urbanism (hereinafter referred to as "MOEU") planned to conduct energy audits for one hundred buildings (hereinafter referred to as "100 Buildings Project") in Ankara. Referring results of the project, MOEU has a plan to apply the EE&C measures for the whole of Turkey.

The main purposes of this study are followings.

1) Before implementing 100 Buildings Project, Japan's knowhow and technologies (in both general and specific issues) for EE&C of buildings are proposed and shared with the counterpart (hereinafter referred to as "C/P"). EE&C measures and laws/regulations on EE&C implementation in buildings in Turkey are to be analyzed and effective measures to improve them should be proposed.

2) Following Turkey's activities time to time, the related information, which is needed to formulate ODA-loan and technical cooperation projects in order to promote EE&C for public buildings in other cities and in private buildings in Turkey, is to be collected. And based on it, useful ideas to utilize ODA (Official Development Assistance) loan will be proposed.

Through the above activities, the capacity development of MOEU and relevant agencies should be conducted.

1.3 Outline of Study

1.3.1 Basic Policy of Study

This study was implemented based on the following policies.

Basic Policies

1. Utilizing the previous JICA cooperation results in EE&C.
2. Studying current condition and problems of "regulation (stick)", "support (carrot)", and "awareness (information)", which are needed for promoting EE&C
3. Utilizing Japanese experiences and the results from EE&C studies which were conducted by JICA in Asian countries
4. Utilizing the output of NEDO Feasibility Study on EE&C pilot projects

【Basic Policy 1】 Utilizing JICA cooperation results in EE&C.

Referring the basic information acquired from "Basic Study of Energy Efficiency / Conservation and Renewable Energy Project for the Republic of Turkey (2009)", the following progress is to be confirmed.

Referring the key issues pointed out in "Project Study on Energy Conservation by Utilizing ESCO (Energy Service Company) (2006)", the eligibility of soft-ware, which is the base for promoting 100 Buildings Project in Turkey, current condition and problems of certified ESCO (EVD (Accredit Certification Energy Service Company) to be explained later), and it's activities and so on should be confirmed. After that, the most suitable approach should be chosen. In parallel the Study Team will advise and propose for the more functional operation.

【Basic Policy 2】 Studying current condition and problems of "regulation (stick)", "support (carrot)", and "awareness (information)", which are needed for promoting EE&C.

On promoting EE&C, there are three fields, "enforcing rules and regulations (regulation)", "strengthening government support (support)", and "enhancement of awareness of EE&C (awareness)". It is necessary to implement integrated and balanced EE&C measures and to cooperate with each other in the three fields. The basic philosophy is that the final goal to be targeted is not "regulation" and "support" but self-reliant EE&C activities of consumers should be understood. Based on this philosophy, the survey of current condition for EE&C in Turkey should be conducted and analyzed in three fields (Figure 1.3.1-1)

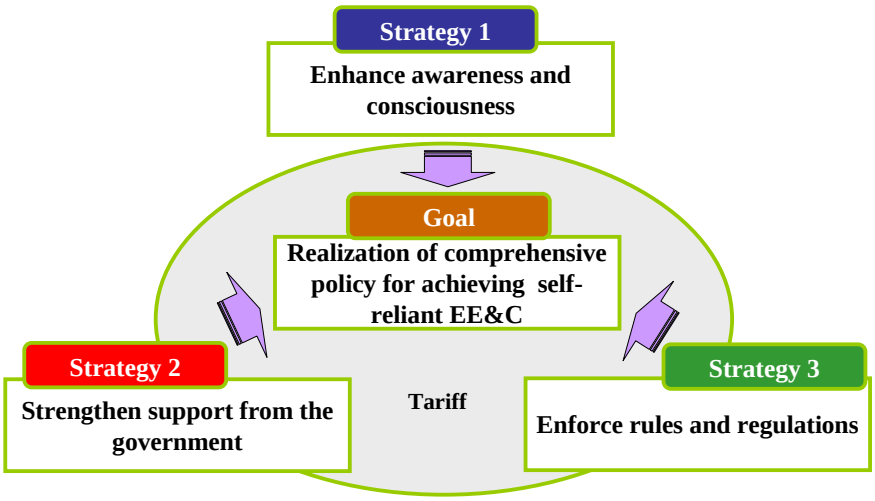


Figure 1.3.1-1 Basic Strategy for Promoting EE&C

【Basic Policy 3】 Utilizing the output of NEDO Feasibility Study on EE&C Pilot Projects

The following two feasibility studies for building energy conservation pilot projects have been conducted by New Energy and Industrial Technology Development Organization (hereinafter referred to as "NEDO") in 2011. The output of NEDO Feasibility Study is utilized.

(1) Zero Emission Building (hereinafter referred to as "ZEB") project on new construction

(2) Renovation of the existing building for an energy conservation building (30 % less energy consumption)

The outline of outputs from these two feasibility studies is summarized below.

(1) ZEB Project on New Building

The project site is in Ege University in Izmir. The feasibility study was implemented by NIHON SEKKEI, Inc. with the other companies. The proposed main energy conservation

measurements are as follows.

a) Introduction of External insulation
b) Introduction of low-e pair glass
c) Introduction of high efficient heat pump air conditioning system
d) Introduction of Light Emitting Diode (hereinafter referred to as "LED") and motion sensors
e) Introduction of Photovoltaic (hereinafter referred to as "PV") power generation, incl. see through type
f) Introduction of high density heat storage system
g) Introduction of high efficient heat pump hot water supply system
h) Introduction of day light control system
i) Introduction of BEMS

(2) EE&C Project for an Existing Building

The project site is located in Ankara. The feasibility study was conducted by Taisei Corporation. EE&C survey for an existing building in Ankara was carried out. The proposed main energy conservation measurements are as follows.

a) Addition of external insulation
b) Replacement to low-e pair glass
c) Introduction of total heat exchanger (HEX)
d) Introduction of Light Emitting Diode (hereinafter referred to as "LED") and motion sensors
e) Replacement of air conditioners (hereinafter referred to as "AC") into variable refrigerant flow (hereinafter referred to as "VRF") system with inverter control
f) Introduction of heat pump water heater
g) Introduction of PV power generation
h) Introduction of BEMS

1.3.2 Work Implementation Flow and Staffing Plan

The working implementation flow and staffing plan are shown in Figure 1.3.2-1 and -2 respectively. The activity records of 6 missions are shown in Annex 1.

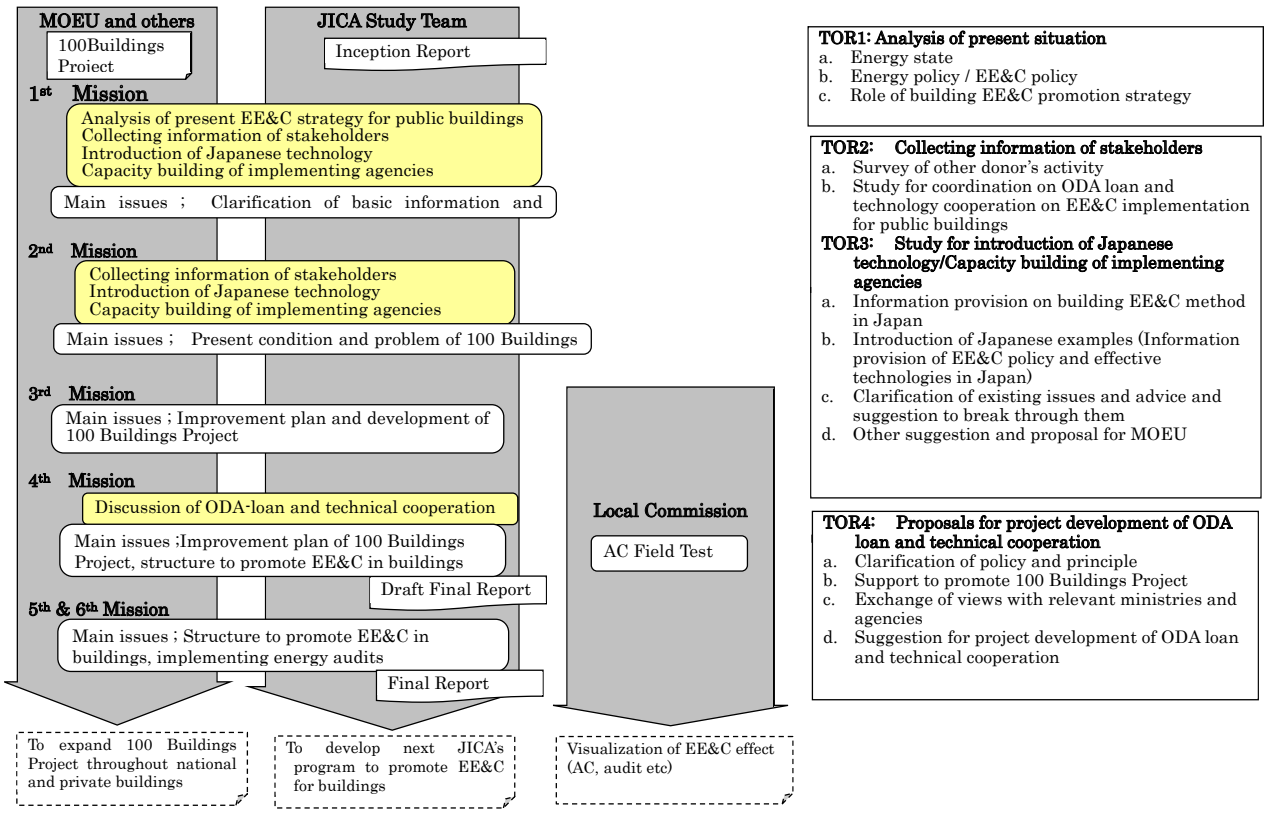


Figure 1.3.2-1 Work Implementation Flow

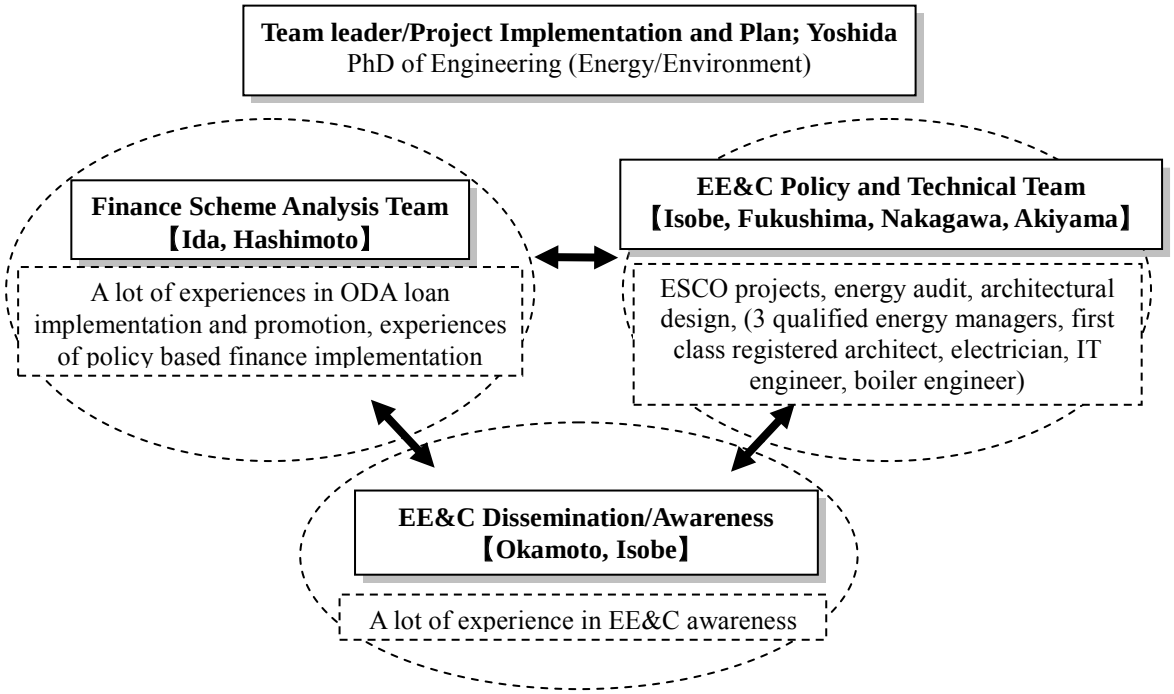


Figure 1.3.2-2 Staffing Plan

Chapter 2

Survey and Recommendations

Chapter 2 Survey and Recommendations

2.1 Confirmation on the Actions and Legal Framework for EE&C Strategy of Public Buildings

2.1.1 Energy Situation of Turkey

(1) Energy Balance of Turkey

Turkey faces a rapid and growing demand for energy. Primary energy consumption in Turkey has been continuously increasing with an annual increase rate around 4 - 4.5% in last 20 years. Turkey's primary energy consumption increased from 81.2 mil. TOE in 2000 to 114.3 mil. TOE in 2011. However, the economic crisis in the last quarter of 2008 and throughout 2009 caused a decrease in energy demand.

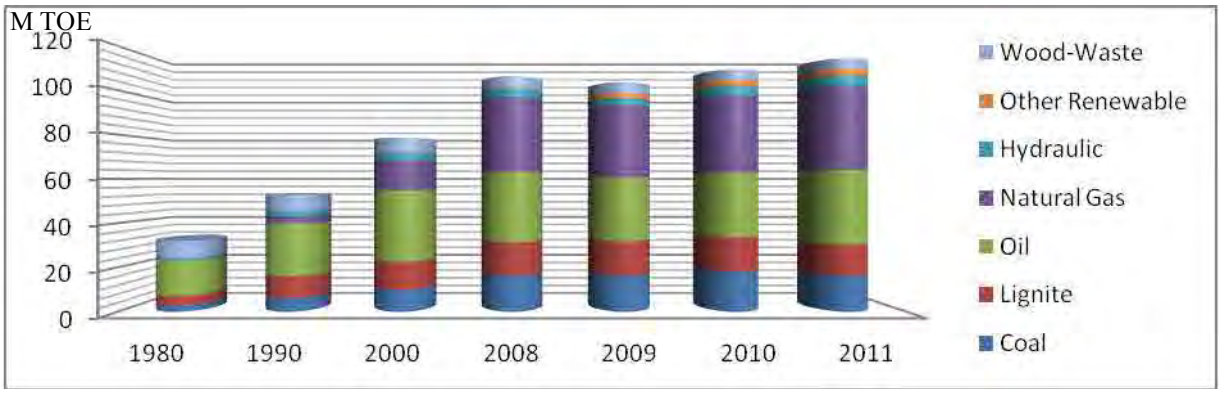
Table 2.1.1-1 Developments in Energy Sector of Turkey (2000-2011)

		2000	2001	2005	2008	2009	2010	2011
PRIMARY ENERGY								
Production	1,000 TOE	27,621	24,576	26,285	30,300	30,560	32,493	31,600
Consumption	1,000 TOE	81,193	75,402	90,077	108,360	103,500	109,266	114,300
Per Capita Consumption	KOE	1,264	1,103	1,313	1,525	1,440	1,477	1,555
ELECTRICITY								
Installed	MW	27,264	28,333	38,843	41,818	44,761	48,931	53,051
Thermal (*)	MW	16,070	16,641	25,917	27,625	29,416	31,780	34,163
Hydraulic (**)	MW	11,194	11,692	12,926	14,193	15,345	17,151	18,888
Production	GWh	124,922	122,725	161,956	198,418	194,813	210,000	228,431
Thermal (*)	GWh	94,010	98,652	122,336	164,301	157,360	156,496	170,959
Hydraulic (**)	GWh	30,912	24,072	39,620	34,117	37,453	54,711	57,472
Import	GWh	3,786	4,579	636	789	812	1,144	4,747
Export	GWh	413	433	1,798	1,122	1,546	1,918	3,833
Consumption	GWh	128,295	126,871	160,794	198,085	194,079	211,981	229,344
Per capita Consumption	kWh	1,997	1,851	2,345	2,787	2,699	2,865	3,099

Source: MENR, Chamber of Mechanical Engineers "TÜRKİYE'NİN ENERJİ GÖRÜNÜMÜ"uptdated version-July 2012

Although the demand for energy is dramatically increasing year by year, primary energy production in Turkey has remained relatively constant. Primary energy production was 27.6 mil. TOE in 2000, and in 2011 it was 31.6 mil. TOE.

Turkey has very limited domestic energy resources, and in 2011 72% of primary energy consumption was secured by import. The total cost of imported energy reached to USD (United States Dollar) 54 bn. and occupied the share of 22.4% in total import of the country in 2011, which is one of the main reasons to cause a foreign trade deficit in Turkey. Especially the energy self-sufficiency rate of natural gas is only 2%, which is the lowest among the energy sources. Besides, over 50% of natural gas is imported from Russia. The structure of energy production and demand in Turkey is shown in Table 2.1.1-1 and Figure 2.1.1-1.



%	Coal	Lignite	Oil	Natural Gas	Hydraulic	Other Renewable	Wood-Waste	Total
1980	8.9	13.2	50.5	0.1	3.3	0.0	24.1	100.0
1990	11.7	18.8	45.3	5.9	4.6	0.1	13.7	100.0
2000	12.6	15.9	41.1	17.5	4.3	0.3	8.2	100.0
2008	15.2	14.3	29.9	31.8	3.8	0.5	4.5	100.0
2009	15.8	14.8	27.9	31.6	3.0	2.2	4.6	100.0
2010	16.6	14.1	26.7	31.9	4.1	2.4	4.2	100.0
***2011**	14.1	12.2	29.7	33.3	4.1	2.5	4.1	100.0

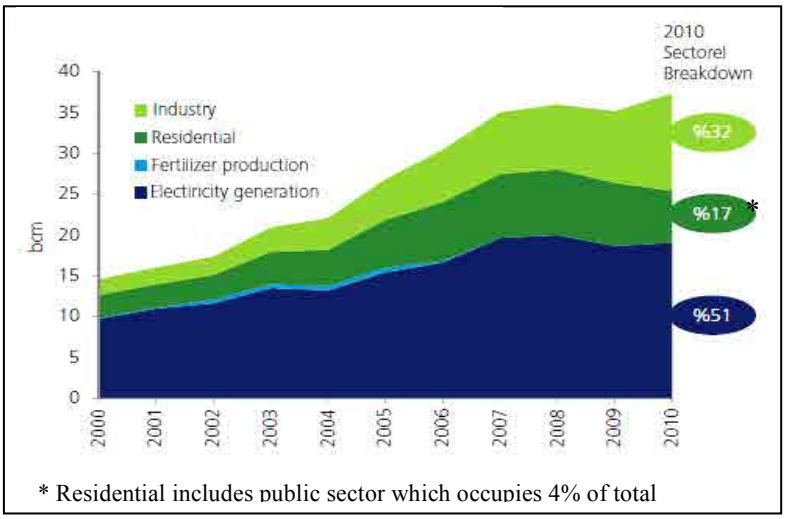
*Estimate

Source: MENR, Chamber of Mechanical Engineers "TÜRKİYE'NİN ENERJİ GÖRÜNÜMÜ"uptdated version-July 2012

Figure 2.1.1-1 Developments in Primary Energy Consumption by Shares of Sources of Turkey

Over the years the main energy source was oil. After 2008, however, gas took over the biggest share in energy supply. In 2011 gas has the biggest share with 33.3% in TPES (Total Primary Energy Supply), followed by oil 29.7 %, coal 26.3% and hydro and other renewable 10.7% shares.

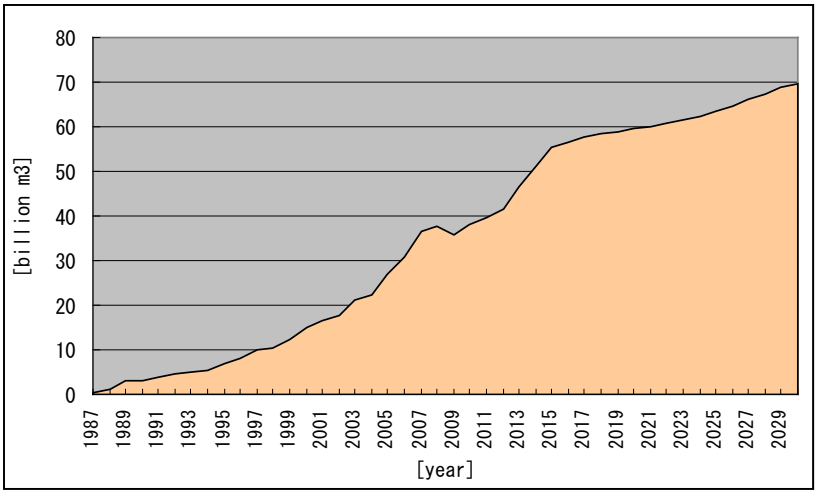
The annual trend of natural gas consumption and sectoral breakdown in 2010 are shown in Figure 2.1.1-2. According to the information from EMRA (Energy Market Regulatory Authority), consumption for electricity generation occupies 51%, and residential sector occupies 17% (includes 4% of public sector of total). From the result of the site survey by the Study Team, natural gas is mainly used for heating systems and kitchen in public buildings.



Source: Deloitte. "Turkey's natural gas market Expectations and developments 2012"

Figure 2.1.1-2 Changes of Natural Gas Consumption by Sector

Natural gas consumption has increased by the average of 10% every year in last 10 years. The consumption in 2011 became twice as much as that in 2003. The consumption of natural gas is assumed to keep increasing in the future and it is expected to reach 70 bn. m^3 in 2030 [1] (See Figure 2.1.1-3).



Source: Prepared by JPOWER from Chamber of Mechanical Engineers "TÜRKİYE'NİN ENERJİ GÖRÜNÜMÜ"

Figure 2.1.1-3 Demand Forecast of Natural Gas

(2) Electricity Sector

In Turkey electricity demand increased every year by 7 - 8 % in last 25 years. Although two economic crises happened in 2001 and 2008-2009, electricity consumption has increased by the average of 5.5 % every year from 1998 to 2010 (See Table 2.1.1-2). Electricity consumption has almost doubled in last 12 years, and it is expected to be doubled in next 10 years.

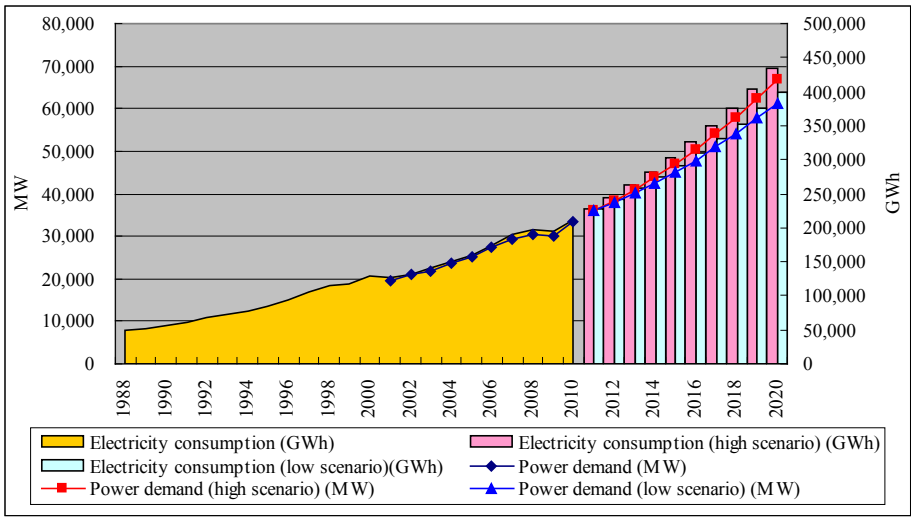
[1] Chamber of Mechanical Engineers "TÜRKİYE'NİN ENERJİ GÖRÜNÜMÜ

Table 2.1.1-2 Growth in Electricity Demand by Year

Years	Peak Power Demand (MW)	Increase (%)	Energy Demand (GWh)	Increase (%)
1998	17,799	**5.2**	114,023	**8.1**
1999	18,938	**6.4**	118,485	**3.9**
2000	19,390	**2.4**	128,276	**8.3**
2001	19,612	**1.1**	126,871	**-1.1**
2002	21,006	**7.1**	132,553	**4.5**
2003	21,729	**3.4**	141,151	**6.5**
2004	23,485	**8.1**	150,018	**6.3**
2005	25,174	**7.2**	160,794	**7.2**
2006	27,594	**9.6**	174,637	**8.6**
2007	29,249	**6.0**	190,000	**8.8**
2008	30,517	**4.3**	198,085	**4.3**
2009	29,870	**-2.1**	194,079	**-2.0**
2010	33,392	**11.8**	210,434	**8.4**

Source: Prepared by JPOWER from TEIAS "TÜRKİYE ELEKTRİK ENERJİSİ 10 YILLIK ÜRETİM KAPASİTE PROJEKSİYONU (2011 – 2020)"

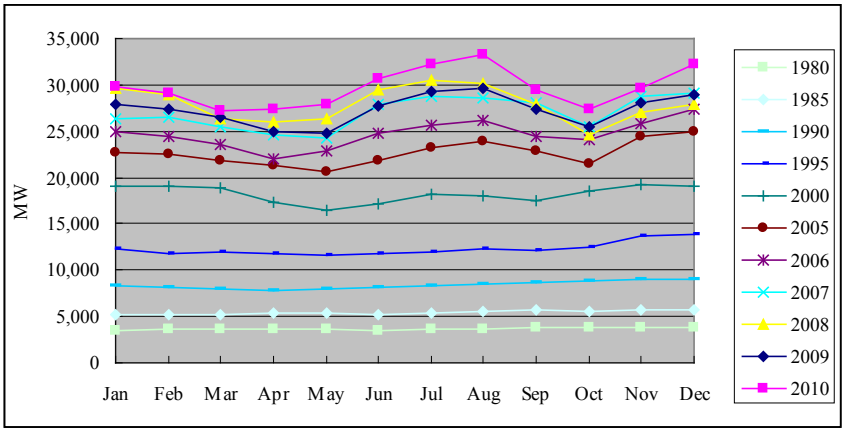
Maximum demand in 2020 is estimated over 60,000MW (about 34,000MW in 2010), which is twice as large as that of 2010 (See Figure 2.1.1-4).



Source: Prepared by JPOWER from TEIAS "TÜRKİYE ELEKTRİK ENERJİSİ 10 YILLIK ÜRETİM KAPASİTE PROJEKSİYONU (2011 – 2020)"

Figure 2.1.1-4 Electricity Demand Projections (High and Low Scenarios)

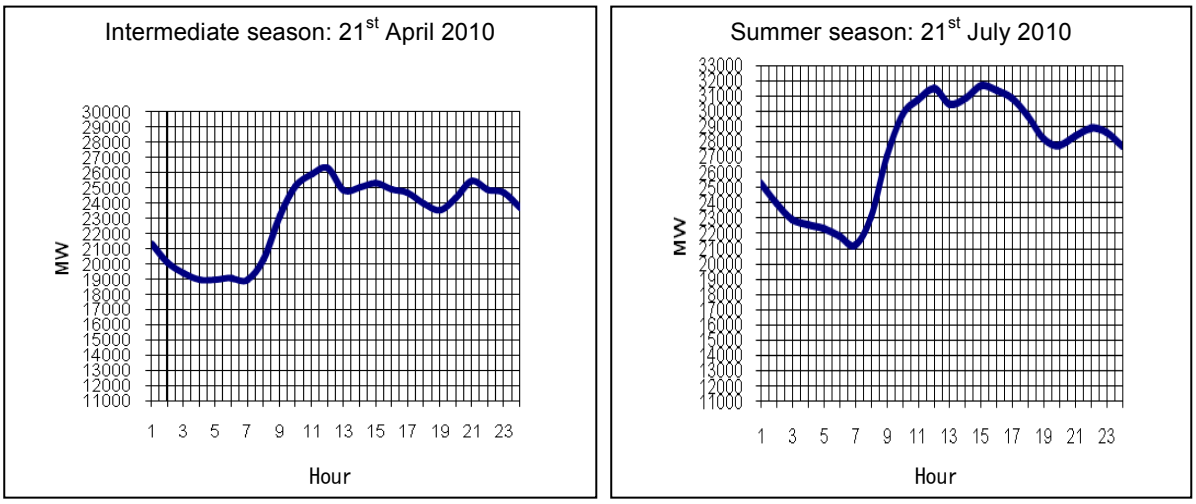
Annual trend of hourly peak load on monthly basis is shown in Figure 2.1.1-5. Power demand in summer and winter seasons has increased since 2000, while there had not been a big difference throughout the year. Moreover, the demand in summer has been exceeding winter demand since 2008. It is likely that increasing of summer demand results from a spread of air conditioners due to rising welfare in residential sector and developments in commercial sector.



Source: Prepared by JPOWER from TEIAS "TÜRKİYE ELEKTRİK ENERJİSİ 10 YILLIK ÜRETİM KAPASİTE PROJEKSİYONU (2011 – 2020)"

Figure 2.1.1-5 Transition of Hourly Peak Load on Monthly Basis

The daily load curves in intermediate and summer seasons in 2010 on monthly basis are shown in Figure 2.1.1-6. As stated above, maximum power demand has been recorded in summer season since 2008. The daily coefficient of fluctuation[2] in summer season is approximately 34%, while that in intermediate season is approximately 28%. The power demand in daytime in summer season is larger than that in intermediate season. Increasing Air Conditioner (AC) load in summer season is pointed and analyzed in Energy Efficiency Strategy Paper 2012-2023[3]. And this trend was confirmed in the meeting with TEDAS (Turkish Electricity Distribution Company) and AC manufacturers. So as to mitigate daytime peak load in summer season, promotion of highly efficient AC is very important for Turkey.



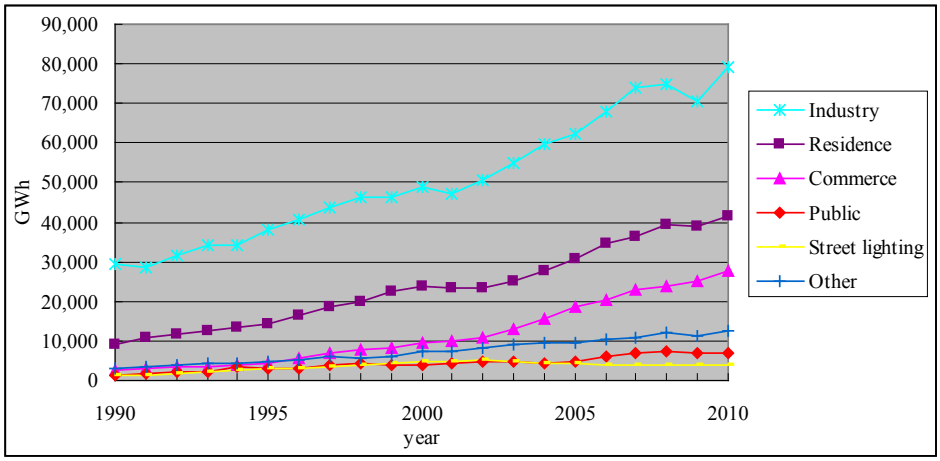
Source: Prepared by JPOWER from TEIAS "TÜRKİYE ELEKTRİK ENERJİSİ 10 YILLIK ÜRETİM KAPASİTE PROJEKSİYONU (2011 – 2020)"

Figure 2.1.1-6 Daily Load Curves in 2010 on Monthly Basis

[2] (Maximum Power Demand [MW] – Minimum Power Demand [MW]) ÷ Maximum Power Demand [MW] × 100 [%]
[3] Regarding Energy efficiency Strategy Paper 2012-2023, refer to 2.1.2 (1) 3)

(3) Final Energy Consumption

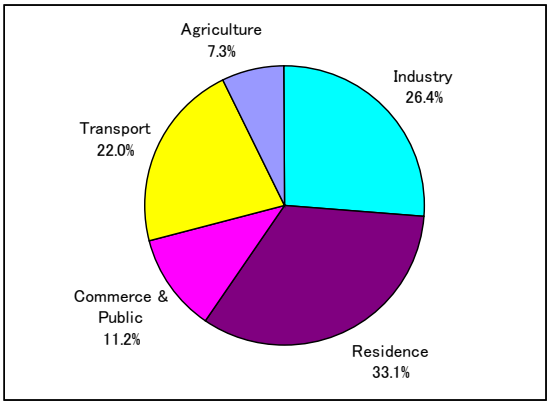
Electricity consumption by sector during 1990-2010 is shown in Figure 2.1.1-7. The consumption of public and residential sectors in 2010 has become 5 times as much as that in 1990. The consumption of commercial sector increased 11 times as large as that of 1990.



Source: Prepared by JPOWER from TEDAS "TURKIYE ELEKTRIK DAGITIM VE TUKETIM ISTATAISTIKLERI 2010"

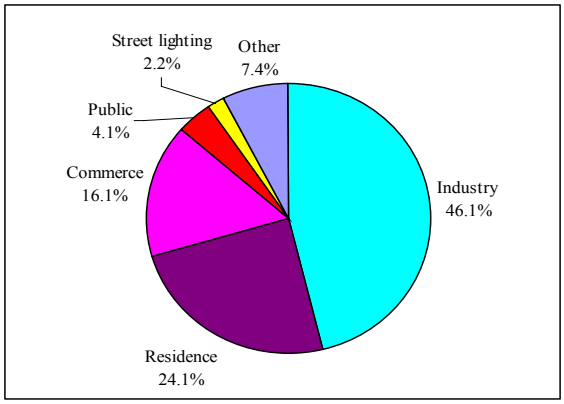
Figure 2.1.1-7 Developments in Electricity Consumption by Sector

The energy consumption and electricity consumption by sector are shown in Figure 2.1.1-8 and -9. The energy consumption of building sector ("Residence" and "Commerce and Public") occupies 44% of all sectors. The electricity consumption of building sector occupies 44% of all sectors and that of public building sector occupies 4%.



Source: Prepared by JPOWER from IEA 2010 Data

Figure 2.1.1-8 Energy Consumption Ratio by Sector



Source: Prepared by JPOWER from TEDAS "TURKIYE ELEKTRIK DAGITIM VE TUKETIM ISTATAISTIKLERI 2010"

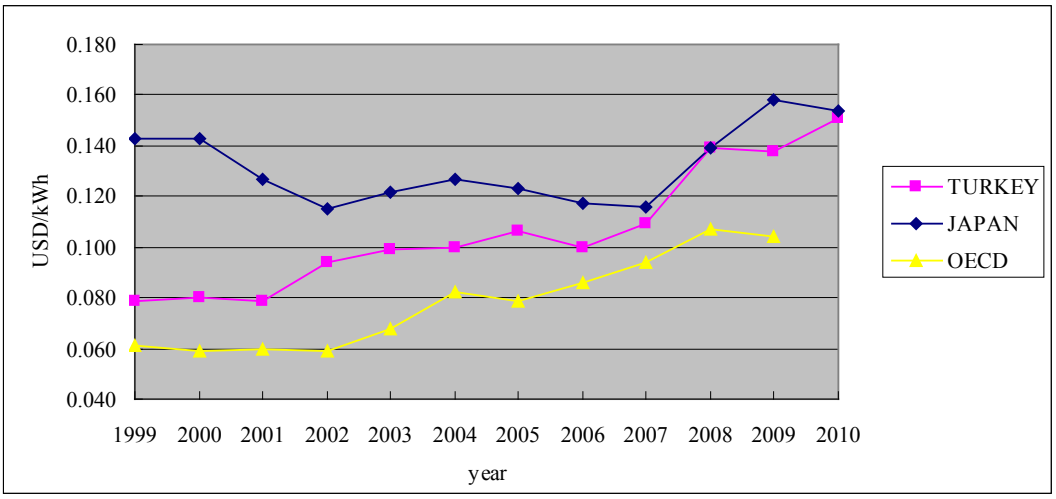
Figure 2.1.1-9 Electricity Consumption Ratio by Sector

(4) Energy Prices

1) Electricity

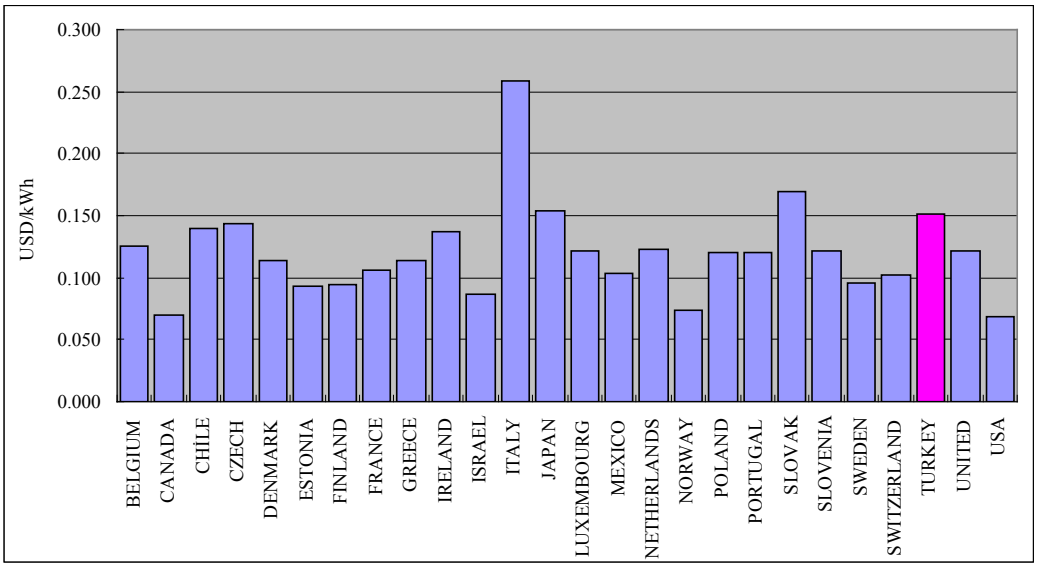
Changes in electricity prices for industry and comparison of electricity prices for industry in OECD (Organization for Economic Co-operation and Development) countries in 2010 are shown in Figure 2.1.1-10 and -11.

These figures show that Turkey's electricity price is increasing and is more expensive than those of OECD countries and as expensive as that of Japan. It is twice as expensive as that in 1999.



Source: Prepared by JPOWER from TEIAS "Electricity Prices of OECD Countries"

Figure 2.1.1-10 Changes of Electricity Prices for Industry



Source: Prepared by JPOWER from TEIAS "Electricity Prices of OECD Countries"

Figure 2.1.1-11 Comparison of Electricity Prices for Industry in OECD Countries in 2010

Recent electricity tariff in Turkey is shown in Table 2.1.1-3.

Table 2.1.1-3 Electricity Tariff without any Funds as of 1st April 2012 (Abstract)

Consumers connected to the transmission switch areas with a single MV electric line of the Distribution Company							
Consumers buying from Distribution Companies							
	Capacity		**Active Energy**				**Reactive Power**
	Power Cost	**Excess Power Cost**	**Single Term**	**Day Hours**	**Peak**	**Night Hours**	
	kr/M/kW	**kr/M/kW**	**kr/kWh**	**kr/kWh**	**kr/kWh**	**kr/kWh**	**kr/kVARh**
Double Term Tariff							
Industry	160.397	320.793	20.590	20.481	33.419	11.152	13.188
Single Term Tariff							
Industry			21.327	21.216	34.429	11.688	13.188
Commercial and other							
Commercial			26.458	24.827	38.071	15.276	13.188
Other 1(covers public buildings)			26.458	24.827	38.071	15.276	13.188
Other 2			26.458	24.827	38.071	15.276	13.188
Agricultural irrigation			22.414	21.334	35.228	11.316	13.188

Source: Prepared by JPOWER from EMRA" Tariff without any Funds as of 1/4/2012"

According to the above electricity tariff, electricity price of public buildings, including tax and levies, is TRY (Turkish Lieasi) 0.34/kWh approximately USD 0.91/kWh (TRY 1 = USD 0.566 basis).

As it is seen Table 2.1.1-4, electricity tariff of public buildings increased by 128 % in last 4.5 years.

Table 2.1.1-4 Electricity Price Increases (kr/kWh)

Tariff Period	**Residential**	**Industry (OG)**	**Industry (AG)**	**Commercial**	**Other 1**	**Other 2**	**Martyr-veteran families**	**Development Priority Regions.**	**Agricultural Irrigation**	**Illumination**
01.01.2007 - 31.12.2007	12.405	11.518	11.629	14.505	11.600	11.969	7.94	11.600	11.187	12.002
01.01.2012 - 31.03.2012	23.734	20.116	21.479	25.386	24.159	24.860	13.884	23.734	20.665	22.658
01.04.2012 - 30.06.2012	25.886	21.855	23.687	26.458	26.458	26.458	13.893	25.886	22.547	24.729
Increase versus according to 31.12.2007 (%)	108.68	89.75	103.68	82.41	128.09	121.06	74.97	123.16	101.54	106.04

Source: Chamber of Mechanical Engineers "TÜRKİYE'NİN ENERJİ GÖRÜNÜMÜ",updated version-July 2012

Reactive power surcharge system is applied in electricity tariff except for small customers, which corresponds to Japanese power factor incentive and disincentive tariff scheme. Both leading and lagging reactive powers are monitored in Turkey. Besides, only lagging reactive power is monitored in Japan. And surcharge system for leading reactive power is introduced in Turkey. As a result, many customers manage power factor by installing automatic power factor compensators in Turkey.

2) Natural gas

As a reference, the natural gas tariff of Başkent Doğalgaz Dağıtım A.Ş., which is the distribution company in Ankara, is shown in Table 2.1.1-5.

Table 2.1.1-5 Natural Gas Tariff as of July 2012

Customer Group	TRY / m^3	VAT	TRY/ m^3 (VAT included)
Residential	0.822769	18%	0.970867
Official	0.822769	18%	0.970867
Eligible Customer	0.687533	18%	0.811289
Industrial	0.687533	18%	0.811289
Compressed Natural Gas Station	0.687533	18%	0.811289

Source: Prepared by JPOWER from Başkent Doğalgaz Dağıtım A. Ş. Website

In Turkey, the customers who consume natural gas 300,000m^3/year or more are defined as "Eligible Customer". And Eligible Customers can choose gas supplier freely. In the case of target buildings of 100 Buildings Project, consumers who use natural gas 300,000m^3/year or more are also defined as "Eligible Customer" and the unit price of natural gas is TRY 0.811289 /m^3 (USD 0.459 /m^3) [4]. On the other hand, consumers who use less than 300,000m^3/year are defined as "Official" and the unit price of natural gas is TRY 0.970867 /m^3 (USD 0.550 /m^3).

The price level of gas in Japan, USA, UK and France is approx. USD 200~460/10^7kcal (approx. USD 0.20~0.46/m^3), and Turkey is approx. USD 460/10^7kcal (approx. USD 0.46/m^3). It is difficult to compare the international gas price simply, since the cost of gas is composed by various elements. However Turkey's natural gas price is roughly as same level as those of developed countries, in spite of the lower purchasing power parity.

(5) Greenhouse Gas Emissions

The overall Greenhouse Gas (hereinafter referred to as "GHG") emissions for the year 2010 as CO_2 equivalent was 401.9mil. tons. In total 2010 emissions, the energy sector had the largest portion with 71%, and the industry sector with 13% was following. GHG emissions in OECD countries slightly decreased in the period from 1990 to 2010. On the other hand, GHG emission in Turkey increased 115%, which makes the Turkey the 2nd biggest rank in OECD

[4] TRY 1= USD 0.566

countries. CO_2 emission per capita was 5.51 tons/capita in 2010, while it was 3.39 tons/capita for the year 1990[5].

The EU member countries have agreed on the numerical target of reduction of GHG by 20% by 2020 compared with 1990 on December 12, 2008. This target becomes a heavy burden on Turkey, which intends to join EU. To achieve this target, about 60% of the present CO_2 emission needs to be reduced. This reduction volume means 180 mil. tons equivalent to CO_2. And the necessary investment is estimated to be TRY 20 bn. by 2020, assuming the necessary unit investment cost as TRY 100/t-CO_2[6]. The Turkish needs for financial support and technical assistance are considered to be very high to reduce CO_2 by introducing EE&C and RE.

(6) Conclusion

Turkey's energy demand is increasing and the growth of economy is almost 10%/year. Especially, electricity demand of building sector, including office buildings and commercial buildings, and residential sector is increasing rapidly. One of the reasons is increase of cooling requirement and AC use for cooling in Turkey. This trend is supposed to continue in the future. In addition, Turkey's electricity price is also increasing in recent years and it's annual increasing rate is more than 20 % in last 4.5 year. Energy price has already reached to the same level of EU and Japan. On the other hand, expensive energy price produces positive economic impact for energy conservation. In this context, the potential for energy conservation in building sector is considered to be large.

Natural gas demand has also increased continuously and is expected to reach 70 bn. m^3 in 2030. Besides natural gas consumption in building sector including residential sector has been almost flat. It is mainly used for heating, hot water supply and cooking. Since Turkey's self-sufficiency rate of natural gas is only 2% in recent years, fluctuation of the import gas price significantly influences the selling price. The effective use of natural gas is also very important for Turkey.

2.1.2 Energy Policy and EE&C Policy in Turkey

The main primary objective of Turkish energy policy has been expressed by MENR as meeting the ever-increasing energy demand in a reliable, sufficient, timely, economic, and environmentally sound manner so as to realize the economic and social development targets

(1) Policy on EE&C and Target

a) The energy sector in Turkey has some bottlenecks such as i) the higher energy demand increase ii) the higher energy intensity (units of energy input per unit of GDP (Gross Domestic Product) than that of comparable similar countries, iii) very high dependency on

[5] TurkStat Press Release , No: 10829 , 01/06/2012

[6] Estimation by J-POWER

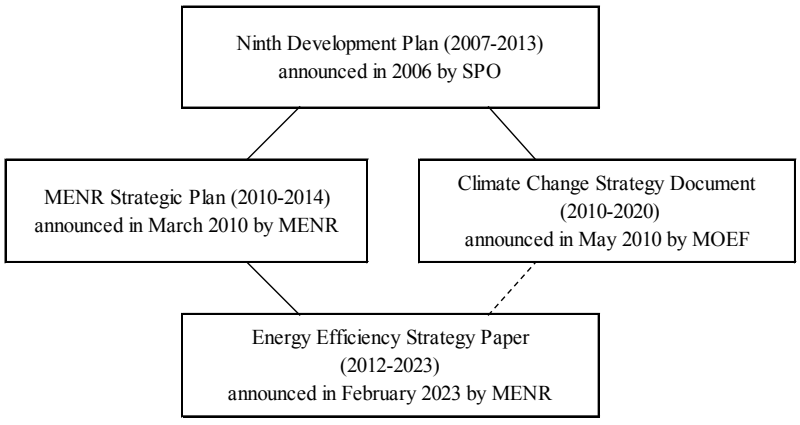
foreign resources that is the important reason of foreign trade deficit, and iv) sharply increasing per capita CO_2 emission. In order to cope with these issues, Turkish government puts high priority on EE&C that the energy will be used in the most efficient and economical manner at all stages from generation to final consumption, while the energy required for economic development will be supplied in a continuous and secure manner at minimum cost[7].

b) Though the importance and effectiveness of EE&C have been recognized since 1980s, actions on ground level have not been taken widely. The systematic and comprehensive approach for EE&C was introduced with EVK in 2007. Two circulars of 2008/2 and 2008/19 on the efficient usage of the energy in public sector have been issued by prime minister respectively. According to circulars, 2008 has been announced as the Energy Efficiency Year and energy efficiency awareness campaigns have been launched.

c) The Government set concrete target of EE&C as energy intensity to be reduced by 10% from the 2008 level by 2015, and reduced by 20% by 2023[8].

In order to reach the above target, MENR developed "Energy Efficiency Strategy Paper 2012-2023" a kind of road map containing action plan time-bounded in 10-year horizon. In this paper, it is stated that "annual energy consumption in the public buildings and facilities shall be reduced by 10% by the year 2015, and by 20% by the year 2023." Actions to be taken for this target are explained in 2.1.3.

Policy framework of energy conservation in Turkey is shown in Figure 2.1.2-1 and legal framework of energy conservation for buildings in Turkey is shown in Figure 2.1.2-2.



Note: former MOEF's function was shifted into present MOEU

Figure 2.1.2-1 Policy Framework of Energy Conservation in Turkey

[7] The Ninth Development Plan 2007-2013 approved by Turkish Grand National Assembly states that "Energy will be used in the most efficient and economical manner at all stages from generation to final consumption."

[8] Strategic Plan 2010-2014, MENR

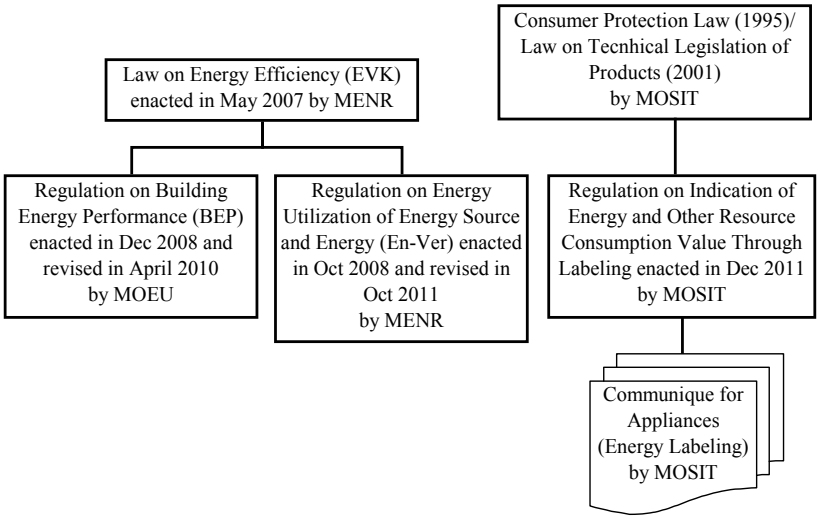


Figure 2.1.2-2 Legal Framework of Energy Conservation in Building Sector

1) Ninth Development Plan (2007- 2013)

Following statements have been placed in the Ninth Development Plan (2007-2013).

"The energy usage would have to be in a most efficiently and economical way in each level from the production to the final consumption"

The main contents of energy sector in Ninth Development Plan are as follows;

a) Target of energy demand[9]

The average annual increase of primary energy demand is projected as 6.2% during the target period, besides the growth rates of GDP and industry are 7.0% and 7.8% respectively. The ratio of increase of primary energy demand to GDP (Energy Elasticity) is 0.89 (= 6.2 / 7.0), which is good target figure for EE&C because of lower than 1.0[10].

b) Improving energy infrastructure[11]

Expected developments on energy resource, energy supply and electricity generation are described in detail in the plan, promotion of EE&C and conservation is indicated with the following description as mentioned before.

"Energy will be used in the most efficient and economical manner at all stages from generation to final consumption".

2) Climate Change Strategy Document 2010-2020

This Document was accepted by the Decision of High Planning Council (hereinafter referred

[9] Paragraph No. 331 and 341 of the Ninth Development Plan (2007 – 2013)
[10] Energy Elasticity below 1.0 is said to be a first step for energy efficient society for developing countries
[11] Paragraph 405 of the Ninth Development Plan (2007 – 2013)

to as "HPC") dated 3 May 2010 and numbered 2010/8, energy and power sectors are the sectors in which a considerable parts of targets of CO_2 emission limits, efficiency and renewable will be achieved. Climate Change National Action Plan (2011-2020) to implement this strategy has announced and Climate Change Department of MOEU was responsible for monitoring implementation. According to the Climate Change Strategy Document, following strategies defined as relevant with building sector in energy sector[12].

a) Short term

- Energy performance certificate (EPC) shall be introduced for new buildings.
- Renewable energy systems will be installed at new buildings, with an initial investment cost consistent with energy economics, with payback periods of 10 years for new buildings with floor area less than 20,000 m^2 and 15 years for new buildings with floor area of 20,000 m^2 or larger.
- Solar power collectors for central heating and sanitary hot water will be installed at new hotels, hospitals, dormitories, other non-residential buildings used for accommodation purposes, as well as sports centers with a usage area of more than 1,000 m^2.

b) Medium term

- Energy efficiency potential in the building sector shall be evaluated and realized at maximum levels; priority projects on energy efficient construction materials and technologies will be identified in cooperation with industry.
- The infrastructure for the introduction of EPC practices will be developed for existing buildings and heat isolation and other efficiency increasing measures will be encouraged.
- Energy management in compliance with standards shall be ensured in the industrial and building sectors by certified energy managers.
- Use of low and zero greenhouse gas emission technologies, primarily renewable energy and clean coal technologies, as well as nuclear energy, shall be fostered, R&D activities on clean technologies and energy resources shall be carried out and domestic industries shall be supported in these ventures.
- Use of new and alternative fuels in increasing levels shall be supported together with market incentives and penetration strategies for this purpose.

c) Long term

- By 2020, energy intensity shall be decreased with reference to 2004 levels.
- Improvements shall be ensured in energy consumption at existing public buildings and facilities.

3) Energy Efficiency Strategy Paper 2012-2023

The Energy Efficiency Strategy Paper 2012-2023 was formulated as a road map of Turkish energy efficiency area with a strategic and dynamic point of view. Main target is to

[12] http://iklim.cob.gov.tr/iklim/AnaSayfa.aspx?sflang=en

decrease at least 20% of energy consumption intensity per GDP in 2023. However baseline is not indicated. It also aimed to define a hierarchical set of particulars consisting of the main target, seven strategic purposes, strategic targets and activities. It also describes the responsibilities of the authorities to be undertaken during this process. The Strategy Paper was approved by HPC which is headed by the prime minister, and published in the Government Gazette on February 25, 2012. Therefore, necessary actions must be taken by relevant authorities for reaching these targets. The activities and progress of work will be reviewed by the Energy Efficiency Coordination Board (hereinafter referred to as "EECB") at least once a year. The Strategy Paper will be thoroughly examined and updated every four years.

Relevant contents from the Energy Efficiency Strategy Paper in connection to building sector energy efficiency are summarized in time horizon table form in Table 2.1.2-1. Explanatory notes of major contents are provided in the following section (Refer to 2.1.3 (1) 2).

Table 2.1.2-1 Road Map (Summary of Activities) 2012-2013 in Promotion of Building Sector EE
(Excerpts from Energy Efficiency Strategy Paper 2012-2023)

	Activities	Procedures	Responsible	Collaboration	2012.2 2012	2013	2014.2 2014	2015.2 2015	2016	2017.2 2017	2018	2019	2020	2021	2022	2023.2
SP 02	Promote **sustainable** environment friendly buildings				10 years											
ST 01	Heat insulation and energy efficient heating systems for all commercial & service buildings more than 10,000m2	**MOEU has two ongoing projects: 1) UNDP/GEF 2) TUBITAK/ MOEU**			TUBITAK Study on BEP/ TR methodology 1yr (by mid-2013)	10 years										
A 01	Encourage maximum energy requirement and maximum emission limitations for buildings	BEP Specifications to be revised	MOEU	MENR, Turkish Standard Agency	36 months											
					UNDP Buildings EE Project: BEP Regulation Review (by 2015)											
A 02	Administrative sanction on buildings with carbondioxide emissions exceeding the minimum amount defined in the related legislation by the year 2017	Preparation of bill to revise related laws, secondary legislations	MOEU	MENR	24 months (framework)											
					Regulation on Monitoring of CO2 (Issued 24/4/2012)											
ST 02	1/4 building stock in the year 2010 shall be made as **sustainable** building	**No data available for 2010: The latest buildings data with energy consumption is 2000 cennsus done by TUIK**			Urban Transformation Law (Bill passed on May 17 2012 in parliament)											
					10 years											
A 01	Commercial buildings and luxury dwellings and residences >10.000 m2 to attribute **sustainability** as of the date of 18 months following the issue of license (by 2017)	Secondary legislation arrangements	MENR MOEU	Local authorities	Study on Urban Transformation	Implementation of urban transformation projects										
					Study on standard "Sustainable Buildings"											
					12 months (framework)				by 2017							
A 02	For public housing projects, at least 10% of the dwelling cost shall utilize RE sources, cogeneration or microgeneartion	Energy Efficiency Law and in the related laws and the secondary legislation arrangements,	MENR	MOEU	12 months (framework)											
SP 06	To use energy effectively and efficiently in the public sector				10 years											
ST 01	Decrease annual energy consumption in the public enterprises buildings and facilities	**MOEU will submit report of 100 Buildings Project to PM, which could make the implementation compulsory**	**MOEU's 100 Buildings Project has no command over other ministires in their implementation of EE retrofit investments. ⇒MOEU will report the result to MOD,UT and PM**				Decrease by 10% (by 2015)									Decrease by 20% (by 2023)
A 01	Efficiency improvement of public sector buildings	Revise Prime Ministry circular 2008/2 *			12 months											
		Make internal legislation arrangements in public sector	Public sector	MENR, EVD, MOD, MOF		12 months										
A 02	Public procurement of commodities, services and construction works shall meet the minimum efficiency criteria defined by the Ministry	Preparations of the bill in parliament related to making changes in the Energy Efficiency Law and other related laws or the secondary legislation arrangements	MENR, MOF, Public Procurement Authority	Ministry of Science, Industry and Technology (MSIT)		24 months										
A 04	Energy Performance Agreements with EVDs for public enterprises and establishments		MENR, MOF, Public Procurement Authority	MOD	12 months (framework)											
SP 03	Market transformation of EE products															
ST 01	Lamps, refrigerators and electrical motors by end-2012; and heating/ cooling systems and other EE products in parallel to EU implementations	EU Directive 2010/30/EU on energy labeling, EC regulation 2009/125/EC on environmentally-conscious design shall be published in Offical Gazette			by end-2012											
A 01	Limit sales of energy inefficient goods	Application arrangements by product group (regregerator, lamp, TV, external power supply, electrical motors), etc.	MSIT	MENR, TWGMA	3 months (by 2012.5)											

Notes: SP: Purpose; ST: Target; A: Action; TWGMA: Turkish White Good Manufacturer Association

*The efficiency improvement projects shall be prepared by making energy audits in the buildings and facilities of the public enterprises and the budget allowances of the maintenance shall be used for these projects with priority. GDRE(MENR) will conduct energy audits by 2013 of all public buildings >10,000m2 according to Temporary Article 5, and Article 30 of EE Regulation No. 28097 issued 27/10/2011.

(2) Related Law and Regulations

1) EE (Energy Efficiency) Law: EVK May 2007

EVK (Law on Energy Efficiency) aims to increase the efficient use of energy and energy resources for reducing the burden of energy costs on the economy and protecting the environment. This law comprises the organization, principals and procedures for increasing energy efficiency in industry, power plants, transmission and distribution system, buildings, and service and transport sectors. It sets the rules for energy management in industry and in large buildings, project supports, energy efficiency consultancy companies, voluntary agreements and so on.

2) Building EE Regulation: BEP (Regulation on Building Energy Performance), December 2008, amendment in April 2010

EPC by MOEU imposes minimum performance criteria and standards for building structure, heat insulation, heating and cooling system and electric appliances. Furthermore, central heating is compulsory for new buildings with floor area of more than 2,000m^2. As of January 2011, EPC will be issued under BEP in order to indicate energy consumption and CO_2 emissions for new buildings. Construction permit will not be granted to new buildings which are rated D or lower on their EPC. For all existing buildings, EPC must be obtained by May 2017. (Refer to 2.1.3 (2) in details)

3) EE Regulation: En-Ver (Amended in October 2011)

a) Article 6 and Annex 5: Enforcement of EVD

To strengthen EVDs' capacity to accelerate EE&C retrofitting and energy management of buildings, the following statements are placed.

- License of EVD is classified into 2 sectors of industry and building
- License of EVD for industry sector is classified into 6 sub-sectors of iron and steel-making, chemical and petro chemistry, stone, soil and mining, paper and textile, food, and transportation vehicles industry. EVD has to register experts in the target sub-sectors respectively.
- License of EVDs for building sector is classified into 2 sub-sectors of residence, and commercial and service building.
- EVDs have to employ 3 to 19 specialists according to the specified sectors and sub-sectors. And in the new circular (2012), in order to get a license of EVD in building sector, it is required to register at least two certified engineers with 5-year experience and one engineer with 10- year experience in building sector.

b) Article 9: Appointment of energy manager

The managements of commercial buildings and service buildings with total floor area of minimum 20,000 m^2 or with total annual energy consumption of 500TOE and more and the managements of government buildings with total floor area of minimum 10,000 m^2 or

with total annual energy consumption of 250TOE and more shall appoint a certified energy manager or shall receive service from firms with a certified energy manager.

c) Article 10: Implementation of energy audit of designated factories and buildings

Energy audit has to be conducted every 4 years for enterprises of more than 5,000TOE in annual energy consumption and commercial buildings of more than 20,000 m^2 in total floor area.

d) Article 30,31and Temporally Article 5: Energy audits

Within three years from the effectiveness date of En-Ver (Regulation on Efficiency Utilization of Energy Sources and Energy) (by October 2011), energy audits shall be conducted for public buildings and enterprises required to appoint energy managers, on all matters relating to heat isolation, heating, cooling and hot water systems, lift and lighting system etc., and the energy audit report shall be prepared for the implementation of measures specified in these audits.

Energy efficiency projects, which were prepared and/or implemented by the establishments and institutions in the public sector, shall be reported to General Directorate of Renewable Energy (hereinafter referred to as "GDRE").

4) Regulations for energy efficiency labeling/standard

a) Outline of energy efficiency labeling scheme

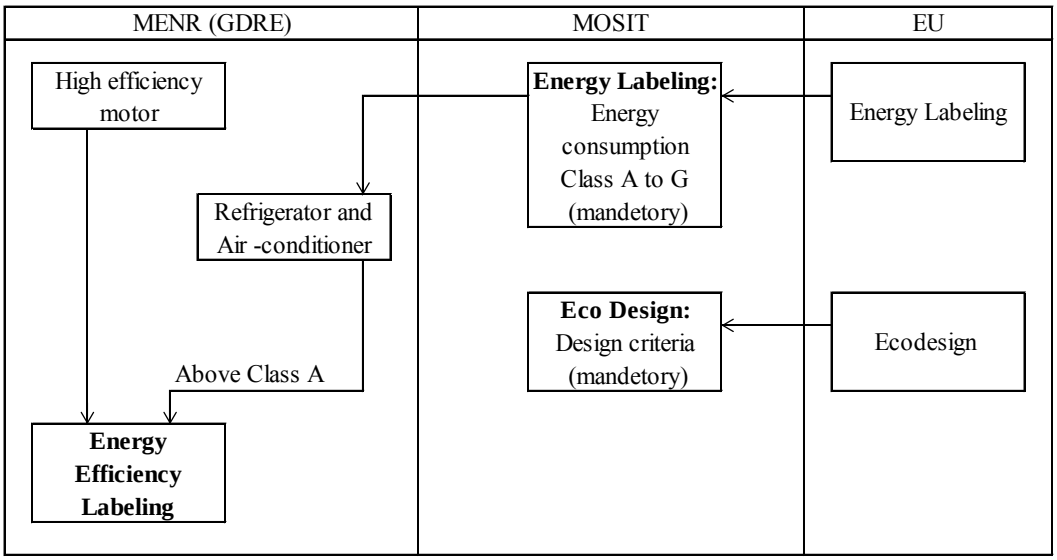
In line with "EU Directive 2010/30/EU on the Indication by Labeling and Standard Product Information of the Consumption of Energy and other Resources by Energy-Related Products", Turkish "Regulation on the Indication of the Energy and other Resources Consumption Values of Products through Labeling and Standard Product Information" was published in Government Gazette on December 2, 2011 and became effective on the same day.

There are several types of energy efficiency certification system of energy-consuming products in Turkey. Firstly "Energy Labeling" and secondly "Eco design", transposed from EU Directives.

"Energy Labeling" program indicates energy efficiency performance of home appliance and energy consuming equipments with 7 classes of A to G. By referring this Energy labeling, consumers can select high efficient appliances and equipments. "Eco Design" program specifies not only the design criteria for energy efficiency but also for environment protection. The responsible ministry for Energy Labeling and Eco Design is Ministry of Science, Industry and Technology (hereinafter referred to as "MOSIT").

Besides another "Energy Efficiency Labeling" program which is called "ENVER ETİKETİ" will be managed by GDRE as voluntary basis in accordance to the Energy Efficiency Regulation Article 21. The targets of his scheme are refrigerators and ACs above Class A and motors above IE3 (in accordance to EN60034-30 standard) class

(Refer Figure 2.1.2-3). However this scheme has not yet been initiated as of December 2012.



Source: JICA Study Team, hearing from MOSIT and GDRE

Figure 2.1.2-3 Relationship of Energy Labeling Programs in Turkey and EU

b) Energy Labeling for AC

In EU area, several regulations for energy consuming appliances have been developed and issued. One of noteworthy examples is labeling for ACs: Commission Delegated Regulation (EU) No 626/2011, supplementing the above mentioned Directive 2010/30/EU with regard to energy labeling of air conditioners. This Regulation introduces two energy efficiency scales, namely, Seasonal Energy Efficiency Ratio (hereinafter referred to as "SEER") for cooling and Seasonal Coefficient of Performance (hereinafter referred to as "SCOP") for heating.[13] ACs are used mainly in part-load conditions, and this new efficiency scales can take into account the benefits of the inverter driven technology and the conditions in which these appliances are used.

Besides, Eco Design gives the certificates to the energy efficiency products, which are A level or more of Energy Labeling. Review of the levels is been carrying, and consequently, split, window and wall ACs should have a new A-G energy efficiency class scale with a '+' added on the top of the scale every two years until the A+++ class has been reached. This Regulation should ensure that consumers get more accurate comparative information about the performance of ACs. The Regulation will be applied from 2013.

And Energy Label is spread in the market and about 80% of ACs are labeled with A rank, (hearing from MENR, MOEU, and manufacturers).

[13] SEER or SCOP; SEER or SCOP = STL / SEC. STL means the total heat load in cooling period or in heating period respectively. SEC means the total energy consumption for cooling in cooling period or for heating in heating period respectively.

And also new labeling program in accordance with EU Directive 626/2011 will be introduced in 2013 or 2014, after the analysis of climate condition in Turkey[14] (hearing from MOSIT and manufacturers). Several manufacturers in Turkey are printing this SEER values on their product's leaflet in advance. (See Table 2.1.2-2)

Table 2.1.2-2 Energy Efficiency Certification of Products in EU and Turkey

DIRECTIVE / REGULATION	PUBLISHED IN TURKISH OG REF. DATE & NO.
ENERGY LABELLING	
2010/30/EU Framework Labelling Directive	**02.12.2011 / 28130**
• 94/2/EC – Refrigerators • **(1060/2010)**	30.1.2010 / 27478 **22 June 2012 / 28331**
• 95/12/EC – Washing Machines, 95/13/EC, Tumble Driers, 96/60/EC Washer Driers • **1061/2010 – Washing Machines**	3 separate regulations published in Turkish OG on the same date: 95/12/EC: 20.8.2002 / 24852 95/13/EC: 20.8.2002 / 24852 96/60/EC: 20.8.2002 / 24852 **22 June 2012 / 28331**
• 97/17/EC – Dishwashers • **(1059/2010)**	20.8.2002 / 24852 **22 June 2012 / 28331**
• 98/11/EC – Lamps	20.8.2002 / 24852
• 2002/31/EC – Air conditioners • **(626/2011)**	11.6.2007 / 26549 **???????**
• 2002/40/EC – Electric Ovens	26.2.2003 / 25032
• **1062/2010 – TV**	**22 June 2012 / 28331**
• **392/2012 – Tumble Driers**	**IN PROGRESS**
ECODESIGN	
2009/125/EC Framework Eco-design Directive	**7.10.2010 / 27722**
• 1275/2008 – Standby/Off	27.8.2011 / 28038
• 107/2009 – Simple Set Top Boxes	27.8.2011 / 28038
• 244/2009 – non-directional household lamps	27.8.2011 / 28038
• 245/2009 – tertiary lighting	27.8.2011 / 28038
• 278/2009 – External Power Supplies	27.8.2011 / 28038
• 641/2009 – Circulators	23.9.2011 / 28063
• 642/2009 – Televisions	23.9.2011 / 28063
• 643/2009 – Refrigerating appliances	23.9.2011 / 28063
• 1015/2010 – Washing Machines	23.9.2011 / 28063
• 1016/2010 – Dishwashers	23.9.2011 / 28063
• 640/2009 – Electric Motors	07.02.2012 / 28197
• 206/2012 – Air Conditioners	**IN PROGRESS**
• **327/2011 – Electric Fans**	**????????**
• **547/2012 – Water Pumps**	**????????**

Source: GDRE

5) Prime Ministry Circulars

Two Prime Ministry Circulars 2008/2 and 2008/19 on the Efficient Usage of the Energy in Public Sector were issued in 2008. Within the scope of the first circular, the EE&C measures to be implemented by public organizations have been defined by legislation and issued on the website of the former General Directorate of Electrical Power Resources Survey and Development Administration (hereinafter referred to as "EIE"). Public

[14] "Energy Labeling Program for AC" is formulated by assessing rated energy efficiency. Besides "new labeling program" is intended to introduce soon in Turkey and is formulated by assessing energy efficiency in seasonal period.

organizations must undertake these measures and report to GDRE (former EIE) in March every year. The second circular was issued in August 2008 requesting all public sector buildings to replace incandescent lamps with energy efficient compact fluorescent lamps. As a result of issuance of the second circular, 1.8 mil. lamps were replaced with a cost of TRY 11.5 mil. The saving was estimated 165GWh annually and annual electricity bill reduction was TRY 41 mil. The annual financial saving was 3.5 times of its replacement cost. The Turkish Government has the new plan to revise the first Prime Ministry Circular of 2008/2, according to the Energy Efficiency Strategy Paper 2012-2023. The Circular will be revised for public bodies to prepare energy efficiency improvement projects through energy audits, and to implement them by using budget allowances of maintenance with priority. It also requires public bodies and public institutions to enforce arrangements like internal regulations, directives, circular, instructions etc., which would guide their employees in the direction of Prime Ministry Circular.

6) Ministerial Circular (2012/1)

Ministerial Circular was issued from MENR/GDRE in June, based upon EECB decision to promote EE&C in public buildings according to the purposes/targets/activities defined under the Energy Efficiency Strategy Paper 2012-2023. All relevant ministries and institutions are obliged to report their progress to MENR/GDRE by the end-December 2012. Contents to be reported are energy improvement activities implemented during the year including those related to Purpose 07/Target 04/Activity 01 (awareness), and Purpose 06/Target 01/Activity 01 (energy efficiency improvement in public buildings), which are defined in the Energy Efficiency Strategy Paper 2012-2023. And MOEU must report the progress for setting a benchmark for energy consumption and CO_2 emission, according to Purpose 02/Target 01/Activity 01 in the Paper.

7) Other regulatory measures on energy management of buildings

In addition to the above, the following EE&C measures are implemented in accordance with EVK and En-Ver

a) Training centers for energy managers

3 training centers, to train energy managers, are operated in GDRE in Ankara, in Koceali Branch of Chamber of Mechanical Engineer Center (hereinafter referred to as “MMO”), and in Izmir Institute of High Technology. And another 3 training centers in Ankara (Gazi University), in Bursa Province, and in Kayseri Province are under construction, which have mini-plant for practical training for energy manager training course. The capacity of training of energy managers will be enforced.

b) Incentive program to promote energy conservation

32 Energy Efficiency Increasing Projects with subsidy were implemented for factories

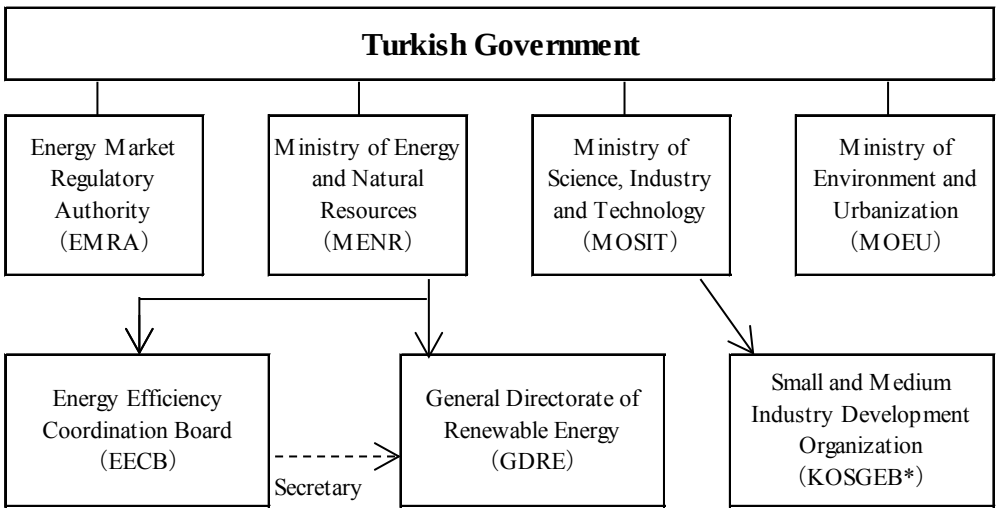
by the end of 2011 and 22 Voluntary Agreement Programs have been contracted between factories and GDRE (former EIE) and are being progressed by the end of 2011. However incentive program has not started to promote EE&C for buildings.

(3) Organizational Structure to Promote Energy Conservation

National Energy Conservation Center (hereinafter referred to as "NECC") was established in the former EIE of MENR in 1992.

NECC played the central role of EE&C promotion in Turkey and had the responsibility for EE&C promotion activity, energy audit in industry sector, EE&C advice for buildings, and management of energy manger system and energy consumption database in industry and building sectors. And NECC also took a role of secretary of EECB. EECB, which consists of senior officers in relevant ministries and agencies, takes a role of preparing national EE&C strategies, plans, and actions.

Afterwards, in accordance with the Decree KHK/662 dated 02 November 2011, EIE was closed and a new GDRE has established as dependent body under the MENR to undertake the roles of EIE except for the duty of hydraulic power generation and water usage. The administrative organization on EE&C in Turkey is shown in Figure 2.1.2-4. The EE&C measures in building sector are managed by MENR in coordination with MOEU as specified in EVK.



* KOSGEB ; an affiliated institution of MOSIT, provides subsidy for EVD project investments (including costs of trainings, energy audits and consulting fees) by SMEs

Figure 2.1.2-4 Administrative Organization on Energy Conservation in Turkey

(4) Present Condition and Issues of Policy, Legal Framework and Organizational Structure to Promote EE&C

The outline of policy, legal framework and organizational structure to promote EE&C were described above. Strategy Paper stipulates cross-cutting strategy among related ministries, and independent legal framework under each ministry has implemented. The relationship among

these is complicated and they have been restructured so often.

2.1.3 Role of MOEU within EE&C Implementation Strategy for Building

(1) Strategy

1) Reorganization of MOEU

MOEU was established as a result of merger between the former MOPWS (Ministry of Public Works and Settlement) and the former Ministry of Environment and Forestry by the re-organization of ministries in 2011.

MOPWS had initially implemented constructions and biddings for all ministries and agencies. However, some of the ministries and agencies, which own large building stocks, such as MOH (Ministry of Health) and MONE (Ministry of National Education), have eventually established their own construction team to implement their own constructions and management.

MOEU's duties are, a) to prepare, enact legislations, and conduct monitoring & control of them, and b) to prepare, introduce, and establish norms and standards of professional services (technical services) for the fields of environment, settlement, and constructions. (Article 2, (1) a), Decision No. KHK/644, Degree Law on the Organization and Role of the Ministry of Environment and Urbanization)

In particular, for public buildings, MOEU's duties are to define general conditions, strategies, and standards, to define qualities of survey and construction, and to define investment projects and procedures. (Article 10, (1) a) and b), Decision No. KHK/644, Degree Law)

As to professional services for public and private buildings, MOEU's duties are to arrange, control, and monitor services for architecture, engineering, contracting, and consultancy and to define implementation of general principles, strategies, and standards. (Article 12, (1) a) and b), Decision No. KHK/644, Degree Law)

2) Energy Efficiency Strategy Paper 2012-2023

According to the Energy Efficiency Strategy Paper 2012-2023, which GDRE prepared, (See Table 2.1.2-1) MOEU's activities for the strategy purposes and targets are as follows.

a) SP02/ST01 (SP: Purpose / ST: Target)

Purpose is to decrease energy demand and carbon emission of buildings for promoting sustainable buildings. Target is to introduce insulation and energy efficient heating and cooling systems for the commercial and service buildings with 10,000 m^2 or more of floor area.

a-1) A01 (A: Activity)

Activity is to determine the maximum of energy consumption and CO_2 emission for buildings.

MOEU's activities at present are a) to study for amending BEP-TR (Building Energy Performance - Turkish) and to amend it in commission to TUBITAK (Scientific and Technical Research Council of Turkey), b) to monitor with the established data base implementation of BEP-TR and keep records of issued EPC and authorized assessor who issue EPC and c) to accelerate the issuance of EPC through capacity buildings to be arranged in the project with UNDP (United Nations Development Program), "Buildings Energy Efficiency Project", which started one year ago.

a-2) A02

Activity is to impose sanction against buildings with CO_2 emission exceeding the minimum amount by 2017.

b) SP02/ST02/A01

Purpose is to decrease energy demand and CO_2 emission of buildings for promoting sustainable buildings. The target is to transform 1/4 of building stock in 2010, (it means approximately 2.2 mil. buildings), into sustainable buildings by 2023. Activities are to issue the licenses for buildings of commercial, service, and luxury residences with 10,000m^2 or more of floor areas.

MOEU, collecting examples of activities and experiences abroad, will start to define the sustainable building and prepare the standards.

c) SP06/ST01/A01

Purpose is to use energy effectively and efficiently in public sector. Target is to decrease 10% by 2015 and 20% by 2023 of annual energy consumption in public buildings and facilities. Activity is to implement energy audits to public buildings and facilities and to implement EE&C improvement measures by ministries and agencies in accordance with to-be-revised Circular of Prime Ministry.

MOEU's 100 Buildings Project is considered as one of the projects under this activity.

(2) Law and Regulation on EE&C

1) Regulation on Building Energy Performance (BEP)

BEP was enacted by MOPWS (Present MOEU) in December 2008. BEP was amended in April 2010 and its implementation (issuing EPC) has started in January 2011.

Purpose of BEP is to lay down the principles and essential requirements for effective and efficient use of energy and energy sources in buildings, prevention of energy waste, and protection of environment (Article 1, BEP).

BEP is applied to all buildings except for industrial buildings, temporary buildings of use

for 2-year or less, buildings of useful floor area of 50m^2 or less, and buildings without heating and cooling units. BEP specifies the design criteria, which relates to energy consumption in buildings, of building design and equipment and define the calculation methods and standards for issuing the EPC (Article 2, BEP).

The primary target of BEP is to issue EPC, and therefore it has no power to enforce the implementation of EE&C measures. And the obligations stipulated in EVK are limited, so that it does not give enough power for BEP implementations.

2) Energy Performance Certificate (EPC)

The acquisitions of EPC are obligations for all buildings of floor area of 10,000m^2 or more, except for the buildings out of scope of BEP (Article 25 (9), BEP).

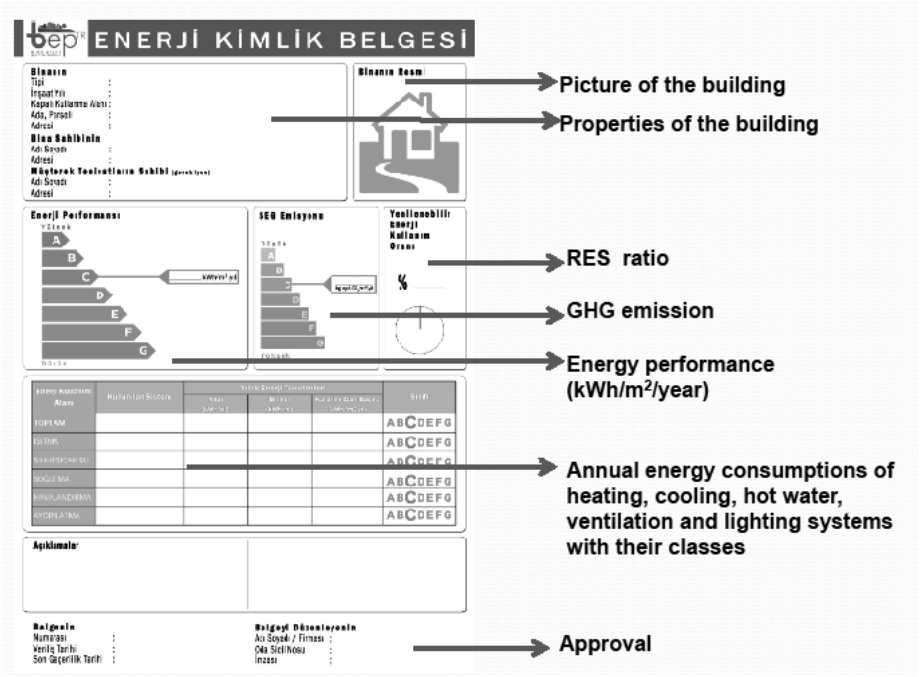
There are seven ratings, from A (the highest) to G (the lowest), in EPC. For all new buildings constructed after January of 2011, EPC scores are required to be equal or over C class in accordance with BEP (Article 27 (5), BEP). And, all existing buildings have to acquire EPC by 2017. However, there is no obligation and no incentive for up-grading the rating, except for the cases where renovation costs exceed 25% of the appraised value of the building for property taxation. Main purpose of EPC is dissemination and awareness raising for EE&C in buildings. Main evaluation index is energy intensity (i.e. energy consumption per GDP) of building by region and type (kWh/m^{2}y) (See Figure 2.1.3-1).

For the certification of both new and existing buildings, the simulation software named BEP-TR can be used online through website. BEP-TR started operation in January 2011, and was reflecting the concept of Turkish Insulation Standard TS825. The number of issuing EPC in 2011 was approximately 10,000. MOEU expects that issuance of EPC will increase at an accelerated pace in the following years.

After participating two days training for BEP-TR, trainees can get the certification of an authorized assessor who can use online BEP-TR and prepare EPC under BEP.

For new buildings, the assessors who prepare EPC are selected from the design office employees, and for existing buildings, the assessors are selected from the EVD company employees.

There are several problems about BEP-TR, such as data-input is complicated, calculation data is cancelled in case that there is something wrong in online application. MOEU requests TUBITAK to improve BEP-TR and to make it more users friendly.



Source: Residential Energy Saving Opportunities, Energy Efficiency Conference, June 3-4.2010, Prof. Dr. Sermin Onaygil, Istanbul Technical University

Figure 2.1.3-1 Form of Energy Performance Certificate (EPC)

3) Urban Transformation Law

Urban Transformation Law was enforced in May 2012. Both earthquake resistant and energy efficient buildings will be promoted in accordance with the law.

In accordance with the law, each ministry and agency will be obliged to implement bidding and construction of its own buildings. Besides, there is a grace period not exceeding three years set forth in the law, during which MOEU could also implement bidding and constructions on behalf of the other ministries. Main responsibility of MOEU is post-construction monitoring of buildings as well as the law enforcement. Japanese technical assistance is further required to promote earthquake resistant and energy efficient buildings.

(3) Project

1) 100 Buildings Project

MOEU intends to go ahead with 100 Buildings Project as the first step for promoting EE&C in public buildings in order to comply with EVK. Under this Project, 100 buildings including main buildings of ministries, schools, nursing homes and hospitals in Ankara were selected and EE&C audits will be conducted in commissions of EVDs. Through the audits, energy consumption data will be collected, the data will be analyzed, EE&C improvement measures will be proposed, and EPC will be issued by using BEP-TR. The indicative list of 100 buildings is shown in Table 2.1.3-1. Targeted buildings have been re-selected several times.

The results of the project will be reported to Prime Ministry (PM), Ministry of Development (MOD), and Undersecretariat of Treasury[15] (UT). Since MOEU has no enforceable power for EE&C improvement works of each ministry and agency, the Ministry planned to utilize the power of Prime Ministry Circular to enforce the improvement works by each ministry and agency[16]. However the bid to select EVDs to carry out energy audits & prepare EPCs of 100 public buildings was cancelled twice, because of some technical reasons.

Table 2.1.3-1 Indicative List of Selected Public Buildings for 100 Buildings Project[17]

NO.	NAME OF INSTITUTION AND ORGANIZATION	QUALITIES OF BUILDINGS					TOTAL
		OFFICE	HOTEL/ HOSPITAL	SHOP/ RESTAURANT	HALL	OTHERS	
1	RADIO AND TELEVISION HIGH COUNCIL	1					1
2	CONSTITUTIONAL COURT	1					1
3	NATIONAL ACCOUNTING	2				1	3
4	MINISTRY OF FOOD, AGRICULTURE AND HUSBANDRY	7					7
5	SOCIAL SECURITY INSTITUTE	7					7
6	SUPREME COURT	2					2
7	MINISTRY OF CULTURE AND TOURISM	5	1		3		9
8	CAPITAL MARKETS BOARD OF TURKEY	1					1
9	TURKISH STATISTICAL INSTITUTE	1					1
10	MINISTRY OF FINANCE	9		1			10
11	MINISTRY OF INTERIOR	5			1		6
12	COUNCIL OF HIGHER EDUCATION	6					6
13	MINISTRY OF FOREIGN AFFAIR		1				1
14	MINISTRY OF TRANSPORT	6		1			7
15	MINISTRY OF JUSTICE	2					2
16	MINISTRY OF FOREST AND WATER WORKS	4					4
17	MINISTRY OF NATIONAL DEFENSE	2	6				8
18	GENERAL DIRECTORATE OF TURKISH RADIO AND TELEVISION	7					7
19	MINISTRY OF ENERGY AND NATURAL RESOURCES	9			1	1	11
20	COMPETITION AUTHORITY	1					1
21	MINISTRY OF ENVIRONMENT AND URBANIZATION					1	1
22	MINISTRY OF HEALTH		1				1
23	TURKISH ELECTRICITY DISTRIBUTION COMPANY	2	1				3
TOTAL		80	10	2	5	3	100

Source: MOEU

2) 1000 Buildings Project

Referring to the results of 100 Buildings Project, MOEU has an idea to formulate new projects such as 1000 Buildings Project which can cover the government buildings all over Turkey[18].

(4) Activity to Raise Awareness and Database of Building Information

The hearing results from Energy Efficiency Department and Geographical Information System

[15] At present, MOEU has no plans to report the results of the project directly to local governments, but would naturally present it at the next Energy Efficiency Congress, which is held every year. MOEU currently has information exchange with local governments through the training of BEP-TR. Cooperation with local governments should be strengthened further through this channel.

[16] Information acquired through interview with the Energy Efficiency Department of MOEU in May 2012

[17] As of Oct. 2012

[18] Information acquired through the interview with MOEU.

General Directorate in MOEU about MOEU's activity to raise awareness for EE&C through website and the database of Turkish building information are described below.

1) Awareness for EE&C

It is indicated during the discussions that awareness program of EE&C for the public is not sufficient. MOEU plans to raise awareness by showing the process and results of the 100 Buildings Project to the general public. In addition to this, activities identified under the Energy Efficiency Strategy Paper 2012-2023 would also be implemented for awareness raising.

2) Website

IT Department of General Directorate of Geographical Information Systems in MOEU develops and operates website of the MOEU. The department has enough (about 10) staffs and enough technical infrastructure for the website. At present, the template of EE&C website has completed and the operation started. (http://www.beg.gov.tr/sss/php)

The present problem is lack of technical contents to keep updated. To begin with, it should be updated on the regular bases with the information to be obtained from the 100 Building Project and activities under Energy Efficiency Strategy Paper.

3) Building database

In Turkey, several organizations collect statistical data for buildings independently.

a) TurkStat has a database of the number of buildings.

b) GDRE has a database for public buildings regarding building structure and consumed energy annually. (Over 10,000m^2 public buildings should filled application form through website of GDRE every year.)

c) MOEU has a plan to prepare its own database, including insulation data and other information of buildings utilizing the information from issued EPC and building inspection database, for the promotion and awareness raising to promote EE&C.

In addition, Ministry of Interior has a plan to formulate the project, "e-government", to integrate all databases.

(5) MOEU's Activities and Problems

In accordance with EVK, MOEU enacted BEP, obligates to acquire EPC for all buildings over a certain floor area, and intends to improve and promote EE&C in buildings. As a specific project, MOEU launched the 100 Buildings Project that is a pilot project for central governments' buildings to promote EE&C.

MOEU is responsible for preparation of legislations and implementation of projects in order to realize sustainable buildings and EE&C retrofitting for public buildings in accordance with the Energy Efficiency Strategy Paper 2012-2023, which was compiled by MENR and approved by HPC headed by the prime minister.

Top-down style is popular to make decisions for policies and projects in Turkey. EE&C regulations and projects of MOEU are also implemented in top-down styles. In general, this top-down style can make a decision speedy. On the other hand, higher knowledge, rich experiences, and adequate understandings of actual conditions are needed to prepare and implement policies and projects.

MOEU is facing problems of lack of knowledge and experiences and does not have very strong connections with the project implementation bodies. Technical assistance is needed to prepare and implement policies and projects. Considering the situation above, in 2.4.2 recommendation of a project scheme for EE retrofitting in Government buildings will be proposed.

2.2 Gathering Information about Multilateral and Bilateral Donor Agencies

In an attempt to collect information valuable to design JICA's assistance scheme (both Technical Assistance (TA) and ODA loans) to promote Turkey's public buildings EE, this section intends to meet the following goals:

- to find specific sectors and the ways in which JICA (through TA and ODA loans) can contribute to the improvement of public buildings EE&C in Turkey by avoiding overlaps with other donor agencies' assistances (and complementary to the existing assistances); and
- to design a financial model (TA and ODA loans) which most suits the local context and meets the need of Turkish counterparts.

As of end-November 2012, major multilateral donor agencies (WB, EU, EBRD, UNDP) and bilateral donor agencies (KfW/GIZ, AFD and JICA) either have ongoing projects or pursue the possibility of promoting EE in Turkey's building sector. (See Table 2.2-1 and Annex 2 for the details) Among the above agencies:

- Those interested in financing public sector buildings (both central and local government owned buildings) are KfW, AFD, JICA and EBRD (indirectly via ESCOs).
- Those mainly focused on financing commercial buildings and municipalities are WB, EBRD and AFD.
- Those currently providing technical assistance to public buildings sector (including EE retrofit and capacity development of MOEU) are EU and UNDP.
- Those considering utilizing EVDs and developing ESCO market in Turkey are EBRD, WB and JICA.
- Those utilizing or going to utilize Eligible Equipment List as a method of cutting loan processing or implementation transaction costs are EBRD, WB and JICA.
- Those acquired Clean Technology Fund (CTF) funds are EBRD's Turkish Turkey Sustainable Energy Financing Facility (TurSEFF, 2010-2012) and WB's Private Sector RE and EE Project Phase 2 (2009-2014).

Table 2.2-1 Summary of Activities of Multilateral and Bilateral Donor Agencies in Promoting EE in Turkey

Issues	JICA	KfW (+GIZ)	AFD	WB	EU	EBRD	UNDP	EIB
Main focus on EE	(Idea) Public sector buildings EE (future, SME, Industry)	Public sector buildings EE retrofit covering all climate regions	RE, Industry EE, SME EE	RE, Industry EE, SME EE, Commercial Buildings EE	Energy sector: 1) RE, 2) Alignment to EU Aquis (Energy Legislation), 3) Nuclear safety	Small scale EE/RE including 1) Commercial buildings 2) ESCO financing	Energy Sector Projects: 1) Industry EE, 2) Appliances EE, 3) Buildings EE	Industry RE/EE SME RE/EE (mainly RE)
Public buildings EE	(Idea) - TA for buildings EE; - TA & finance for Urban Transformation Project	Eur 110 mil. secured for subsidized loans for public sector buildings EE retrofit	Started to pursue EE in public sector buildings since March 2012, earmarked Eur 100 mil. for EE projects	Under joint management of EU's FY2012 energy sector funds, SME EE will be pursued	FY 2011 budget: Retrofit of 2 buildings and MOEU capacity building	Not yet, but considering financing public buildings via ESCOs (Established ResiSEFF & MunSEFF for buildings EE/RE)	1) Buildings EE Project; 2) Southeast Anatolia RE/EE Project; 3) Sustainable Cities Project	Not considered
Implementation scheme	(Idea) Setting up Project Management Unit with approval of High Planning Council/ Prime Ministry	Sovereign loan to UT: 1) Bundling individual ministries' retrofit investment budgets 2) Loan to one ministry with large building stock	"Climate Turkey Program": Credit lines (non-sovereign loans) for commercial banks and municipalities (in future) both sovereign & non-sovereign loans to municipalities	"RE/EE Project Phase 2" "SME EE Project" Credit line (sovereign loans) for intermediary banks with UT credit guarantee	FY 2012 budget (EE component): Grants for FS/TA for Industry and SME EE market development (Joint management with WB)	"TurSEFF": Credit line (non-sovereign loans) for 5 partner banks (all private banks)	"Buildings EE Project" Capacity development, awareness raising, monitoring, demonstration	RE/EE Project: Credit lines for 3 policy-based banks (TSKB, TKB, Vakif Bank) with EC grants SME RE/EE Project: Credit lines for 4 private banks
Sub project formation	(Idea) 100 Buildings Project in Ankara, 1000 Buildings Project	1) MOEU's100 Buildings Project (1000 Buildings Project) and other 2) MONE, MOH, etc.	-	Clients of partner banks, initially (ESCO projects, later)	MENR and MOEU propose to Ministry of EU Affairs, main TK coordinator of EU program	Project implementation team proactively assist partner banks (TA, regular meetings, etc.)	"Buildings EE Project" Chosen by UNDP/Turkish Government (GDRE, MOEU, TOKI, MONE.)	Clients of partner banks
Sub-Project/Project approval method	(Idea) Bundling Method (EE Equipments List Method); Energy Audit method	-	-	"SME EE Project" Standardization by using "Shopping list" (line of product)	Big Umbrella method: lump-sum approval of big portfolio which includes several projects under energy sector	1) List of Automatically Eligible Equipments and Suppliers 2) Energy Audit 3) Simplified energy audit	-	All sub-project require ex-ante approval by EIB
TA	(Idea) TA for MOEU, GDRE, EVDs, etc.	GIZ provides TA (Euro 6.5 m)	TA to raise awareness among SMEs, industries, and bank managers and employees	TA for intermedary banks (Vakif Bank, Ziraat Bank), EVDs	TA for MOEU, EVDs	TA for partner banks, vendors (suppliers, etc.) and sponsors	"Buildings EE Project" TA for GDRE, MOEU, etc.	TA for partner banks (EE project appraisal, marketing, etc.)
ESCO/EVD	(Idea) EVD capacity development via OJT and ESCO market development	Not considered	Will conduct capacity development of EVDs & ESCOs as part of KOSGEB capacity development program to enhance SME EE (2013-2015)	- EVD capacity development with GEF fund, awareness raising - EVD capacity building, ESCO market development under EU FY2012 funds	Trainings, Awareness raising, information dissemination	Support the materialization of Energy Performace Contracts	"Southeast Anatolia RE/EE Project"(Initial plan to hold 10 audits using EVDs and 2 EE retrofit implementation)	Not considered
Turkish C/P	(Idea) MOEU (MENR, MOD, PM, UT)	not yet defined Turkish C/P	Intermediary banks (private banks) (In future) Municipalities via private banks (non-sovereign) and Iller Bank (sovereign)	MENR & Intermediary banks (Development banks and state owned banks)	FY2011 budget: MOEU FY2012 budget: MENR FY2013 budget: MOEU	Commerical sector building owners, municipalities, EVDs (indirectly public sector building owners)	Buildigs EE ⇒GDRE Southeast Anatoria RE/EE ⇒Regional Development Admnistration Sustainable Cities Project ⇒MOEU, municipalities	Intemediary banks (development banks, state-owned and private banks)
Use of CTF	-	-	-	RE/EE 2: USD 100 mil. SME EE: USD 50 mil.	-	TurSEFF: USD 50 mil. Resi SEFF: n.a. MunSEFF: n.a.	-	-

Source: Compiled by JICA Study Team based on the information acquired through interviews with respective agencies and disclosed information on public websites

In order to avoid overlaps with other donor agencies, JICA could consider cooperation with one of GEF agencies such as UNDP and EBRD. UNDP has been conducting Buildings EE Project in Turkey since 2011 and already accumulating some knowhow in the realm of public buildings EE. UNDP also plans to conduct buildings' energy audits as part of Southeast Anatolia RE/EE Project. EBRD, which has accumulated abundant expertise in private-sector EE financing through the implementation of Turkey Sustainable Energy Finance Facility (TurSEFF), is currently exploring the possibility of financing EE retrofits of public sector buildings indirectly through ESCO financing. It has newly established programs entitled ResiSEFF and MuniSEFF, which aim to improve EE in residential/buildings and municipality infrastructures, respectively. JICA's cooperation with these two GEF agencies would be beneficial in implementing the future public sector buildings EE retrofit project on a large scale covering the whole country.

The Study Team assumes that it is possible to construct a workable implementation scheme to promote public sector buildings EE retrofit investments in Turkey. There is the market (i.e. the needs) for EE retrofit investments in buildings sector; there are players, namely, EVDs (Turkish ESCOs) who are eager to participate and accumulate experience in public sector buildings EE retrofitting, and there are funds and know how available from many donor agencies.

The missing piece is a workable implementing scheme and a reliable executing agency to integrate all the above factors.

All bilateral agencies are at the preliminary stage of project formulation in which all are pursuing to find an effective implementation scheme and a reliable executing agency for the promotion of public sector buildings EE retrofit project. It is a common understanding among international donor agencies that MOEU is important since it is mandated by law to promote public sector buildings EE retrofit, however which alone could not be sufficient to promote EE retrofit effectively: the assistance and approval of important ministries such as MENR, MOD, MOF, and UT are indispensable.

2.3 Introduction of Japanese EE&C Technologies and Capacity Development of Implementing Organizations for 100 Buildings Project

As of January 2013, the 100 Buildings Project implementation is delaying. Under this situation the Study Team has carried out seminars, field surveys of buildings and information exchange with various related organizations and MOEU.

Extensive information exchange carried out both through meetings and seminars to support MOEU's tasks are as follows;

a) Implementing policy and measures, which are defined under the Energy Strategy Paper 2012 - 2023

b) Improvement of the function of BEP-TR

c) Implementing another EE&C policies and selecting eligible EE&C technologies referring best practices in Japan

The outline and major findings of seminars, building field surveys and hearings are summarized hereinafter.

2.3.1 Capacity Development for EE&C Policy Making

In order to promote EE&C effectively three strategies, which are shown in Figure 2.3.1-1 should be enacted at the same time. In Turkey some rules and regulations have been implemented, however structured and comprehensive awareness and support programs have not been formulated enough. It is needed to enhance the programs focusing on awareness and governmental support.

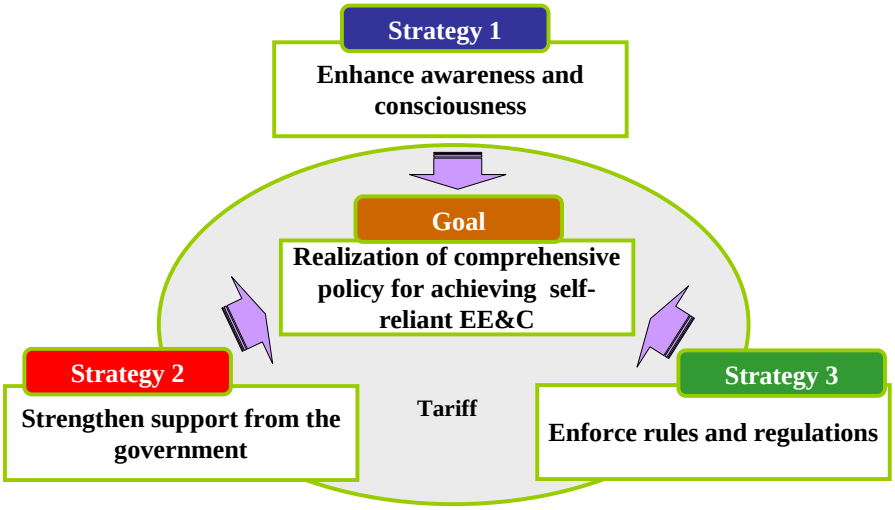


Figure 2.3.1-1 Integrated Strategy Needed for Promoting EE&C

In the light of above mentioned integrated strategy, the key issues and potential measures to increase effectiveness of EE&C in Turkey initially defined by the Study Team are as follows;

(1) Enhance Awareness and Consciousness

1) In Turkey legal frame work for labeling has already established. However efforts to display EE performance on energy consuming products are not sufficient.

2) Database structures and analyses of collected data related to energy consumption, buildings and equipment etc. are not enough, which is required to establish baseline for the governmental strategy to develop implementation roadmap of EE measures and monitoring of the implementations.

3) Although GDRE and MOEU have been carried out some activities and have mandates EE&C, setting up an organization in charge of awareness, dissemination and database (like Energy Conservation Center, Japan (hereinafter referred to as "ECCJ")) might be functional.

4) Regarding technical aspect for promoting EE&C, importance of insulation and reduction of consumed energy in air conditioning (heating and cooling) should be recognized by public and responsible authorities. In this context, for instance mitigation of 1 degree on AC setting temperature means 7 to 10 % saving.

These are to be checked and discussed in Turkey;

Cooling;	Japan	Government campaign	28 ^{0}C
	Turkey	MENR Regulation28097/2011	24 ^{0}C
Heating;	Japan	Government campaign	20 ^{0}C
	Turkey	MENR Regulation28097/2011	22 ^{0}C

(2) Strengthen Financial Support Mechanism

1) There are three financial support measures, namely, tax incentives program, subsidy/rebate program and policy-based finance program. Among these three financial support measures, policy-based finance program has been the most effective in Japan. It may be also effective in Turkey to apply this policy-based finance program. However one of the problems to apply low interest loan for building EE&C retrofitting is that there are not appropriate (experienced) local banks for the execution of low interest loan in Turkey. There should be developed a scheme for Turkey similar to Japan.

2) Japan's Governmental financial source for EE&C comes from mainly tax on fuel, Energy Special Account, is unique and to be referred in Turkey. There are different taxes on fuels in Turkey also. If at least small portion of these taxes could be allocated, this Special Account can be structured for Turkey also.

(3) Evaluation Method of Energy Conservation

1) Improvement of BEP-TR

BEP-TR has enough scope to enforce insulation of buildings. To improve the function of BEP-TR, the development of some energy management tool and easy input operation should be considered. In Japan evaluation method of energy conservation, which utilizes Japanese evaluation tool, PAL (insulation) and CEC (equipment efficiency), equivalent of Turkish BEP-TR, has been applied. And it is regulated to submit the evaluation result before new construction in Japan. Besides for the purpose of evaluation of middle size and small sized buildings, simplified evaluation method, Point Method (without PAL/CEC calculation), was introduced. In order to promote energy conservation of large number of middle size and small sized buildings, this simplified evaluation method is worth being referred (See Figure 2.3.1-2 and Table 2.3.1-1 and -2).

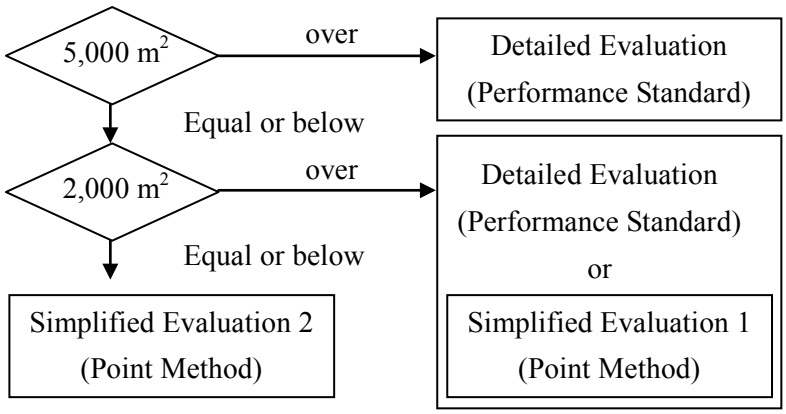


Figure 2.3.1-2 Japanese Evaluation Method by Building Size

Table 2.3.1-1 Evaluation Items of Japanese Point Method (1)

	1. Building heat loss	2. Air conditioning	3. Ventilation
	1) Basic building design	1) Reducing of fresh air heating /cooling	1) Control system
	Direction, plan, core position and floor height	Working time and pre-heating time	CO2, human sensor, temperature control, linkage to lighting, time schedule etc.
	2) Wall/roof insulation	2) Location of outdoor unit and length of pipe	2) Efficiency of motors
	3) Window insulation	3) Efficiency of air conditioner	3) Introduction of natural ventilation
	4) Solar heat control	4) Adjustment point	4) Adjustment point
Total point	100 ≦ Clear		
	100 > Not good		

Table 2.3.1-2 Evaluation Items of Japanese Point Method (2)

	4. Lighting	5. Hot water supply	6. Elevator
	1) Efficiency of lighting fixture	1) Piping root and insulation	1) Control system
	Type of lamps, efficiency of fixture	Insulation for pipes, bulbs and flange, root of pipe line and pipe diameter	Inverter control and regenerative control
	2) Control system	2) Control system	
	Human sensor, day light/dimmer control, brightness control, time schedule, zone or spot control etc.	Circulation pumps, water tap of lavatory and shower	
	3) Placement of fixtures luminous level and interior finish	3) Efficiency of heat source	
	Task and ambient lighting, room shape and interior color	Efficiency of heat source, solar heating and heat recovery	
	4) Adjustment point	4) Adjustment point	4) Adjustment point
Total point	100 ≦ Clear		
	100 > Not good		

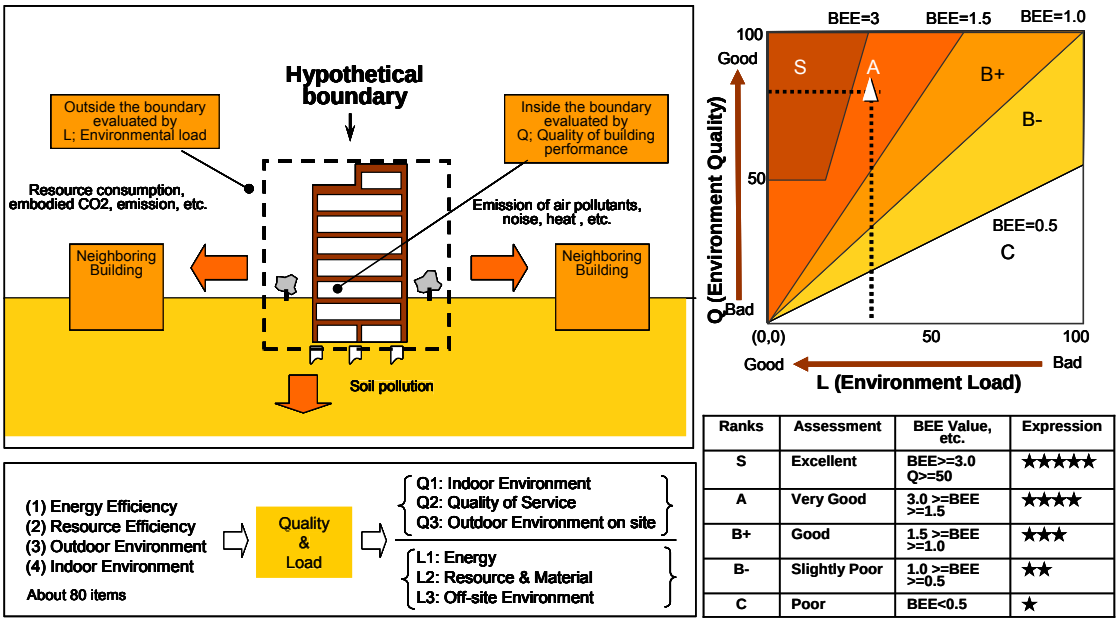
2) Assessment tool for sustainable building

The concept of Japanese assessment tool for sustainable building, CASBEE may be good reference for Turkey to develop Turkish sustainable building standard with the aspects of energy efficiency and earthquake resistance. The referential points for Turkish Government are as follows. For details of CASBEE, refer to Annex 3.

a) Target of assessment

Target of assessment is shown in Figure 2.3.1-3.

i) Quality of building performance (Indoor environment, quality of service including earthquake resistance, and outdoor environment onsite) and ii) Environmental load (energy, resource & material, and off-site environment) are assessed. Detailed categories are shown in Table 2.3.1-3 and -4. Weighting coefficients among the categories is shown in Table 2.3.1-5, which were decided by academy people and the total for Quality of building performance and the total for Environmental load is 1.0 each.



Ranks	Assessment	BEE Value, etc.	Expression
S	Excellent	BEE>=3.0 Q>=50	★★★★★
A	Very Good	3.0 >=BEE >=1.5	★★★★
B+	Good	1.5 >=BEE >=1.0	★★★
B-	Slightly Poor	1.0 >=BEE >=0.5	★★
C	Poor	BEE<0.5	★

Source: JaGBC (Japan GreenBuild Council) / JSBC (Japan Sustainable Building Consortium)

Figure 2.3.1-3 Target of CASBEE Assessment

Table 2.3.1-3 Target of CASBEE Assessment (1)

	Large Category	Middle Category	Small Category
Environment Quality of the Building	Q1. Indoor Environment	Noise	Noise, Sound Isolation, Sound Absorption
		Thermal Comfort	Room Temperature Control, Humidity Control, Type of AC System
		Lighting & Illumination	Daylight, Anti-glare Measures, illuminance Level, Lighting Controllability
		Air Quality	Source Control. Ventilation, Operation Plan
	Q2. Quality of Service	Service Ability	Functionality and Usability, Amenity, Maintenance Management
		Durability & Reliability	Earthquake Resistance, Service Life of Components, Reliability
		Flexibility & Adaptability	Spatial Margin, Floor Load Margin, System Renewability
	Q3. Outdoor Environment on Site	Preservation & Creation of Biotope	
		Townscape & Landscape	
		Local Characteristics & Outdoor Amenity	Attention to Local Characteristics & Improvement of Control, Improvement of Thermal Environment on Site

Source: Technical Manual (2010 Edition) of CASBEE for New Construction / Japan Sustainable Building Consortium (JSBC)

Table 2.3.1-4 Target of CASBEE Assessment (2)

	Large Category	Middle Category	Small Category
Environment Load Reduction of the Building	L1. Energy	Building Thermal Load	
		Natural Energy Utilization	
		Efficiency in Building Service System	
		Efficient Operation	Monitoring, O&M System
	L2. Resources & Materials	Water Resources	Water Saving, Rainwater, Graywater
		Reducing Usage of Non-renewable Resources	Reducing Usage of Materials, Continuing Use of Existing Structure Frames etc, Use of Recycled Materials as Structural Frame Materials, Use of Recycled Materials as Non-structural Materials, Timber from Sustainable Forestry, Efforts to Enhance the Reusability of Components and Materials
		Avoiding the Use of Materials with Pollutant Content	Using Materials without Harmful Substances, Elimination of CFCs and Halons
	L3. Off-site Environment	Consideration of Global Warming	
		Consideration of Local Environment	Air pollution, Heat Island Effect, Load on Local Infrastructure
		Consideration of Surrounding Environment	Noise, Vibration & Odor, Wind/Sand Damage & Daylight Obstruction, Light Pollution

Source: Technical Manual (2010 Edition) of CASBEE for New Construction/Japan Sustainable Building Consortium (JSBC)

Table 2.3.1-5 Weighting Coefficients of CASBEE

Assessment Categories		
Q1 Indoor Environment	Non-factory	Factory
	0.40	0.30
Q2 Quality of Service	0.30	0.30
Q3 Outdoor Environment on Site	0.30	0.40
LR1 Energy	0.40	
LR2 Resources & Materials	0.30	
LR3 Off-site Environment	0.30	

Source: Technical Manual (2010 Edition) of CASBEE for New Construction/Japan Sustainable Building Consortium (JSBC)

b) Existing typical assessment tools for sustainable building

Existing typical assessment tools for Sustainable Building are summarized in Table 2.3.1-6.

Table 2.3.1-6 Comparison among CASBEE, LEED and BREEAM

	CASBEE	LEED	BREEAM
	(Comprehensive Assessment System for Building Environmental Efficiency)	(Leadership in Energy and Environmental Design)	(Building Research Establishment Environment Assessment Method)
Establishment	Japan 2004	U.S. 1998	England 1990
Target	All buildings	High grade (25%) buildings	High grade buildings
Evaluation categories	6 large categories focusing environment,service level, reliability (incl. earthquake resistance) and flexibility etc.	5 large categories focusing environment and well-being	9 large categories focusing environment and health
Easiness of input	NO3	NO1	NO2
Application	Applied for many Japanese municiparities	Linked to asset evaluation, commercial	Applied for EU countries
Quality (Q) & Environmental load (L) evaluation	Separate evaluation BEE (Building Environmental Efficiency) = Q/L	Mixed evaluation Total score	Mixed evaluation Total score
URL	http://www.ibec.or.jp/CASBEE/english/index.htm	http://www.usgbc.org/	http://breeam.org/

i) CASBEE (Japan)

- Applicable for all buildings
- Evaluating building quality, including earthquake resistance, except environmental aspects
- Utilizing Japan's domestic simulation tool PAL (Perimeter Annual Load Factor) /CEC (Coefficient of Energy Consumption)
- Introduction to local government

ii) LEED (US)

- International software
- Applicable for only high grade buildings
- Targeting property appraisal

iii) BREEAM (UK)

- Spread in EU
- Targeting high grade buildings

(4) Summary of Recommendations

Summary of recommendations for Turkish Government are described as follows.

1) Enhance awareness and consciousness

a) Obligation to display EE performance on energy consuming products

b) Structuring and utilization of database for energy consumption on buildings and equipments

c) Establishment of an organization focusing on awareness and dissemination for EE&C

d) Investigation and discussion on the recommended room air temperature

2) Strengthen financial support mechanism

a) Establishment of policy-based finance program, which has been the most effective in Japan

b) Utilization of a part of taxon fuel as a financial source for EE&C (referring Japanese Special Account)

3) Evaluation method of energy conservation

a) Establishment of simplified evaluation method for middle and small sized buildings (e.g. Japanese Point Method)

b) Recommendation for establishing Turkish sustainable building standard

Turkish Government would like to issue the licenses for all the buildings of commercial, service, and luxury residences with 10,000m^2 or more of floor areas[19]. Besides in Urban Transformation Law, it is stipulated to keep not only energy efficiency but also earthquake resistance for the target buildings[20]. Referring these backgrounds and the existing typical assessment tools for sustainable building, CASBEE (Japan), LEED (US), and BREEAM (UK), the following measures were recommended for MOEU to introduce.

i) Standard should be applicable for all buildings.

ii) Evaluation of building quality, including earth quake resistance, should be included.

[19] Refer to 2.1.3（1）1）b）
[20] Refer to 2.1.3（2）3）

iii) Linkage with BEP-TR, Turkish assessment tool for insulation and EE&C performance, should be ensured.

iv) Introduction (applicable) to local governments is necessary.

2.3.2 Implementation of Energy Audits

The Study Team conducted energy audits for 2 buildings of 100 Buildings Project from November to December 2012. The outline of the energy audits is described below.

(1) Outline

1) Target buildings

a) DSI Buildings

Outline and Facade of DSI Buildings are shown in Table 2.3.2-1 and Figure 2.3.2-1 respectively.

Table 2.3.2-1 Outline of DSI Buildings

Building name	Floor area (m^2)	Floor number	Construction year
A	29,449	13	1969
B	3,291	3	1969
C	7,444	7	1980
Conference hall	830	2	
Total	41,904	-	-

Figure 2.3.2-1 Facade of DSI Buildings

b) EM Hospital

Outline and Facade of EM Hospital are shown in Table 2.3.2-2and Figure 2.3.2-2 respectively.

Table 2.3.2-2 Outline of EM Hospital

Building name	Floor area (m^2)	Floor number	Construction year
Out-patient building	8,000	3	2003

Figure 2.3.2-2 Facade of EM Hospital

2) Audit team formation

4 JICA Study Team members, 6 members from 5 EVDs, and 4 local staffs

3) Energy audit work flow

Energy audit was carried out for 16 days, starting with the kick-off meeting on 27th November 2012 and ended in the workshop on 12th December. The work flow of energy audit is shown in Figure 2.3.2-3. And the result of energy audit was reported to top managers of each building.

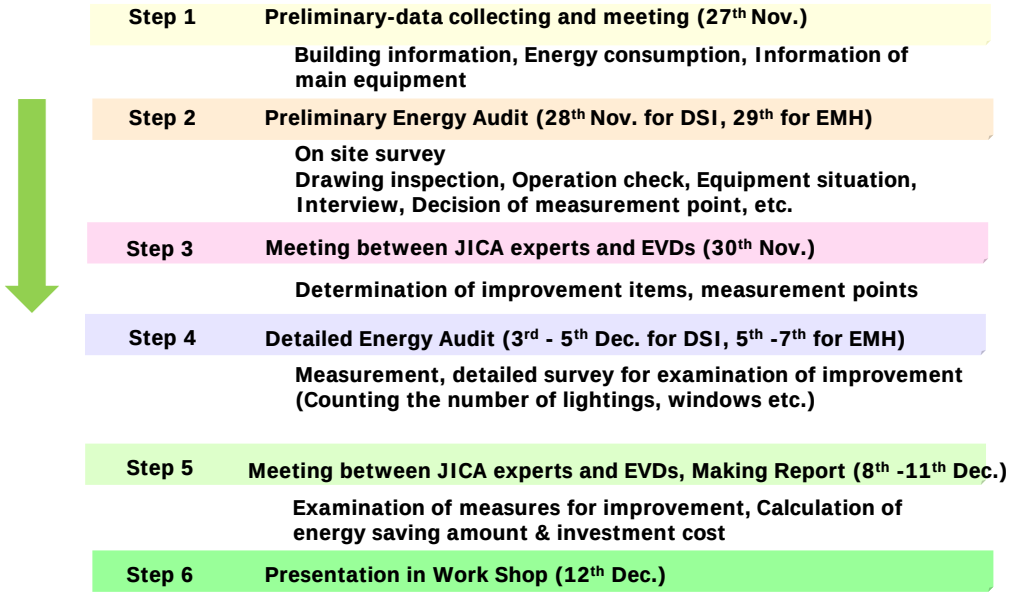


Figure 2.3.2-3 Energy Audit Work Flow

(2) Present Condition and Issues

As for the present condition and issues to promote EE&C for DSI Buildings and EM Hospitals, common condition/ issues and individual ones are described as follows.

1) Common issues for DSI Buildings and EM Hospital

a) Good points

i) Top Management's concern for energy conservation: Responsible person is clear.

ii) Building design (Direction, plan, light color blind)

iii) Lighting (Turning off unnecessary lighting, blight interior color)

iv) Reduction of electricity consumption at lunch time

v) Inverter control for elevators

b) Issues to be cleared

i) Lack of utilization on measured data and monthly bills

ii) Unsuitable boiler operation (starting time is too early, load factor of boilers is about 50 - 70%, and frequently in ON/OFF operation, in-efficient air ratio) 2 - 3 hot water boilers were installed and normally only 1 boiler works. In the coldest season, 2 boilers work (See Figure 2.3.2-4 and -5).

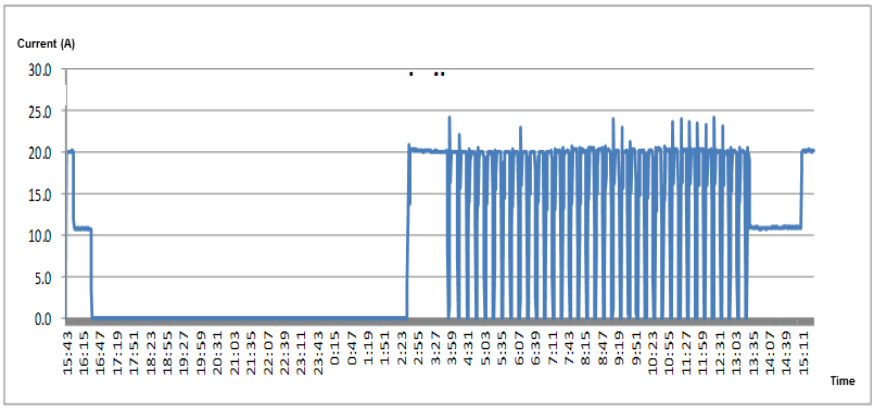


Figure 2.3.2-4 Operation Pattern of Hot Water Boiler in DSI Buildings (3th-4th Dec. 2012)

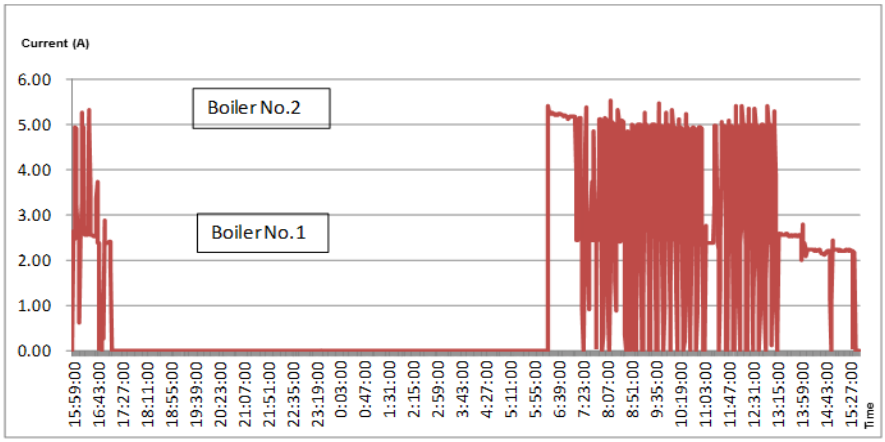


Figure 2.3.2-5 Operation Pattern of Hot Water Boiler in EM Hospital (5th-6th Dec. 2012)

In DSI Buildings, boilers start their operation at 2:30 AM, 6 hours before 8:30AM, start of working hour. Besides, room air temperature becomes stable after 3 hours from boilers combustion starts, around 5:30 AM (See Figure 2.3.2-6).

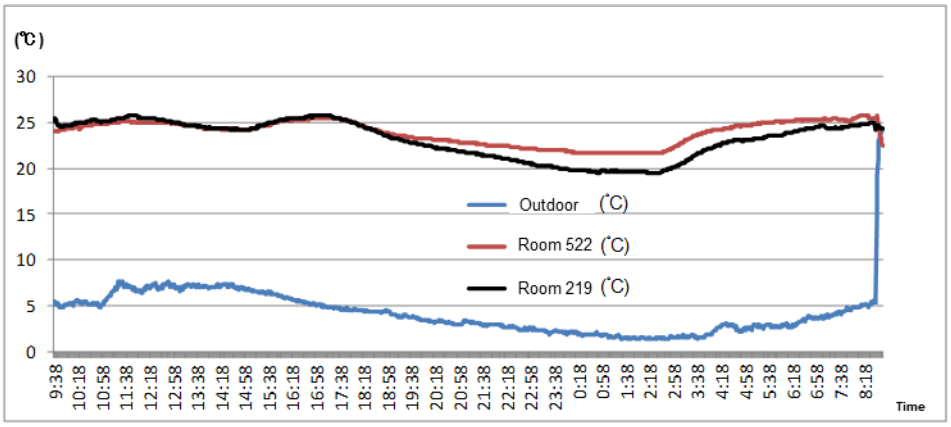


Figure 2.3.2-6 Daily Fluctuation of Room and Outdoor Air Temperature in DSI Buildings (4th-5th Dec. 2012)

In EM Hospital boilers start their operation at 6:20, 2 hours before 8:30AM, start of working hours. Besides room air temperature doesn't rise rapidly, because outdoor air temperature is too cold to warm up in this period. On the other hand with high insulation, the room air temperature drop is very small at night (See Figure 2.3.2-7).

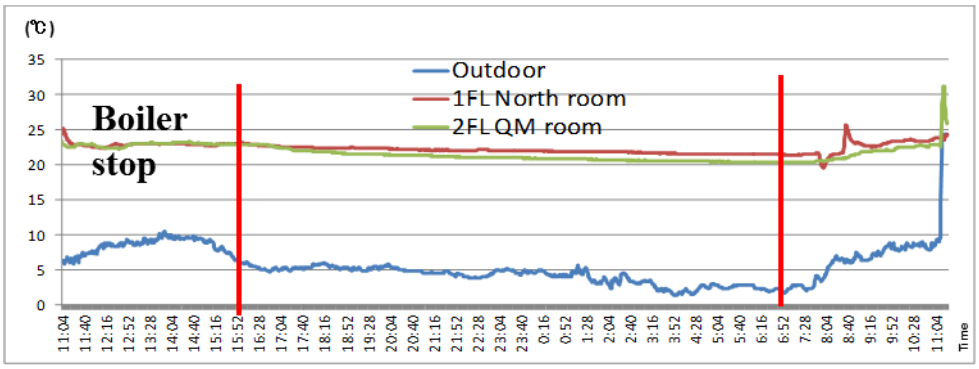
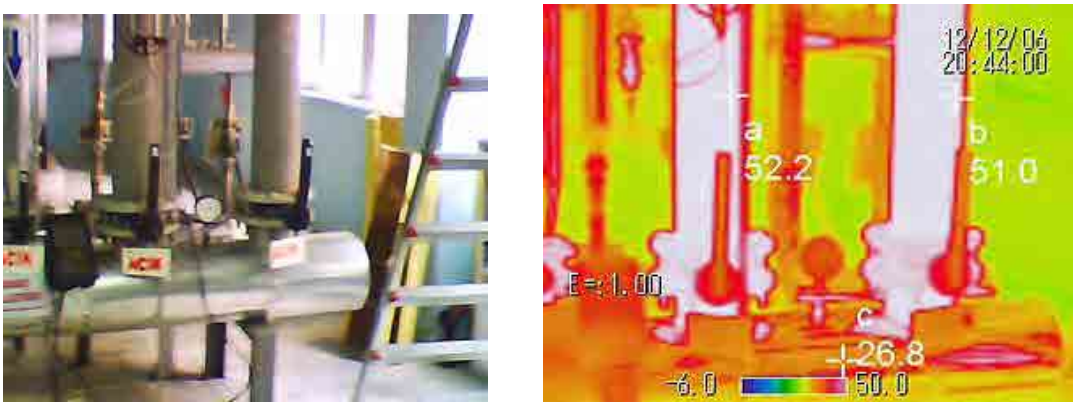


Figure 2.3.2-7 Daily Fluctuation of Room and Outdoor Air Temperature in EM Hospital (6th-7th Dec. 2012)

iii) No insulation for valves of hot water supply and return pipes (See Figure 2.3.2-8)



(Normal camera view) **(Thermo camera view)**

Figure 2.3.2-8 Non-insulated Valves in EM Hospital

iv) No control system for air conditioning (Valves, dumpers and motors)

v) Comparatively large consumption of night time electricity (See Figure 2.3.2-9 and -10)

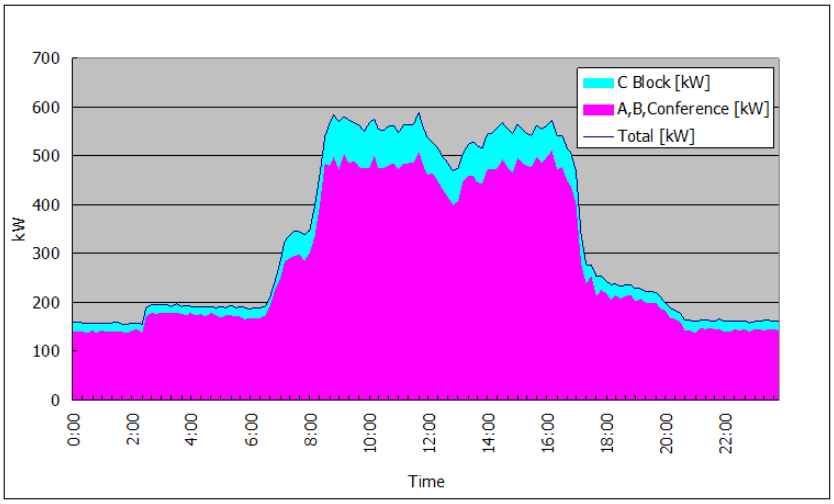


Figure 2.3.2-9 Electricity Daily Load Curves in DSI Buildings (4th Dec. 2012)

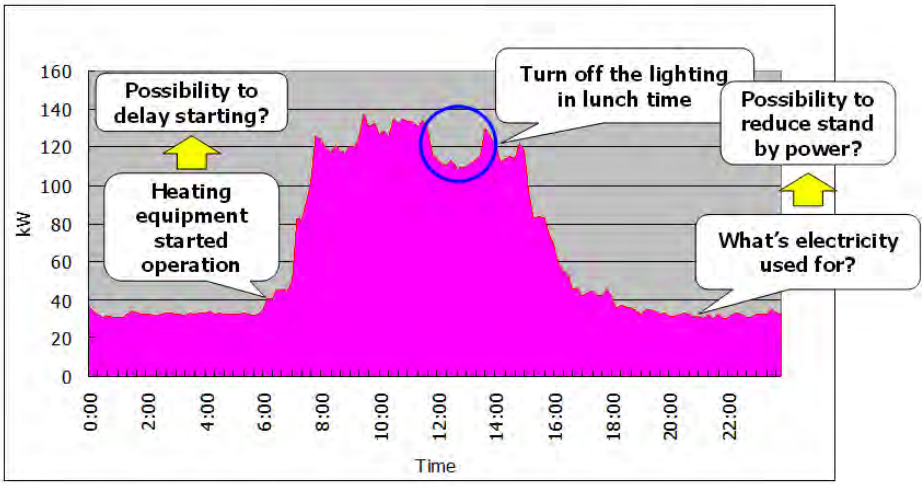


Figure 2.3.2-10 Electricity Daily Load Curve in EM Hospital (6th Dec. 2012)

vi) Opening of windows in winter time (heat loss) Reason: Hot room air temperature, smoking

vii) Utilization of in-efficient magnetic ballast for fluorescent lighting mainly

viii) Opening of blinds in winter time

2) DSI Buildings

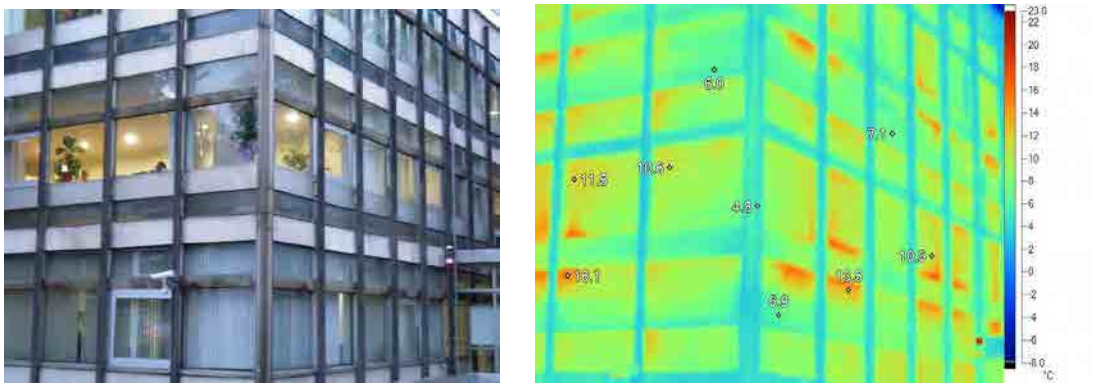
a) Good points

i) Continuous challenge for energy conservation

b) Issues to be cleared

i) Lack of Building insulation

Lack of insulation means heat loss and money loss through windows and walls. It is estimated that the energy (money) loss through windows and walls of DSI buildings is TRY 456,000/y. And accumulated amount since 1969 is TRY 18,000,000 (present value equivalent) (See Figure 2.3.2-11).



(Normal camera view) **(Thermo camera view)**

Figure 2.3.2-11 Heat Loss through Windows and Walls in DSI Buildings

ii) No control system for room air temperature

iii) Lack of insulation for heating pipes (See Figure 2.3.2-12)

Figure 2.3.2-12 Non-insulated Pipes in Piping Shaft and Office Area in DSI Buildings

iv) No mechanical ventilating system

3) EM Hospital

a) Good points

i) Periodical meetings on environmental management and EE&C

ii) Sign boards for energy conservation are put on every switch and outlet

iii) Installation of insulation, double glass with PVC sash

iv) Installation of control system of fan coil units

v) Insulation for heating and cooling pipes

b) Issues to be cleared

i) Air conditioning and ventilation

100% all fresh air intake and exhaust, no recovery system has installed. As shown in Figure 2.3.2-13, this situation is equivalent to throwing heated or cooled air away outside.

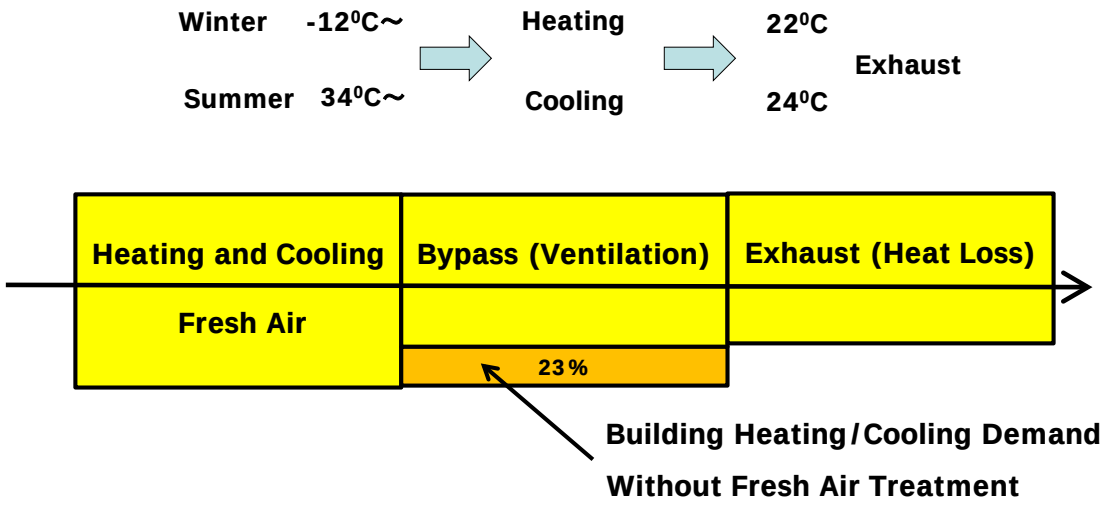


Figure 2.3.2-13 Heat Loss in Air Conditioning and Ventilation in EM Hospital

ii) COP of air cooled chiller is low as 2.07.

(3) Recommendations to Break through the Issues

The recommendations to break through the above mentioned issues are described as follows. Besides the evaluation result using Japanese evaluation method is shown in Annex 6-1, and the details and back data of energy audits are described in Annex 6-2.

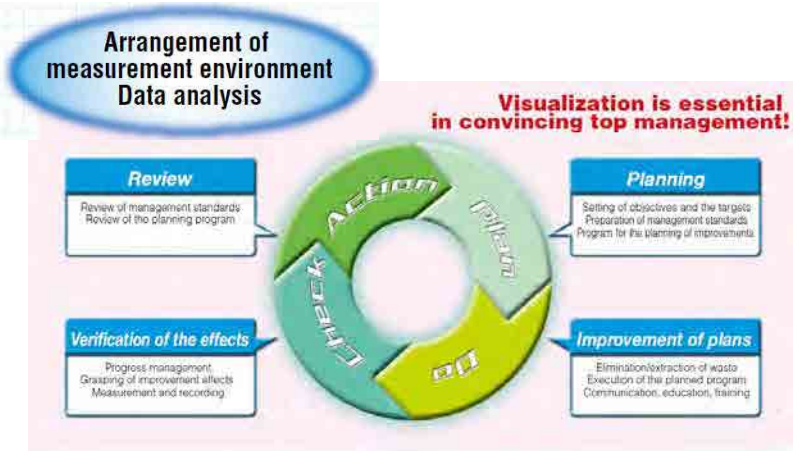
1) Common items for DSI Buildings and EM Hospital

a) Management and more effective operation

i) Formulation of PDCA cycle

Through Target setting (referring data), everybody's participation, discussion for

energy and cost saving periodically (formulating PDCA cycle), 5 % saving is expected to be achieved. Figure 2.3.2-14 and -15 show images of PDCA cycle.



Source：Energy Conservation for Hospital, ECCJ

Figure 2.3.2-14 Formulation of PDCA Cycle to Promote Energy Conservation

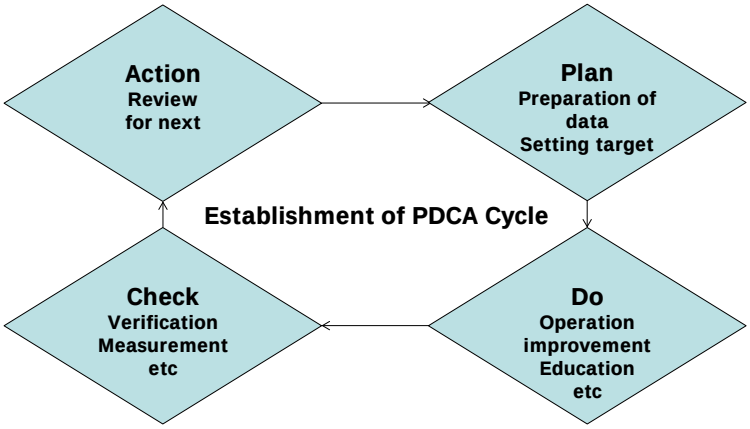


Figure 2.3.2-15 Next Action Plan for Energy Conservation to be Implemented Tomorrow

ii) Optimization of boiler operation (Later start operation, reduction of operating units)

iii) Window operation

- Establishment of the rule for window opening and room air temperature setting
- At winter peak time, by closing blinds, 0.5W/m^2 energy can be saved, It means about TRY 3.0 reduction/ym^2 .

b) Small investment

i) Adjustment of boiler air ratio

Air ratio of hot water boiler should be adjusted from 2.2 to 1.3. By this measure 4.2% gas reduction is expected. Investment: TRY 6,000 (Oxygen analyzer).

ii) Insulation jacket for valves of heating pipes

Insulation for valves of equal/over 65mm pipes: By this measure TRY 2,400/y gas

reduction is expected. Investment: TRY 2,400. Simple payback period: 1.0 year. (See Figure 2.3.2-16)


Figure 2.3.2-16 Insulation Jacket for Valves

2) Recommendations for DSI Buildings

a) Small investment

i) Changing target room air temperature from 26℃ to 22℃ (Adding temperature control function on indoor heating units and inverter control system on circulation pumps)

Following reduction of energy and cost is expected.

Reduction of gas consumption:	102,000m^3/y, TRY 92,800/y
Reduction of electricity consumption:	10,100kWh/y, TRY 3,600/y
Total benefit:	TRY 96,000/y
Investment:	TRY 43,000
Simple payback period:	0.4 years

ii) Improvement of circulation pump efficiency by replacing with high efficiency motors.

By this measure 7,500kWh/y, TRY 2,600/y electricity reduction is expected. Investment: TRY 18,000. Simple payback period: 6.8 years.

iii) Insulation for heating pipes

Insulation for 80mm pipes in Building B: By this measure TRY 4,000/y gas reduction is expected. Investment: TRY 12,000. Simple payback period: 2.9 years.

Moreover environmental condition will be improved (At present too hot in winter time).

Insulation for other 100mm-150mm pipes: By this measure TRY 16,000/y gas reduction is expected. Investment: TRY 6,000. Simple payback period: 0.5 years.

iv) Changing ballast of fluorescent lamp fixture to electronic one

By this measure 3,200kWh/y, TRY 1,100/y electricity reduction is expected. Investment: TRY 5,000. Simple payback period: 4.5years.

v) Introduction of motion sensor in wash rooms: By this measure 4,000kWh/y, TRY

1,400/y electricity reduction is expected. Investment: TRY 5,200. Simple payback period: 3.7 years.

b) Large investment

i) Insulation for windows and walls (U value4.5W/m$^{2\,0}$K→2.0W/m$^{2\,0}$K), insulation for heating pipes and installation of control system caused by the target room air temperature change from 26℃ to 22℃ (Adding temperature control function on indoor heating units and inverter control system on circulation pumps).

Reduction of gas consumption: 261,000m^3/y, TRY 238,000/y
Reduction of electricity consumption: 27,000kWh/y, TRY 10,000/y
Total benefit: TRY 248,000/y

This means TRY 19.1/y reduction per 1m2 window and wall. If DSI Buildings is to be in use in additional 40 years, then accumulated energy loss would reach TRY 10,000,000.
Investment: TRY 3,000,000

On the other hand, if whole retrofitting of adding insulation work with expected investment of TRY 3,000,000 is implemented, then drastic reduction of energy loss could be realized.
Moreover it passed over 40 years since DSI Building construction, and the investment for retrofitting of adding insulation is not small, the following procedure shown in Figure 2.3.2-17 should be checked. (Firstly evaluation of earthquake resistance and building function)

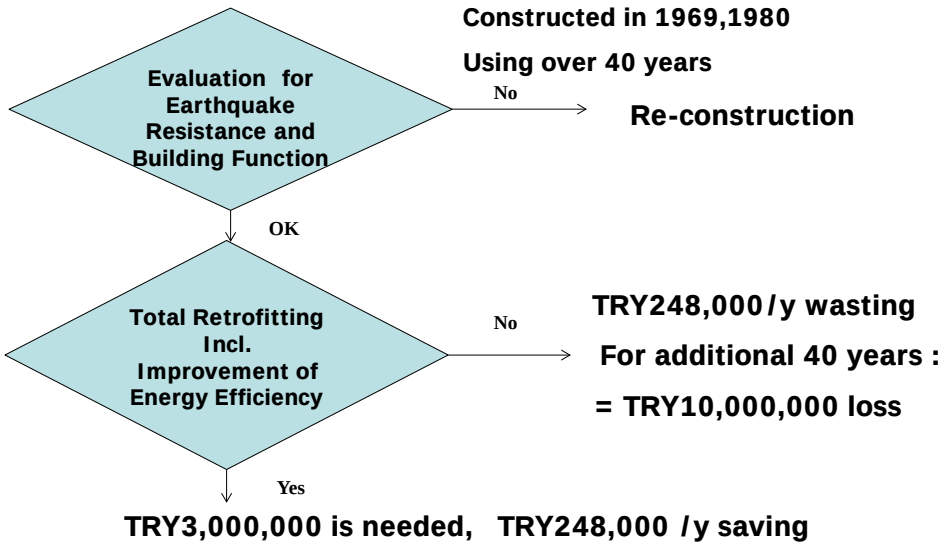
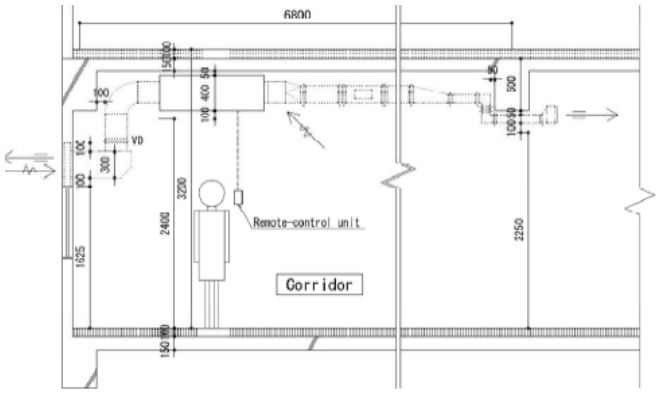


Figure 2.3.2-17 Procedure for Decision Making before Retrofitting Work

ii) Introduction of heat recovery mechanical ventilation

Although the volume of DSI Buildings is large, mechanical ventilation system has not been equipped (Natural ventilation only). 1,800 PPM of CO_2 density was measured in the meeting room of DSI Building. In Turkey there exists no regulation to stipulate CO_2 density in a building; however this data excesses 1, 000 PPM, which is a threshold of Japanese regulation. In the future with the introduction of air tight sash (higher insulation), a mechanical ventilation system should be also introduced to avoid the increase of CO_2 density. Figure 2.3.2-18 shows an example of heat recovery mechanical ventilation equipment (HEX).

500m^3／h HEXs



Source : Energy Conservation Renovation Study for Existing Office Buildings, Oct. 2012, NEDO

Figure 2.3.2-18 Example of Heat Recovery Mechanical Ventilation (HEX)

3) Recommendations for EM Hospital

a) Management and more effective operation

i) Reduction of fresh air intake volume for air conditioning

Present total supply fresh air volume is 47,000m^3/h, besides necessary fresh air volume is 6,000-15,000m^3/h. The fresh air intake volume should be reduced to 30,000m^3/h.

By this measure the following energy consumption and cost reduction is expected.

Reduction of oil consumption: 19,300liter/y, TRY 37,400/y

Reduction of electricity consumption (Change opening of dampers of air handling units and exhaust fans): 36,600kWh/y, TRY 11,600/y

Total benefit:	TRY 49,000/y
Investment:	Free

ii) Change of setting of motion sensor in wash room: By this measure 1,900kWh/y, TRY600/y electricity reduction is expected. Investment: Free.

b) Small investment

i) Changing ballast of fluorescent lamp fixture to electronic one: By this measure 2,100kWh/y, TRY700/y electricity reduction is expected. Investment: TRY 3,300. Simple payback period: 4.9years.

c) Large investment

i) Reduction of fresh air intake (from 47,000 to 20,000m^3/h) and introduction of heat recovery ventilation system (HEX) (10,000m^3/h), and adding inverter control system on air handling units and exhaust fans;

Reduction of oil consumption:	27,400liter/y, TRY 52,000/y
Reduction of electricity consumption:	73,100kWh/y, TRY 23,200/y
Total benefit:	TRY 75,200/y
Investment:	TRY 150,000
Simple payback period:	2.0 years

As for the outline of HEX, refer to Figure 2.3.2-18.

ii) Replacement of AHU with heat recovery function (proposed by EVD);

Reduction of energy consumption:	TRY 66,000/y
Investment:	TRY 422,000
Simple payback period:	6.4 years

(4) Summary of Recommendations

1) Recommendations for DSI Buildings and EM Hospitals

Table 2.3.2-3 shows the summary of EE&C recommendations. And Table 2.3.2-4 and -5 show the summary of recommendations for DSI Buildings and EM Hospital respectively.

And the evaluation result using Japanese methods are summarized in Annex 6-1. Besides as for the back data and details of the recommendations, please refer to Annex 6-2.

Table 2.3.2-3 Summary of EE&C Recommendations for DSI Buildings and EM Hospital

Measures	DS Buildings	EM Hospital
Zero cost	Formulating PDCA cycle, target setting based on data	
	Efficient operation of boiler (time and units)	
	Reduction of night time electricity consumption based on daily load curve	
	Open/close operation of blinds and windows	
		Reduction of fresh air for AC
		Utilizing motionsensor in wash rooms
Small investment	Insulation for valves	
	Adjustment of boiler air ratio	
	Introduction of electronic ballast	
	Insulation for pipes	
	Introduction of room temperature control system	
	Replacement of hot water circulation pumps	
	Introduction of motion sensor in wash rooms	
Large investment	Insulation for waidows and walls	Introduction of heat recovery HVAC system
	Introduction of heat recovery ventilation system	

The findings in DSI Buildings are as follows.

a) there is huge (16%) potential by ZERO cost energy conservation (management and operation improvement), b) there is largest potential by improvement of insulation, and c) including ZERO cost measures, simple payback period for recommended measures (mix) is around 6 years, and d) EE&C potential is estimated as 27 - 47%.

Besides the procedure for retrofitting of insulation improvement are shown in Figure 2.3.2-19. Key points are reducing heating and cooling load first, introducing temperature control valves second, and introducing high efficient equipment for reduced loads next. And after the introduction of these measures, suitable operation should be implemented.

Table 2.3.2-4 Summary of Proposal for DSI Buildings

Measure	Cost (TL)	Benefit(TL/y)	Simple Pay Back Period	Energy Saving Ratio (%)
1.Operation & management				
(1) Formulating PDCA cycle	0	64,000	0.0	5.0
(2) Blind for heating period	0	21,000	0.0	1.5
(3) Reduction of boiler operaion hours	0	92,000	0.0	7.9
(4) Improvement of hot water boiler operation	0	27,000	0.0	2.3
2. Room temperature control				
(1) Thremo control, inverter	43,000	96,000	0.4	8.3
3. Improvement of insulation				
(1) Wall and window	3,000,000	228,000	13.2	21.2
(2) Insulation for valves and pipes	18,000	20,000	0.9	1.7
(3) Introduction of mechanical ventilation	360,000			
4. Improvement of boiler control				
(1) Boiler air ratio adjustment	6,000	22,600	0.3	1.9
5. Lighting				
(1) Introduction of electronic ballast	5,000	1,100	4.4	0.1
(2) Introduction of motion sensor for WC	5,200	1,400	3.7	0.1
6. Circulation pump for heating & cooling				
(1) Introduction of high efficiency motor	18,000	2,600	6.8	0.2
Adjustment of energy saving in boiler		(14,600)		
Total Case1: Room temp control (1+2+4+5+6)	77,200	313,100	0.2	
Total Case2: + Insulation (1+2+3+4+5+6)	3,412,200	465,100	7.3	

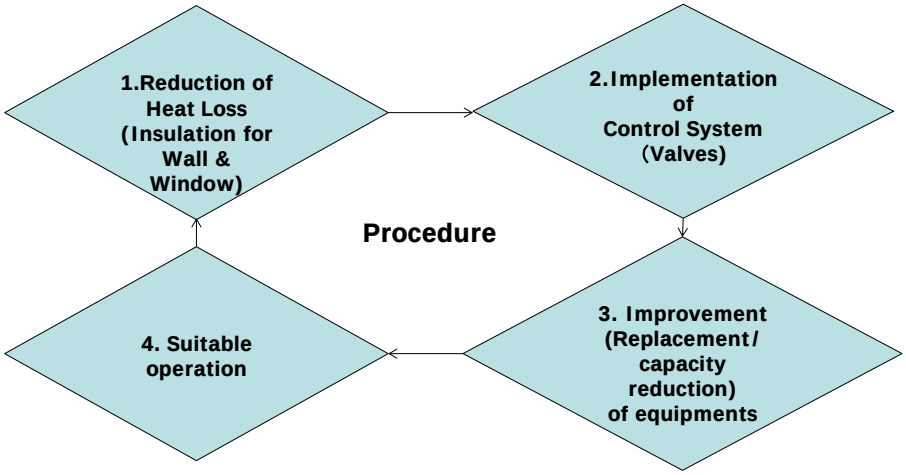


Figure 2.3.2-19 Procedure for Retrofitting of Insulation Improvement

The findings in EM Hospital are as follows.

a) there is huge (30%) potential by ZERO cost energy conservation (management and operation improvement), b) there is largest potential by reduction of fresh air intake, and c) including ZERO cost measures, simple payback period for recommended measures (mix) is around 1 - 3 years, and d) EE&C potential is estimated as 28 - 38%.

Besides the procedure for retrofitting of air conditioning improvement are shown in Figure2.3.2-20. Key points are clarification of heat loss through ventilation first, designing heat recovery ventilation/air conditioning system and temperature control system second,

and introducing high efficient equipment for reduced loads next. And after the introduction of these measures, suitable operation should be implemented.

Table 2.3.2-5 Summary of Proposal for EM Hospital

Measure	Cost (TL)	Benefit(TL/y)	Simple Pay Back Period	Energy Saving Ratio
1.Operation & management				
(1) Formulating PDCA cycle	0	30,000	0.0	5.0
(2) Blind for heating period	0	1,700	0.0	0.3
(3) Reduction of boiler operaion hours	0	17,000	0.0	2.0
(4) Improvement of boiler operation	0	8,000	0.0	1.0
(5) Change setting of motion sensor for WC	0	600	0.0	0.1
2. Air conditioning & ventilation				
(1) Reduction of fresh air heating/cooling load				
1) Case 1 Reductio of fresh air to 30,000m3	0	48,000	0.0	19.0
2) Case 2 Introducing HEX and control	150,000	73,500	2.0	45.0
3) Case 3 Replacement of AHU	422,000	66,000	6.4	40.0
(2) Boiler air ratio adjustment	6,000	6,700	0.9	0.8
(3) Insulation for valves	2,400	2,400	1.0	0.3
4. Lighting				
(1) Introduction of electronic ballast	3,300	670	4.9	0.1
Adjustment of energy saving in boiler		(1,700)		
Total Case1 Reduction of fresh air	11,700	113,370	0.1	
Total Case2 Introducing small HEX	161,700	138,870	1.2	
Total Case3 Replacement of AHU	433,700	131,370	3.3	

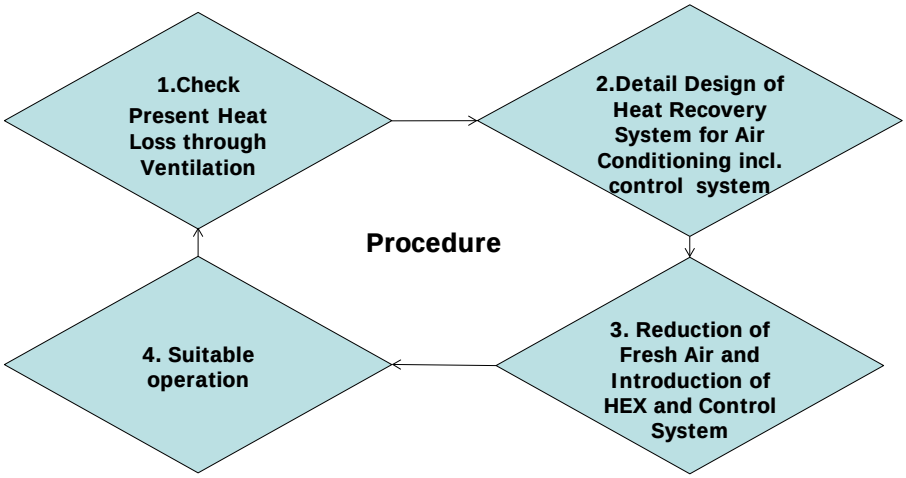


Figure 2.3.2-20 Procedure for Change in Air Conditioning and Ventilation System

2) Recommendations for Turkish Government

Referring the above analyzed energy audit result, recommendations for Turkish Government are summarized as follows. By breaking through them, the potential of ZERO cost EE&C can be expanded.

a) Enhancing EVD's capacity development by OJT is a high priority issue (Soft technology,

lack of experiences).

i) Proposal based on measured data

e.g. Improving boiler operation
Adjustment of boiler air ratio
Proposal based on daily electricity load curve

ii) Proposal based on cost benefit analyses

iii) Proposal to implement heat recovery HVAC system

b) Suitable room air temperature should be realized.

i) Many people are feeling hot in winter time (Opening window).

ii) Temperature control system has not been implemented.

c) Night time electricity consumption should be reduced.

In Japan stand-by & IT (server & PC etc.) electricity is dominant.

2.3.3 Present EE&C Condition and Target Technologies in Turkish Government Buildings

(1) Applicable EE&C Technologies for Turkey

Considering the hearing result from related technical organizations (Refer to Annex 4), EVDs (Refer to Annex 5), the findings from energy audits (Refer to 2.3.2 and Annex 6), and preliminary energy audits (Refer to 2.3.3 (2), Turkish typical EE&C technologies in existing government buildings and economically feasible typical technologies, which is considered to be applicable for Turkish public buildings, are summarized in Table 2.3.3-1. These technologies are considered to be common for all types of buildings.

Table 2.3.3-1 Technologies of Existing Buildings and for EE&C Retrofitting

Item	Typical technology of existing buildings	Technology for EE&C retrofitting	Typical manufacturer's country for EE&C technology
1. Building Materials			
Insulation (Wall)	None or less	EPS, rock wool (fire protective part)	Domestic
Insulation (Roof)	None or less	XPS, glass wool, SPF (spray polyurethane foam)	Domestic
Glass and Sash	Single glass, partially pair glass, Low-e not yet, non-insulated sash	Low-e pair glass with insulated sash	Mainly domestic (with Japanese and French Low-e glass)
Entrance	Air curtain, rotary/double door	Air curtain, rotary door, double door	Domestic, EU
2. Heat Sources			
Boiler	Large and not so efficient	Smaller and more efficient and insulation	Domestic, EU
Insulation of boiler	Partially	Equipped	Domestic
Insulation of valves	None or less	Equipped	Domestic
Insulation of pipes	Glass wool is used already or partially	Equipped	Domestic
3. Air Conditioning and Ventilation			
Heating	Gas hot water boiler, partially split AC with non-inverter	High efficient gas hot water boiler, split AC with inverter	Domestic, EU, Japan, Korea
Cooling (partially)	Split AC with non-inverter	High efficient split AC with inverter	Japan, Korea
Cooling (medium scale)	Split AC with non-inverter	Replace with high efficient central system such as VRF	Japan, EU
Central cooling	Central air cooling	High efficient cooling system	USA, EU, Japan, Korea
Ventilation	No ventilation	Ventilation by HEX, central system	Domestic, EU, Japan
Pumps and fans	Not high efficient	High efficient pump and fan with inverter	EU
4. Hot Water			
Water heater	Boiler	High efficient gas boiler, heat pump	Domestic, Japan
5. Lighting			
Usage of daylight	Already	Usage including solar duct	EU
CFL	Already	Less	EU
T5 and T8 with high frequency control	Rarely	Less	EU
LED	None	Equipped (Design and price should be secured) not now but near future	EU, Japan
Sensor and lighting control	Motion sensor is pupular	Advanced	Domestic
Reflector	Already	Equipped	Domestic
6. BEMS			
BEMS	None	Future	EU, USA, Japan
7. CHP			
Co-generation or tri-generation	None	Equipped in hospitals, hotels etc	EU, China (Absorption chiller)
8. Renewable Energy			
Solar heater	None	Recommended	Domestic
Solar cell	None	Recommended	EU, Japan, China
Heat pump (soil, water)	None	Recommended	EU, Japan, Korea

In order to promote EE&C in buildings, Heating, Ventilating and Air Conditioning (hereinafter referred to as "HVAC"), insulation and lighting are the three major technologies to be improved. And the combination of Turkish, Japanese and EU's eligible technologies can contribute to promote EE&C in buildings.

Especially the insulation for walls and roofs, which contributes the reduction of energy

consumption very high, the Study Team had meetings with IZODER (Association of Heat, water, Noise and Fire Isolators) (Insulation Association) and manufacturers and conducted several field surveys (Retrofitting for insulation).

Target standard insulation model for the insulation retrofitting for the government buildings, which the Study Team recommends, is Expanded Polystyrene (EPS) for walls and Extruded Polystyrene (XPS) for roofs. The thickness needed is defined in TS825 (See Figure 2.3.3-1 and -2)[21].

The insulation added is not so heavy that usually the effect for the building physical strength is considered to be less (Average budget needed for adding insulation is TRY40 - 50/m^2 (including plastering and painting).

Besides as a target standard insulation model for windows, the Study Team recommends pair glass with Low-e glass and insulated sash. Insulated sash can be provided by domestic manufacturers. Besides Low-e glass can be provided by Japanese manufacturers (Nippon Steel Glass and Asahi Glass) and French manufacturer.

Figure 2.3.3-1 Target Standard Insulation Model (EPS)

Figure 2.3.3-2 Retrofitting to Add Insulation for Existing Building

The first priority is adding insulation on walls/roofs and change into insulated sash. And next is change into high-efficient heating and cooling equipment for the reduced heating/cooling demand.

Regarding cooling equipment, introducing inverter technology is effective. Inverter technology has already 20% [22] market share in Turkey. Japanese market has reached 100 % on inverter technology. Japanese manufacturers (incl. Turkey-Japan joint venture) can contribute more quick market transformation by introducing inverter technology for split type air conditioners and VRF (Variable Refrigerant Flow) air conditioners.

[21] Major materials for insulation on walls and roofs are the followings; i) EPS in short for wall, ii) XPS in short for roof, iii) Rock wool for the wall where fire protection is needed (over 21m height) and iv) Glass wool for interior insulation

[22] İSKİD information

(2) Findings from Other Preliminary Energy Audits

In the former mission, nine preliminary energy audits for the government buildings were conducted. The result of them is summarized in Table 2.3.3-2. The major findings are reflected and summarized in Table 2.3.3-1.

Table 2.3.3-2 Present Condition for EE&C of Surveyed Government Buildings

No.	Item / Building name	A	B	C	D	E	F	G	H	I
1	**Building outline**									
1.1	Survey date	22-5	23-5	24-5	25-5	25-5	30-5	01-6	29-5	13-7
1.2	Location	Ankara	Ankara	Ankara	Ankara	Ankara	Istanbul	Istanbul	Istanbul	Ankara
1.3	Owner by government	Central	Central	Central	Central	Central	Regional	Regional	Central	Central
1.4	Type	Office	Office	Office	Office	Hospital	Office	School	School	Office
	Numbers of building	1	1	3	8	1	1	1	1	1
1.5	Stories (UG=Under ground)	5	18	UG2+12	UG2+10	UG2+4	2	3	3	UG1+21
1.6	Floor area (m2)	2500		12000	57000	30323	2500	4500		10000
1.7	Completion year	1986		1960	1984	2009	1810	1990		1982
1.8	Renovation year						2002			
2	**Insulation and air-tightening**									
2.1	External wall insulation	Not yet	Not yet	Not yet	Already	Already	Not yet	Not yet	Not yet	Not yet
2.2	Insulation of Roof	Already	Not yet	Already	Already	Already	Not yet	Already	Not yet	Not yet
2.3	Double glazing glass	Partially	Already	Not yet	Already	Already	Already	Already	Already	Already
2.5	Low-e-glass with hard coating	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
2.6	Rotary door of entrance	Not yet	---	---	Already	---	Not yet	Not yet	Not yet	Not yet
2.7	Double door of entrance	Not yet	Already	Already	---	Already	Not yet	Not yet	Not yet	Already
2.8	Air curtain unit	Not yet	Already	Already	---	Already	Not yet	Not yet	Not yet	Already
3	**Air-conditioning system: Heating**	Central Hot water	Central Hot water	Central Hot water	Central Hot water	Central Hot water	Central Hot water	Central Hot water	Central Hot water	Central Hot water
	Air-conditioning system: Cooling	20-set Split	100-set Split	50-set Split	Split (Partially Chiller)	Central Chiller & Split	All room Split	2-set Split	Researcher room Split	Central Chiller+FCU
3.1	Split-type Inverter air-conditioner	Partial	Not yet	Not yet	Partial	Partial	Not yet	Not yet	Not yet	Not yet
3.2	VRF type air-conditioner	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
3.3	High-efficient turbo chiller	---	---	---	Not yet	Not yet	---	---	---	---
3.4	Heat pump chiller	Not yet	Not yet	Not yet	Not yet	Already	Not yet	Not yet	Not yet	Already
4	**Heat sources**									
4.1	Combustion control of boiler	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
4.2	Insulation of boiler	Partial	No data	Partial	No data	Already	Partial	Partial	Partial	Already
4.3	Insulation of steam piping & valve	Not yet		Not yet	Partial	Partial	Not yet	Not yet	Not yet	Not yet
4.4	Insulation of chilled water piping &	---	---	---	---	Partial	---	Not yet	---	Not yet
5	**Lighting**									
5.1	Usage of day light (Daytime off)	Already	Already	Already	Already	Already	Already	Already	Already	Already
5.2	CFL lamp	---	Already	Partial	---	Already	Partial	Partial	Already	Already
5.3	Hf fluorescent lamp (T8,T5)	Not yet	Already	Not yet	Already	Not yet	Not yet	Not yet	Not yet	Already(T8)
5.4	LED lamp	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
5.5	Lighting control by motion sensor	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
5.6	Solar-duct system	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
5.7	Refrector	Already	Already	Already	Already	Already	Not yet	Already		Already
6	**Renewable energy**									
6.1	Solar water heater	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
6.2	Photovoltaic cells	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
7	**Building energy management system (BEMS)**	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet	Not yet
8	**Power receiving equipment**									
8.1	Auto controled phase compensator			Already	Already	Already	Already	Already		Already

Note 1:
Already: Already introduced
Partial: Partially introduced
Not yet: Not yet introduced

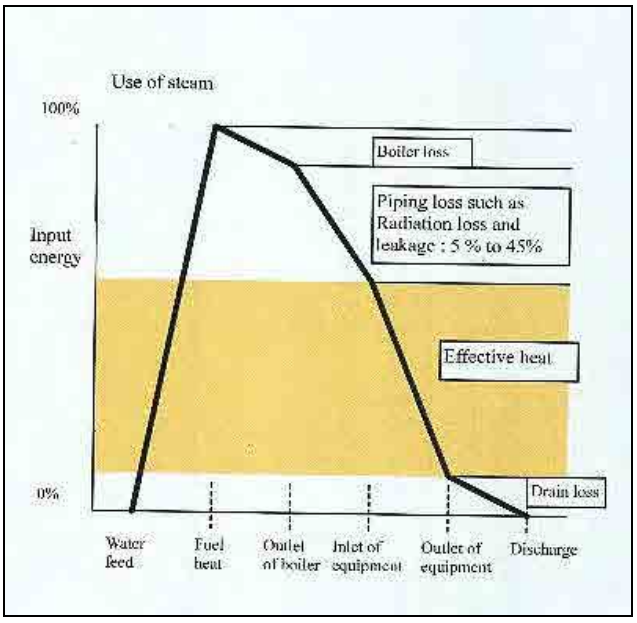
Note 2:
A Strategy Development Head Office, Ministry of Forest
B Head Office, Ministry of Energy and Natural Resources
C Building of State hydraulic Works (DSI)
D Head Office, Ministry of Finance
E Yenimahalle public hospital
F Environmental protection and Historical Department, Istanbul City
G Adnan Menderes High School, Istanbul Province
H Energy Institute, Istanbul Technical University
I Head Office, Ministry of Coal

Heat insulation work is an effective measure to reduce heat loss of buildings, heat sources and heat transfer. Heat loss amount is calculated with measurement of surface temperature of building interior wall, window glass, boilers and piping. The Study Team used an infrared camera to measure the surface temperature of several government building walls, boilers and piping etc. Pictures of infrared camera are shown in Figure 2.3.3-4 to -6. Especially the lack of insulation of heating sources, valves and building surface was observed in almost all buildings.

1) Steam boiler and steam piping

Steam pipes and valves are not insulated, which surface temperature is more than 100°C. Heat loss of steam piping is 5% to 45% of input heat of a boiler as shown in Figure 2.3.3-3, therefore insulation of steam piping is important measure in energy saving in steam system.

In industry sector there are a lot of steam boilers, so the insulation condition for industry sector is worth being investigated.



Source: Energy conservation information, The Federation of Electric Power Companies of Japan, March 2011

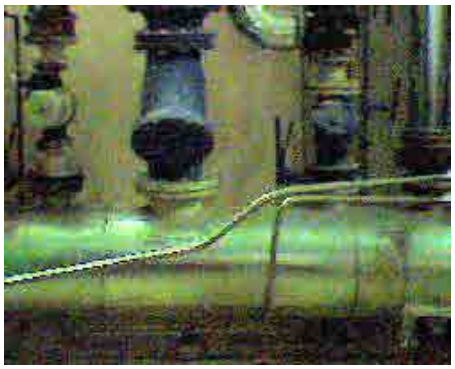
Figure 2.3.3-3 Effective Heat and Heat Loss in Steam System

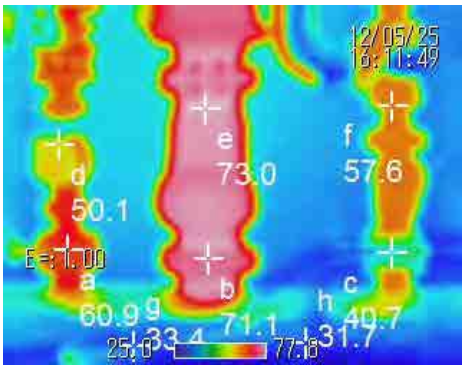
2) Hot water piping and valves

Many pipes and valves of hot water feeding piping are not insulated. Temperature of non-insulated pipe can be reduced from 70°C to 32°C, as surface temperature of insulated pipe is 32°C.

(Normal camera view) **(Thermo camera view)**

Figure 2.3.3-4 Steam Boiler and Piping with Insufficient Insulation in an Office Building





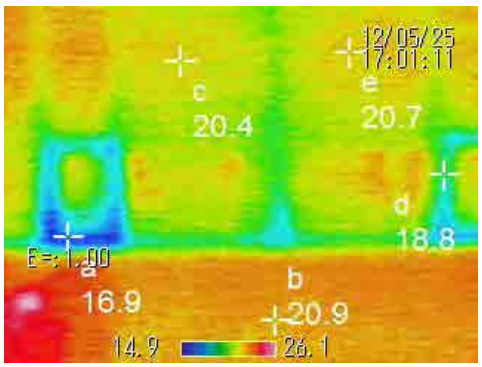
(Normal camera view) **(Thermo camera view)**

Figure 2.3.3-5 Non-insulated Valves and Piping of Hot Water in a Hospital.

3) Building wall and window glass

This building is constructed 2 years ago, and so insulation work of building wall and window glass is good except for sash of window.

Temperature of interior wall and window glass is 20°C, although room air temperature is 24°C and outside air temperature is 13°C.



(Normal camera view) **(Thermo camera view)**

Figure 2.3.3-6 Window Glass and Wall of Waiting Area in a Hospital

EE&C technologies, which were found through on–site surveys in Ankara, are summarized in Annex 7.

(3) Summary of Recommendations

The summary of recommended technologies, which is estimated economically feasible and can contribute Turkish government buildings EE&C are as follows.

a) External wall and roof insulation (e.g. EPS for walls and XPS for roofs)

b) Pair glass (with low-e glass and insulated sash)

c) Inverter technology for air conditioning (incl. VRF)

d) Insulation for heating pipes and valves

e) Heat recovery ventilation

f) Inverter technology for pumps and fans

g) Hot water supply by solar heat

h) Heat pump system

2.3.4 AC (Air Conditioner) Field Test

For air conditioners (ACs), which are the most electricity consuming equipment in buildings, the field test of measuring electricity consumption in the actual offices in Istanbul is being carried out. The purposes of this field test are as follows;

a) Electricity consumption of inverter ACs and non-inverter ACs is measured in the actual offices. Compared with both consumption data, energy saving by introduction of inverter ACs is clarified (Visualization of the energy saving effect).

b) The necessity of introducing Seasonal Performance Factor (hereinafter referred to as "SPF") and Annual Performance Factor (hereinafter referred to as "APF"), which will be used worldwide as ISO 16358 in 2013, is recognized (For the details of SPF and APF, refer to the following Section (1)).

(1) SPF and APF

1) Movement of SPF and APF

Energy Efficiency Ratio (hereinafter referred to as "EER") and Coefficient of Performance (hereinafter referred to as "COP"), which evaluate the energy efficiency at the rated time, have been used in the past. However, with the spread of inverter ACs, which, following the fluctuation of the actual load, can operate, it is found that the existing EER and COP can't evaluate the performance of variable operation.

Recently, preparation and introduction of SPF and APF, which can evaluate seasonal and/or annual energy performance, as the evaluation standard, are starting in Japan and

other countries. SPF and APF will be standard as ISO16358 in 2013 and will start operation of this standard.

SPF and APF will be also introduced in Europa. Therefore, it is expected that spread of inverter ACs in Turley will is promoted by the introduction of this standard.

2) Outline of SPF and APF

a) EER and COP

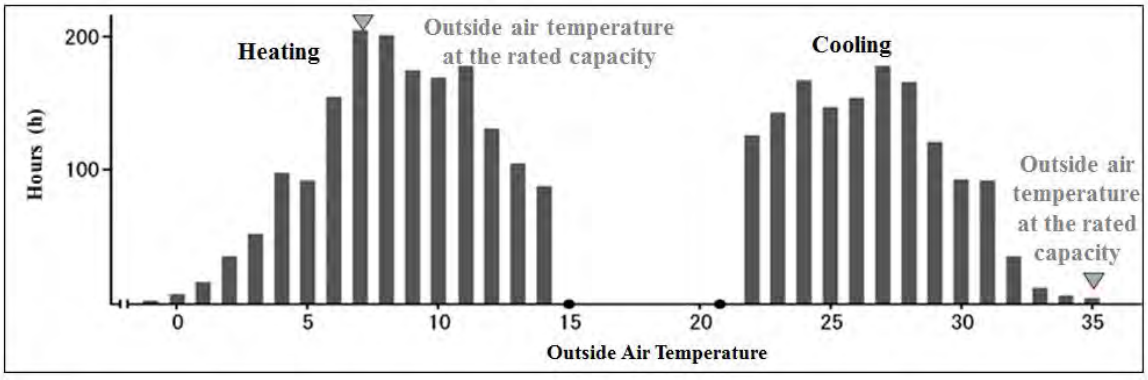
EER and COP, which are the existing energy efficiency evaluation standard, evaluate ACs only by using the capacities at the rated points.

$$EER = \frac{\text{Cooling Rated Capacity (W)}}{\text{Cooling Rated Energy Consumption (W)}}$$

$$COP = \frac{\text{Heating Rated Capacity (W)}}{\text{Heating Rated Energy Consumption (W)}}$$

b) Outside air temperature in cooling and heating period

Distribution of outside air temperatures for calculating APF of the commercial and office buildings in Japan is shown in Figure 2.3.4-1. EER and COP can't evaluate the actual situation, since electricity consumption for cooling or heating in the actual operation varies in accordance with the change of outside air temperature. It is also funded the rated points of EER and COP are not always the representative points.



Source; Report of Air Conditioner Standard Subcommittee, Energy Efficiency Standard Subcommittee, Advisory Committee for Natural Resource and Energy

Figure 2.3.4-1 Distribution of Outside Air Temperatures for Calculating APF of the Commercial and Office Buildings in Tokyo

c) Energy efficiency for partial load

Energy efficiency of ACs for partial load is shown in Figure 2.3.4-2. Inverter ACs have high energy efficiency for partial load. As shown in Figure 2.3.4-1, Distribution of outside

air temperature, there are many operations under the partial load in actual operation. So, Inverter ACs, as compared with non-inverter ACs, can bring out high energy efficiency for actual operation.

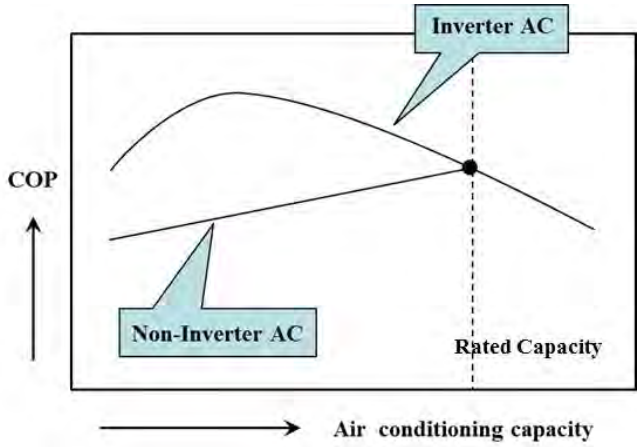


Figure 2.3.4-2 Energy Efficiency of ACs for Partial Load

d) SPF and APF to be defined in ISO 16358

In order to evaluate ACs on the near-actual operation conditions, SPF and APF, as new energy efficiency evaluation standards, which are calculated by using total loads for AC and the characteristics of electricity consumption of AC in cooling, heating, and annual periods, are defined.

i) Cooling Seasonal Performance Factor (CSPF)

$$\text{CSPF} = \frac{\text{Cooling Seasonal Total Load (CSTL) (W)}}{\text{Cooling Seasonal Energy Consumption (CSEC) (W)}}$$

ii) Heating Seasonal Performance Factor (HSPF)

$$\text{HSPF} = \frac{\text{Heating Seasonal Total Load (HSTL) (W)}}{\text{Heating Seasonal Energy Consumption (HSEC) (W)}}$$

iii) Annual Performance Factor (APF)

$$\text{APF} = \frac{\text{CSTL (W)} + \text{HSTL (W)}}{\text{CSEC (W)} + \text{HSEC (W)}}$$

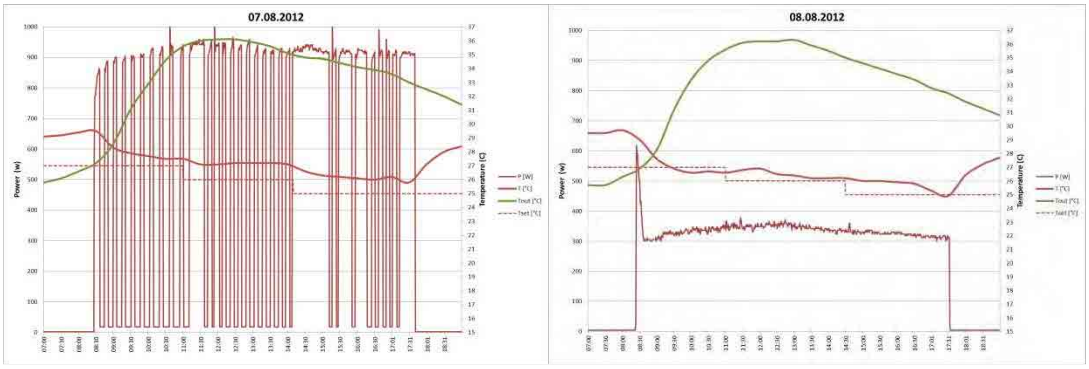
In order to calculate SPF and APF, the energy consumption is not measured in actual field. In accordance with ISO 16358, the total heat load is prepared in consideration of each local climate in Turkey and the energy consumption is prepared by using a) the rated capacity and the half capacity for cooling, b) the rated capacity, the half capacity, and the low temperature capacity for heating. And the SPF and/or APF are calculated by the total heat load and the energy consumption.

(2) AC Field Test

1) Result of measurement

AC field text was conducted by using inverter AC and non-inverter AC with same EER and same COP. Electricity consumption of both ACs was measured in actual offices in Istanbul (See Annex 8 for the details of AC field test).

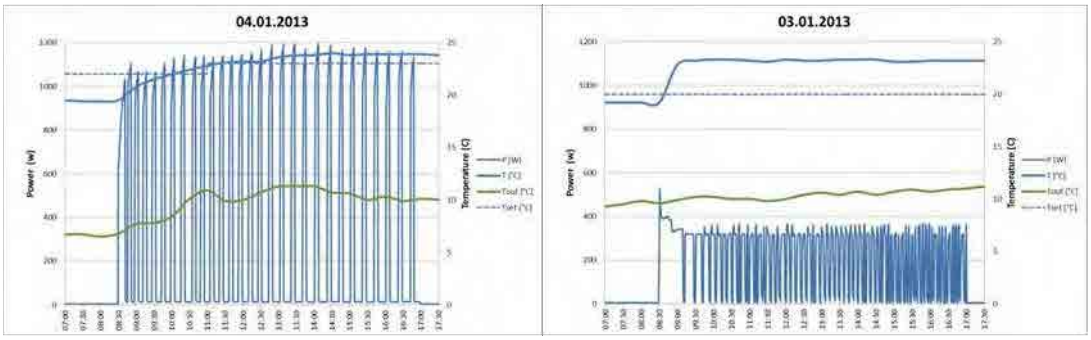
On the typical two days, which have similar outside and indoor air temperatures, daily electricity consumption of non-inverter and inverter ACs for cooling is shown in Figure 2.3.4-3 (for cooling). Inverter AC continuously operates at the low power and non-inverter AC repeatedly operates at the high power and stop in operation hours. The Figure specifically shows the feature for energy efficiency of inverter AC.



Note; P: Power, T: Air temperature in room, Tout: Outsilde air temperature, Tset: Set temperature

Figure 2.3.4-3 Daily Electricity Consumption of Non-inverter and Inverter ACs for Cooling

On the typical two days, which have similar outside and indoor air temperatures, daily electricity consumption of non-inverter and inverter ACs for heating is shown in Figure 2.3.4-4 (for heating). This field test for heating was conducted in the limited period, which has low heat load without peak period. Therefore, electricity savings was confirmed but the situation, which not only non-inverter AC but also inverter AC operated and stopped repeatedly, arisen.



Note; P: Power, T: Air temperature in room, Tout: Outsilde air temperature, Tset: Set temperature

Figure 2.3.4-4 Daily Electricity Consumption of Non-inverter and Inverter ACs for Heating

2) Result of analyses

As the result of the field test, the followings are found and confirmed;

a) As compared with non-inverter ACs, inverter ACs have 20% energy saving potential for cooling, 30% for heating, and 26% for total of cooling and heating. (This field test was conducted in the limited period. Especially, the field test for heating was not conducted in the peak season. As a result, analysis for heating was conducted based on the limited and less data, compared with the analysis for cooling.)

b) The existing EER and/or COP, which are evaluation by the rated input and output, are difficult to evaluate the energy efficiency of inverter ACs. Therefore, the introduction of SPF and APF, which are new evaluation factors, is needed.

On the other hand, there are needs for cooling in peak summer season, however the demand (kWh) in cooling period is not big in Istanbul. Under such conditions, in order to promote EE&C through the introduction of inverter ACs, it seems to be effective to select ACs with suitable capacity, not an oversized capacity, and with a wide control range.

In addition, it is expected to increase the use of inverter ACs, as equipments for both heating and cooling, in the south areas of Turkey, where cooling demand is large and gas has not been delivered for heating .

(3) Summary of Recommendations

The result of the field test will be shared with MOEU and the relevant governments and agencies in the seminar which was held in Ankara on 30th January 2013. In the seminar, the energy saving effect of inverter ACs was shown and the necessity of introducing SPF and APF was recognized. And four recommendations from the AC field test are as follows;

a) This field test was conducted in the limited period, which the peak period for heating was not included especially. For the improvement of analyses accuracy, the further continuous study should be needed.

b) Since Turley has various meteorological and special local conditions, AC field test should be spread to other regions to collect and analyze the data based on the regional characteristics.

c) SPF and APF in Turkey should be prepared and introduced, considering meteorological and special local conditions in Turkey, in accordance with ISO 16358 to be issued in this year.

d) In Turkey, SPF and APF should be introduced as the evaluation method and inverter ACs should be disseminated for promoting EE&C.

2.4 Recommendation of a Project Scheme for Energy Efficiency Retrofitting in Government Buildings

2.4.1 Confirmation of Government Policy and Objectives

Through the missions and desk study in Japan, the policy and course of actions of Government of Turkey with regard to EE&C in government buildings have been identified as explained in 2.1.2. The most important ones are summarized hereunder.

(1) Necessity and Rationale of EE Retrofitting in Government Buildings

There are two kinds of important requirements obligated to the Government, legal and policy requirements in EE&C retrofitting in public buildings in Turkey. One is a legal requirement by BEP (2008/2011) under Energy Efficiency Law of 2007. In this regulation, it is stated that "The energy use of the buildings and enterprises belong to public buildings shall be reduced by at least 20% in the year 2023 compared to the year 2010." in Article 31. The other is a policy requirement stipulated in the Energy Efficiency Strategy Paper 2012-2023. In response to the above legal requirement, the Energy Efficiency Strategy Paper specifies an action "The EE projects shall be prepared by making energy audits in the buildings and facilities of the public enterprises and the budget allowances of the maintenance shall be used for these projects with priority". And linked to the other measures, it is stated that "annual energy consumption in the public enterprises buildings and facilities shall be decreased as 10% by the year 2015 and as 20% by the year 2023."

(2) Expected Outcomes

1) Industry was the dominant energy consumer for the last years. However, because of the economic contraction in 2008, the building sector has become the largest energy consuming sector with a share of 36% in 2008 and 40% in 2009 in total consumption. By 2010, the share decreased to 35% despite the fact that its energy consumption had actually increased to 28.9 mil. TOE. Out of the total 8.6 mil. buildings in Turkey, majority of buildings (more than 90%) was built before 2000, the year new thermal insulation regulations came into operation. Judging from several energy audit studies indicates that 30% energy saving could be achieved in building sector without much difficulties[23].

2) The public sector buildings also have large energy saving potentials. It is, however, difficult to indicate the potential saving volumes quantitatively, as statistics of energy consumption in public sector buildings are not collected comprehensively. According to the indication of MOF, central government annual expenditure for energy consumption is around USD 2.5 bn. In any case, there must be untouched sizable EE&C potentials in public sector buildings.

3) As effective implementation mechanism including financing has not been developed, it is difficult to make use of this good opportunity.

[23] Strengthening the Capacity of the Ministry of Public Works and Settlement for Improving the Energy Performance of Buildings; Action Plan for Improving the Energy Performance of Buildings in Turkey, May 2011

(3) The Government Plan

1) The relevant government ministries such as MOEU and MENR consider EE&C in public buildings is untouched and thus has large energy saving potentials. MOEU is currently conducting a pilot project entitled, 100 Buildings Project, which involves energy audit and energy-improvement of public buildings in Ankara. MOEU plans to 1) establish standard specifications through 100 Buildings Project, 2) guide (recommend) procurement for other ministries using thus established standard specification, and 3) make other ministries adopt the standard through the issuance of a Prime Ministry Circular. After getting the lessons and feedback from this project, MOEU has idea to extend similar studies to promote EE&C to 1,000 public buildings nationwide.

2) Not only the line ministries, but also agency responsible for national development such as MOD also recognizes the importance and effectiveness of EE&C especially in public buildings. This sector has already become a focused target.

3) The Energy Efficiency Strategy Paper 2012-2023, issued in February 2012 (See 2.1.2 and 2.1.3), and reconfirms the government priority on energy efficiency improvement in public buildings. The Government, therefore, plans to implement the program by creating comprehensive implementing framework together with institutional/human resource development and finance mechanism. The Government also considers it as a smart way to mobilize multilateral/bilateral donor assistances (technical assistance and loan assistance) from countries with experiences and know-how of EE&C, such as Japan, in order to implement large scale program in an effective manner.

2.4.2 Recommendation of a Project Scheme for Energy Efficiency Retrofitting in Government Buildings

During the course of meetings with the key stakeholders (including JICA Turkey Office, MOEU, MOD, MENR, GDRE, municipalities, multilateral and bilateral donors, EVDs and technical associations) the Study Team has discussed various possibilities for the JICA assistance scheme to promote public buildings EE&C in Turkey. Before getting into the overview of the scheme, we need first to understand the following issues.

(1) Principal Barriers and Counter Measures

The Study Team assumes that the target segment at initial stage is "Energy Efficiency Retrofitting of Central Government Buildings[24]." Eligibility criteria for sub-project may include a) reducing energy consumption by more than 20%, and b) recovering full investment cost by reduction of energy bill within five years[25]. Apart from several procedural/regulatory difficulties, there are two major root causes, which have hampered EE in public sector buildings from implementation.

[24] As the same implementation model can be applied to municipal buildings with slight modification for funding, a parallel program may be commenced once the central government program become on track.

[25] The figures "20%" and "five years" are just examples.

- Size of sub-projects varies, from large ones such as a whole building refurbishing with energy efficiency improvement to small replacement of one split-type AC. But majorities are small ones. Being a small size makes transaction cost relatively high, which includes monetary costs, human resources, and time.
- Energy saving brings a tangible benefit of financial savings. As it is in a form of reduction of budget expenditure, savings cannot be used by the organization which really made the savings, but kept by the authority that manages the government budget. Therefore, not many organizations have so far become serious about energy saving.

Table 2.4.2-1 shows the solutions for the above two fundamental barriers.

Table 2.4.2-1 Principal Barriers and Possible Counter Measures

Principal Barrier	Counter Measure
Majority of sub-projects are "small," thus involves relatively high transaction costs	- To standardize investment decision and procedures of sub-projects so as to process easily - To use eligible equipment list for automatic sub-project approval - To bundle a large number of the same kind, small sized sub-projects into one large batch. At the same time, establish the Project Management Unit (hereinafter referred to as "PMU") for the entire project implementation, from budget handling, procurement, contract, so as to avoid the implementation by each ministry.
Little (no) interest for energy saving by building owner agencies (ministries), due to lack of financial benefits	- Not only raising awareness, educational, but also guidance, enforcement by authoritative power; - To set up, for example, the PMU in the highly recognized agency such as the Prime Ministry or in MOEU with support from and coordination with higher government authorities. - Another approach is to make the program compulsory by law, by regulation, or by the issuance of a Prime Ministry Circular so as to ensure that no agency could dismiss the implementation of EE&C improvements in buildings.

With an understanding of principal barriers and counter measures mentioned above, the target of future assistance program is to implement energy efficiency retrofitting of public buildings in an efficient manner and to realize potential benefits within the shortest possible time. The core of the program is the financial assistance for investment by an ODA loan project. As implementation of the loan project is the first case of this kind in Turkey, project implementation requires experts' support to some extent at the initial stage, especially for sub-project formation, sub-project appraisal, procurement, construction supervision, and benefit monitoring. This part can be supported by international cooperation agency in the form of TA.

In addition to the above loan project and technical assistance, there are other connected areas to be strengthened from broader perspectives. These areas may include establishment of assessment method of comprehensive building performance, enhanced coverage of Energy

Labeling, capacity strengthening of EVDs, etc. By strengthening such areas with foreign technical assistances, the better environment with a handful of tools for implementation would be created; thereby the loan project could be implemented in an efficient and speedy manner.

In summary, the proposed future assistance program is divided into the following three different components (See Figure 2.4.2-1).

1) Financial (ODA loan) assistance for implementation of EE&C of public buildings
2) Technical assistance mainly to PMU for a smooth, efficient and effective implementation of the above EE&C investment project
3) Technical assistance aimed toward the broader capacity development for EE&C in Turkey, which at the same time would strengthen the prerequisites for the success of EE&C of public buildings

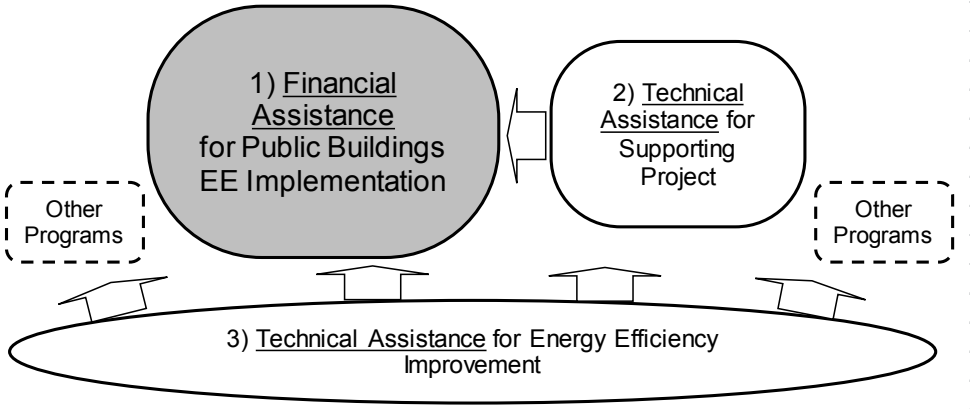


Figure 2.4.2-1 Three Broad Components of Future Assistance Program

(2) Financial Assistance Project

This is concessional loans extended by bilateral and/or multilateral donor(s) to the Government of Turkey represented by UT. Loan proceeds are to be used by the Government as a part of investment budget. This is NOT an on-lending from the Government to other agencies. Therefore, no financial recovery is expected by the Government but the investment returns will be in the form of the reduction of annual expenditures for energy purchase (Budget Classification Code 03-2-3-01, -02, -03, -90).

The approach of Government of Turkey for public sector energy efficiency is shown in the item SP-06/ST-01/A-1 of Energy Efficiency Strategy Paper 2012-2023, "The efficiency improvement projects shall be prepared by making energy audits in the buildings and facilities of the public enterprises and **some parts of the budget allowance of the maintenance shall be used for these projects with priority**. Prime Ministry Circular numbered as 2008/2 shall be revised in this direction by MENR. It is however concerned this approach discourages willingness of government ministries for EE&C because of using allocated maintenance budget. Approach must be end-users (Ministries and General Directorates) friendly by responding to barriers explained in Table 2.4.2-1 Principal Barriers and Possible Counter

Measure.

By taking above factors into considerations, the Project for Energy Efficiency Retrofitting in Government Buildings (The Project) has been designed and proposed in this study. The Project has two intended outcomes, namely; a) realization of energy savings in public buildings, which account for a part of the government's saving target of decreasing as 10% by 2015 and by 20% by 2023, and b) leading EE retrofitting of private buildings by showing success cases in public buildings.

Several important features of the Project are as follows;

- Utilization of Two implementation methods
- Establishment of a powerful PMU with implementation authorities and enforcement tools
- Structuring framework agreement for a large-number of small-scale sub-projects in consistent with Turkish Law
- Implementation of sub-project by PMU for other ministries by delegation of authority to PMU
- Evaluation of tender not by price of bids, but selecting the economically most advantageous tender by taking into account the factor other than price
- Purchasing only high energy efficiency equipment by using energy labeling regulations
- Direct financial beneficiary will be GOT through reduced energy purchase bills

1) Utilization of two implementation methods

There are two methods of sub-project implementation (See Figure 2.4.2-2);

- Energy Audit Method: Energy audits will be done (like 100 Buildings Project) for buildings having high energy saving potentials, based on which sub-projects consisting of several EE&C measures will be formulated. Sub-projects will then be appraised and approved by the PMU, if eligibility criteria are met. Approved sub-projects will be implemented by building owners, i.e. Ministries and General Directorates, with comprehensive support from PMU for energy audit, budget provision (finance), preparation of detail design and tender documents, tender support, implementation support.
- Bundling Method: This is a single most promising EE&C measure, in which small scale but large number of thematic sub-projects, such as replacement of ACs, will be bundled across ministries and administrations, and implemented and financed by the PMU.

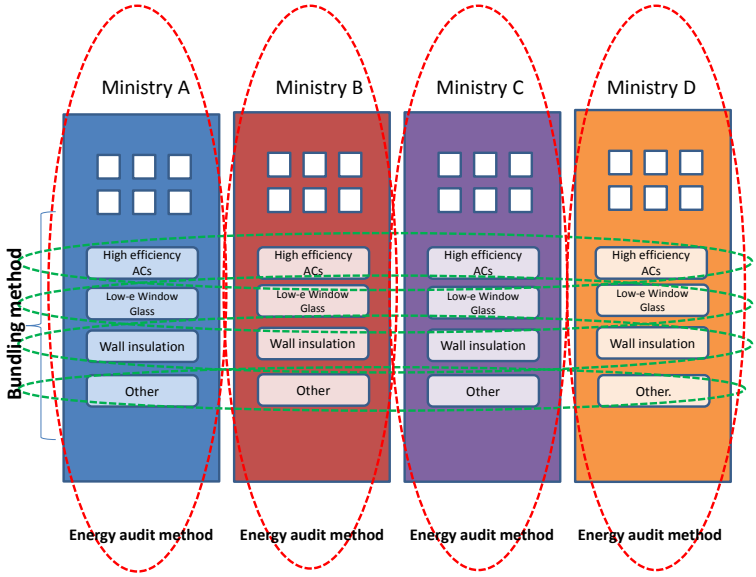


Figure 2.4.2-2 Energy Audit Method and Bundling Method

2) Establishment of a powerful PMU with implementation authorities and enforcement tools

PMU will be created in the higher level of government structure or in the MOEU with support from and coordination with higher government authorities. It must become a powerful enough organization to control all ministries including their General Directorates, and other central governments public administrations (in a sense, all ministries are expected to act according to the instructions from the PMU). The present roles and responsibilities given to MOEU with regard to implementation of EE retrofitting of all public sector buildings are not explicitly mandated. It is therefore recommended to make it as a role of MOEU together with authorities and responsibilities, by amending establishment law of MOEU or Energy Efficiency Law. Another approach is to make the program compulsory by law, by regulation, or by a decision of HPC and/or the issuance of a Prime Ministry Circular so as to ensure that no agency could dismiss the implementation of EE&C improvements in buildings (See Figure 2.4.2-3).

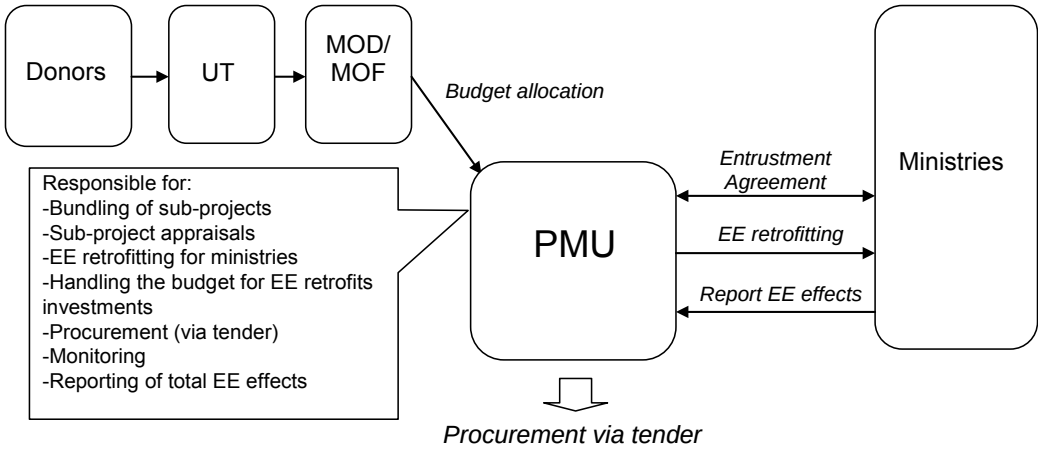


Figure 2.4.2-3 Role of PMU

The PMU Management Team consists of government officials seconded from relevant ministries and recruited from outside the government. The PMU's roles and functions include;

- Overall project implementation and management
- Financial management including loan management
- Establishment of sub-project eligibility criteria, including making and updating "the List of Eligible EE&C Equipment"
- Appraisal and approval of submitted sub-projects in accordance with sub-project eligibility criteria
- Sub-project formation for challenging areas shall be done by the Technical Pool under the PMU subcontracted to EVDs.
- Confirmation of responsibilities of participating ministries and administrations, by signing agreement with each participant
- Procurement, contract, and implementation management in case of Bundling Method (All responsibilities are with the PMU, not participating ministries, etc.). Actual design and constructions works are to be undertaken by subcontracted EVDs.
- Monitoring of sub-project progress and project outcomes
- Awareness raising, dissemination of information about project outcomes

The Project implementation steps and the agencies involved are summarized in Table 2.4.2-2 and -3. Here MOEU would take the leadership, irrespective of the fact whether the PMU is established above the line ministries or not to implement the Project. It is important that at the stage of identification of sub-projects, PMU/MOEU shall take leadership in collecting information from relevant stakeholders by interacting proactively with them. At the tender stage, sub projects are to be screened via energy audits for large-scale EE retrofitting sub-projects, while for many small-scale sub-projects bundled into one batch were to be screened based on tender documents (which define standard specifications and the minimum procurement amount). Lastly, strict monitoring shall be conducted by PMU/MOEU in order to calculate the cost effectiveness and EE&C effects of the Project.

Table 2.4.2-2 Project Implementation Steps and Agencies Involved (Case of Energy Audit Method)

Project Implementation Steps	JICA	Ministries	PMU	MOEU	EVDs	Suppliers/ Contractors
(1) Identification of sub-projects	S	P	P	S	S	S
(2) Request for participation		P				
(3) Acceptance for participation			P			
(4) Initial energy audit by computer software			P		S	
(5) Agreement for investment		P	P			
(6) Appraisals for eligibility/approval	S		P			
(7) Agreement for sub-project implementation		P	P			
(8) Tender/ Tender documents		P	S		S	P
(9) Tender evaluation		P	S			
(10) Negotiation and signing of contract for supply/works		P			S	P
(11) Supervision of works			P		S	
(12) Final acceptance		P				
(13) Operation maintenance		P				
(14) Outcome monitoring	S	P	S	S		

P: Primaliry Responsible Agency
S: Supporting Agency

Table 2.4.2-3 Project Implementation Steps and Agencies Involved (Case of Bundling Method)

Project Implementation Steps	JICA	Ministries	PMU	MOEU	EVDs	Suppliers/ Contractors
(1) Identification of sub-projects	S	P	P	S	S	S
(2) Request for participation			P			
(3) Acceptance for participation		P				
(4) Initial energy audit by computer software					S	
(5) Agreement for investment		P	P			
(6) Appraisals for eligibility/approval	S		P			
(7) Agreement for sub-project implementation		P	P			
(8) Tender/ Tender documents			P		S	P
(9) Tender evaluation			P			
(10) Negotiation and signing of contract for supply/works			P		S	P
(11) Supervision of works			P		S	
(12) Final acceptance		P	S			
(13) Operation maintenance		P				
(14) Outcome monitoring	S	P	S	S		

P: Primaliry Responsible Agency
S: Supporting Agency

3) Structuring framework agreement for a large-number of small-scale sub-projects

As a counter measure against large-number of small-scale works, Framework Agreement

(Contract) stipulated in Additional Article 2 of Public Procurement Law No. 4734 of 2002 can be applied by PMU. This is an agreement between one or more contracting authorities (PMU representing all other ministries) and one or more tenderers (manufacturer, supplier, contractor), which establishes the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, the quantity envisaged. It is, however, that current Public Procurement Law does not allow framework agreement across ministries. Therefore, amendment of Public Procurement Law is required with regard to a new clause that enables frame work agreement among ministries, including budget appropriation and spending for other ministries by a representing ministry (MOEU/PMU). The Public Procurement Policy Department of the Ministry of Finance is undertaking a process of amending it in consultation with relevant ministries and departments.

4) Implementation of sub-project by PMU for other ministries and agencies by delegation of authority to PMU

According to the Establishment Law of MOEU[26], the Ministry is already mandated to implement retrofit investments (budget acquisition & procurement included) for other ministries but only upon the requests of other ministries[27]. It is considered to be much faster, efficient and effective, if implemented by PMU/MOEU rather than implemented by each ministry. This, either implemented by PMU with delegation (Bundling Method), or implemented by each ministry with support from PMU (Energy Audit Method), must be done by exchanging written agreement between PMU and participating ministries.

5) Evaluation of tender not by price of bids, but selecting the economically most advantageous tender by taking into account the factor other than price

It is important to ensure energy efficiency improvement (energy savings) by all sub-projects. Therefore, tenders should not be awarded to a bidder who only submit the lowest price, but must be evaluated and awarded to the bidder who offers most economically advantageous proposal in life time (Life Cycle Cost). Public Procurement Law No. 4734 of 2002 allows an evaluation and award in Article 40: "In cases where it is not possible to determine the economically most advantageous tender on the basis of the lowest price only, the economically most advantageous tender shall be determined by taking into account the factors other than price such as operation and maintenance costs, cost-effectiveness, productivity, quality and technical merit. In tender procedures where the economically most advantageous tenders shall be determined by taking into account the other factors in addition to the price, these factors must be stated in the tender documents and where possible, must be expressed in monetary values. Relative weights shall be determined in

[26] 29/6/2011 No.644 KHK

[27] Article 10 General Directorate of Construction, "(1) c) Public buildings and facilities belonging to public institutions and agencies covered by the budget needs to prepare programs, studies and projects, and perform or make cost calculations, confirm or make the approval, construction, retrofitting, as amended, and perform or make substantial repairs.

tender documents for the factors which cannot be expressed in monetary values."

6) Purchasing only high energy efficiency equipment by using Energy Labeling regulation

There are several regulations in relation to requirements in energy efficiency in public sector procurements. These are;

Regulation on Labeling of Products by Consumption of Energy and Other Resources dated 09/12/2011 No: 2011/2257

Public procurement and incentives

ARTICLE 10 - (1) In relation to the products included in the application communiqués, goods within the scope of Public Procurement Law dated 4/1/2002 and 4734 numbered, to be purchased by the Administrations; to ensure that the application of high-efficiency class and high performance level, in terms of energy consumption or if any, to provide more efficient classes specified in the Application Communiqués, may make necessary modification on technical specifications, in accordance to the communiqués

(2) Government administrations prefer products, taking into account the criteria of cost-effectiveness, economic feasibility, technical suitability and sufficient competition aspects, in the conditions of the highest level of performance and in high-efficiency class.

Regulation Regarding the Increase of Energy Efficiency dated October 27, 2011 No. 28097

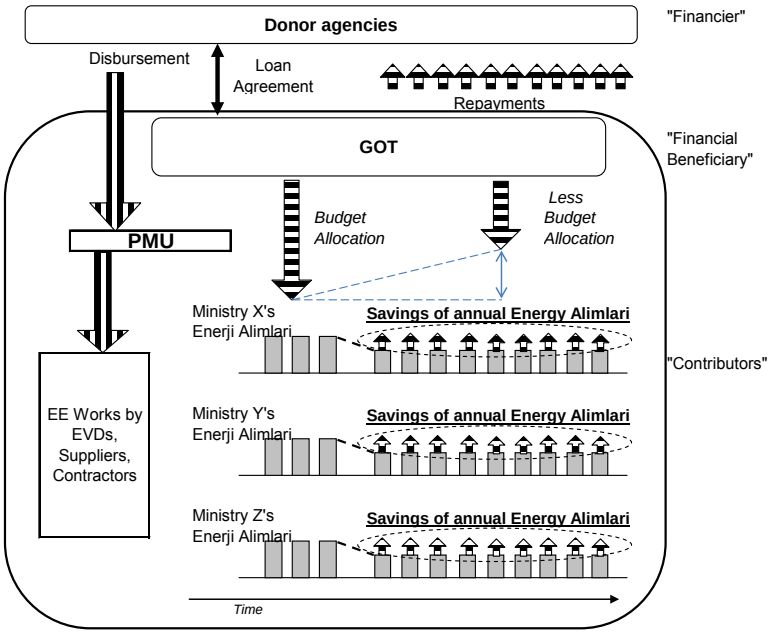
ARTICLE 31 Measures to be taken with priority for increasing the energy efficiency in the buildings and enterprises belong to the public sector; (1) The energy use of the buildings and enterprises belong to public sector shall be reduced by at least twenty percent in the year 2023 compared to the year 2010

(2) Choosing among the air conditioners with at least A class label in new purchases.

7) Direct financial beneficiary will be GOT through reduced energy purchase bills

Project costs will be the total sum of the EE retrofit investments of ministries and agencies. This is financed through PMU by budget. Financiers are JICA and/or multilateral/bilateral donor agencies.

The primary financial beneficiary of the Project will be the Turkish Government through reduced energy purchase bills (i.e. fuel, oil & petroleum and electricity purchase costs) of central government ministries and agencies (See Figure 2.4.2-4).



Note: Enerji Alimlari = Energy purchase = coal, gas + oil + electricity + others

Source: Budget classification 03.2.3

Figure 2.4.2-4 Quasi-collection of Funds through Energy Savings and Loan Repayments

(3) Sub-project Implementation Steps

As suggested in the previous sections, two kinds of implementation methods are proposed in the loan project, namely, Energy Audit Method, and Bundling Method. As explained in sub-section 1) above, types of retrofitting works and role-sharing among organizations are very much different between these two methods. Especially with regard to roles and responsibilities, while each Participating Ministry/Directorate shall take the leading role in Energy Audit Method, in Bundling Method, PMU established within MOEU will play the leading role in implementing the sub-projects of several ministries.

Step-by step work flow and assignment of each work to relevant organizations is shown in Figure 2.4.2-5 for Energy Audit Method and Figure 2.4.2-6 for Bundling Method.

As shown in Figure 2.4.2-5, while various supports are provided by PMU, the decisions shall be made by each Participating Ministry/Directorate, for (7) approval (decision) for sub-project implementation, (9) tender, (10), tender evaluation and (13) final acceptance. On the other hand, in case of Bundling Method shown in Figure 2.4.2-6, most decisions with regard to project implementation shall be made by PMU, i.e. decisions involving (5) tender, (6) tender evaluation, (8) issuing of work order and supervision of works and (9) final acceptance.

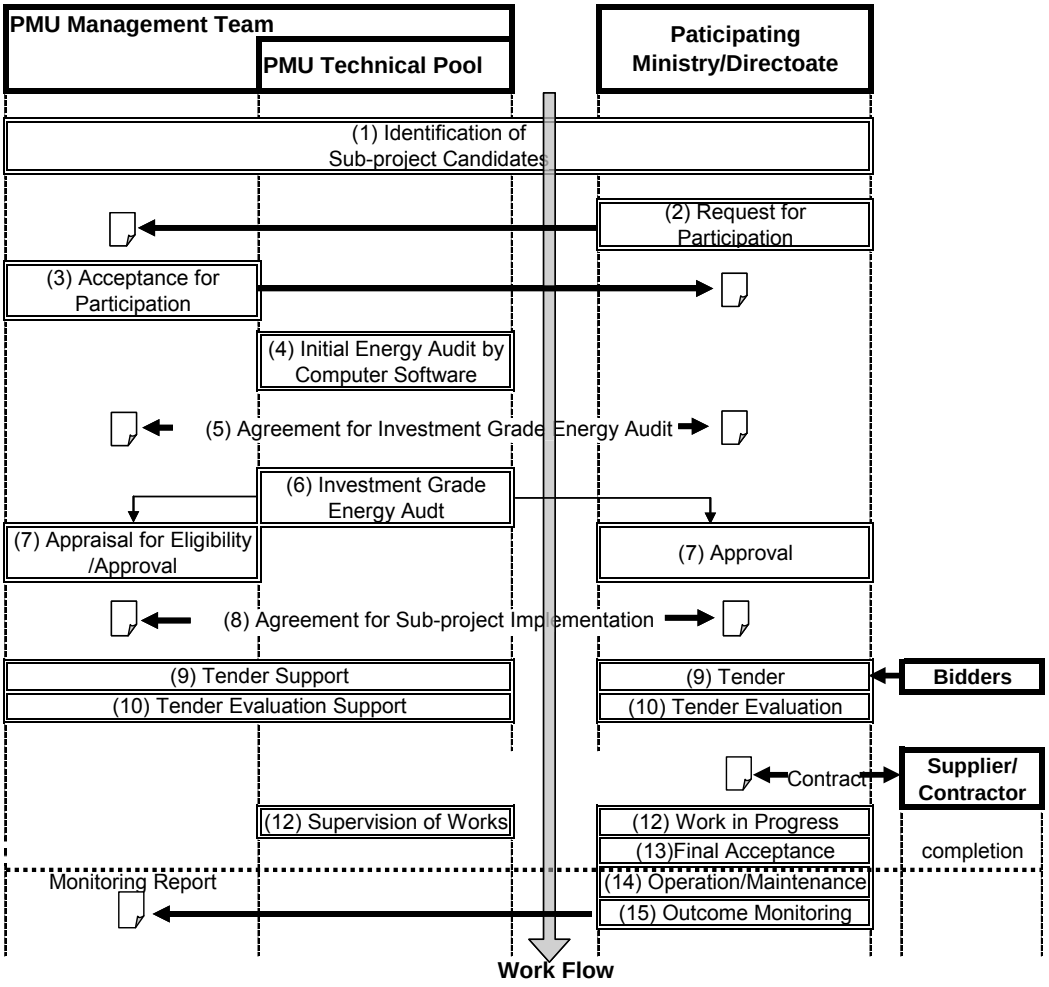


Figure 2.4.2-5 Step-by-Step Work Flow for Energy Audit Method

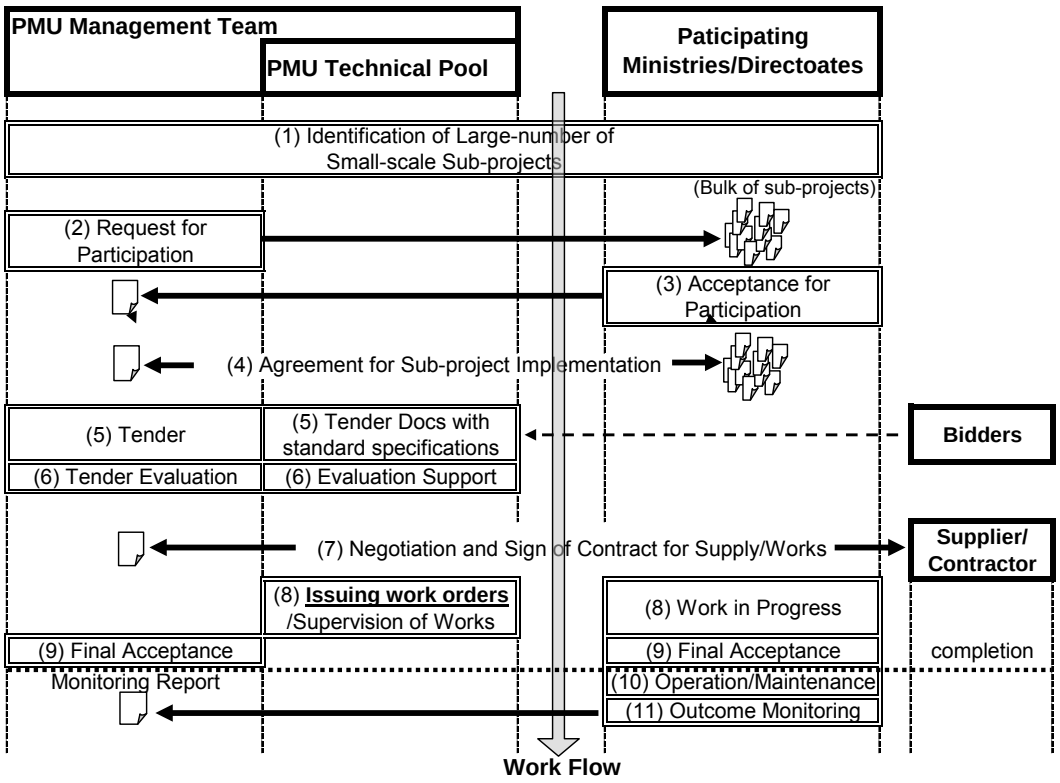


Figure 2.4.2-6 Step-by-Step Work Flow for Bundling Method

The success of implementation of investment projects depends on a) capability of the PMU, b) availability of supportive rules and regulations and c) readiness of private companies who do the works on the ground, for both energy audit and supply/installation.

(4) Timeframe for Preparation and Implementation of the Project (Draft)

Table 2.4.2-4 shows the target time frame for preparation and implementation of the Project (Draft). Asking a support from the international agencies may be needed to prepare and proceed this process functionally and speedy.

Table 2.4.2-4 Target Time Frame for Preparation and Implementation of the Project (Draft)

2013	➢ Project formation and preparation of project proposal (including energy audits under 100 Building Projects and under other programs) ➢ Obtain approval at EECB as the Project to implement an action of No. SP-06/ST-01/A-01 of Energy Efficiency Strategy Paper ➢ Obtain approval for the Project from the HPC as inter-ministerial government priority project ➢ Obtain approval under Public Investment Program ➢ Amendment of relevant sections for framework agreement in Public Procurement Law ➢ Negotiation with JICA/donor agencies for project loan ➢ Budgeting (in bulk) as capital investment project in multi-year
2014	➢ Implementation of first sub-project ➢ Continuation of formulation and implementation of sub-projects
2015	➢ Continuation of formulation and implementation of sub-projects
2016	➢ Continuation of formulation and implementation of sub-projects

Among above future schedule, the year of 2013 as preparation period is of critical importance. The first action must be forming consensus at EECB for the project and its implementation mechanism. At the same time, needs assessment through implementation of energy audits of public sector buildings is to be carried out to identify targeting areas and suitable technologies, and to figure out total quantities for such investment. Based on this needs assessment Project Fiche for Public Investment will be prepared and submitted to MOD. As the Project is not implemented by a ministry, but involves all ministries, it is recommended the Project to be authorized as a national important project by High Planning Council (HPC).

These project formation and authorization process must be completed in the first half of 2013 in order for the Project to be included in the Government Budget for 2014-2016. In addition to budgeting process, for timely and smooth and implementation of the Project, amendment of the Public Procurement Law must be completed or nearly completed within 2013 (See Figure 2.4.2-7).

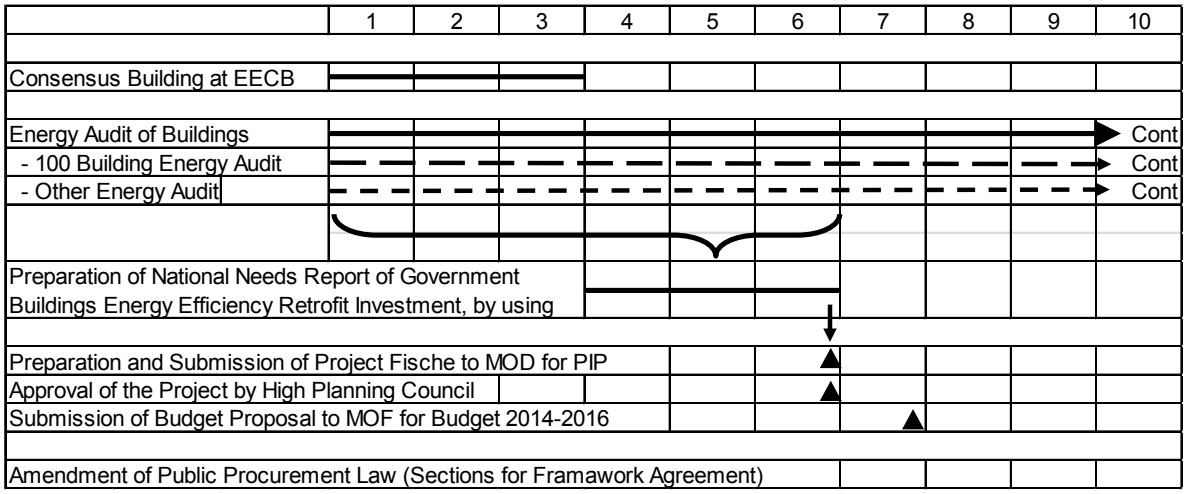


Figure 2.4.2-7 Action Plan for 2013

(5) Technical Assistance to Support the PMU

This implies both the technical assistance (TA) to support capacity development of the PMU as well as the complementary support duties of the PMU where lacking capability in short term. The TA support will be gradually phased out according to the progress of technical transfer. Scope of TA to support capacity development of PMU includes;

- Sub-project formation, and conducting energy audit
- Preparation of tender specifications, support for tender evaluation
- Support for construction supervision
- Monitoring project outcomes
- Awareness, public relations

(6) Candidates of JICA's Next Technical Assistance Program

The Study Team had several meetings with MOEU and related organizations focusing on the candidates of JICA's next technical assistance programs. The candidates of JICA's next technical assistance program are shown in Table 2.4.2-5. Among them, which were requested by Turkish Government, the most effective programs to implement, and in which Japanese technologies contribution is considered to be large, are as follows:

Theme No1: Establishment of sustainable buildings assessment tool

Based on SP -02 "To reduce energy demand and carbon emissions of the buildings; to promote sustainable environment friendly buildings using renewable energy sources", Energy Efficiency Strategy Paper 2012-2023, Responsible ministry: MOEU

Theme No2: Capacity development for EE auditors, EVD association

Based on SP -01 "To reduce energy intensity and energy losses in industry and service sectors", Energy Efficiency Strategy Paper 2012-2023, Responsible ministry: MENR

Theme No3: Capacity development for Energy efficiency standard

Based on SP -03 "To provide market transformation of energy efficient products", and SP-07 "To strengthen institutional capacities and collaborations, to increase use of state of art technology and awareness activities, to develop financial mechanism except public financial institutions". Energy Efficiency Strategy Paper 2012-2023, Responsible ministry: MOSIT

Table 2.4.2-5 Candidates of JICA's Next Technical Assistance Program

Themes		Executing Agency	Project Purpose	Outputs/Activities	Background	Target Group/ Beneficiaries	Duration
1	Establishment of sustainable buildings assessment tools	MOEU	Support for Establishment of the tools to assess sustainable buildings	Support for Establishment of Turkish assessment methodology and tool of sustainable buildings, considering EE, environmental impact and resistance against earthquake etc. Capacity development of staffs of MOEU and related organizations and introduction of the concept of sustainable building for public buildings will be achieved. Activity1 : Support to establish Turkish sustainable building assessment tool Activity2 : Visiting Japan to learn the operation of CASBEE Based on EE Strategy Paper 2012-2023 SP-02 "To reduce energy demand and carbon emissions of the buildings; to promote sustainable environment friendly buildings using renewable energy sources"	Establishment of standard for Turkish sustainable building is urgently needed (next year) MOEU would like to learn from Japan	MOEU, Municipality, Building designer, Building owner	Half a year
2	Capacity development for EE auditors, EVD association	MENR, EVD Association	EVD capacity development	Capacity development of MENR staff and EVDs by OJT Smooth implementation of EE retrofit investments Audit and reporting Activity1 : Procedures for energy audit, and format of reporting (Soft technology) Activity2 : On-site training Capacity development to introduce ESCO scheme Activity3 : Understanding of ESCO and leasing contract scheme Activity4 : Procedures to formulate ESCO business Activity5 : Training in Japan Based on EE Strategy Paper 2012-2023 SP-01 "To reduce energy intensity and energy losses in industry and service sectors"	Result of energy audits for 2 buildings, it was found that the potential of energy conservation was larger than expected. This knowledge can be applied to the other buildings in Turkey. MENR and EVD Association would like to learn from Japan	MENR,EVDs, Building owner, industry	1 year
3	Capacity development for Energy efficiency standard on AC etc.	MOSIT	Improvement of energy efficiency standard, market transformation of energy efficient products and enhance institutional capacities and collaborations to improve technologies and awareness activities	Support to improve and disseminate Turkish energy standard system and enhance institutional capacities and collaboration in order to ensure inclusion of important items and avoid intrusion of low price low efficiency equipment into Turkish market. /Ensure selection of high efficient equipment via public procurement Activity1 : Understanding of Japanese top runner mechanism (Top runner mechanism is suitable for exporting countries) Linkage to labeling institutional responsibility and collaboration should be recognized. Activity2 : Training in Japan (lecture and visiting retail shop/ manufacturer) Activity3 : Formulate action plan for Turkish top runner mechanism (Target setting reflecting Turkish market condition) Based on EE Strategy Paper 2012-2023 SP-03 "To provide market transformation of energy efficient products" and SP-07 "To strengthen institutional capacities and collaborations, to increase use of state of art technology and awareness activities, to develop financial mechanism except public financial institutions"	There are 12,000,000ACs and 150,000 AHUs in Turkey. And half of them were installed over 15 years ago. How to change them to efficient ones, how to formulate more suitable standard and how to create onward spiral market are large Issue. MOSIT would like to learn from Japan At the same time, technical troubles in Turkey's market, which may be caused by the spread of Inverter AC should be considered. (THD: Total Harmonic Distortion etc.)	MOSIT, Consumer, Manufacturer	1year
4	Improvement of energy data collecting mechanism	MENR	Improvement of energy data collecting mechanism and preparation of the baseline energy statistics	Find more effective way to collect periodical energy consumption data under EC Law and figure out energy consumption baseline by sector utilizing IT infrastructure Activity1 : Establishment of a prototype on web-based periodical energy consumption data collecting Activity2 : Pilot operation of the web-based data collecting system Activity3 : Establishment of energy consumption database and baseline by sector Activity4 : Training for data management in Japan Based on EE Strategy Paper 2012-2023 SP-01 "To reduce energy intensity and energy losses in industry and service sectors"	Energy consumption data for buildings has been collected under the regulation. However it has not been utilized well, and not shared with other ministries.	MENR, Building owner industry	1-2 years
5	Establishment of group management system for building energy consumption	MENR,MOEU	Establishment of web-based group management system for building energy consumption	Establishment of Prototype of web-monitoring and future IT management (Future linkage to Theme4) Activity1 : Establishment of prototype of web-monitoring system for consumers' energy consumption Activity2 : Field test of web-based energy management system (incl. demand response) for buildings (group management) Activity3 : Establishment of analysis and utilization mechanism for the above collected data Activity4 : Training in Japan Based on EE Strategy Paper 2012-2023 SP-01 "To reduce energy intensity and energy losses in industry and service sectors"	MOEU has a plan to establish energy consumption database for buildings. However it has not been established. And MOEU is interested in introducing web-monitoring system for government buildings.	Large Building owner, MOF, MENR,MOEU	2 years

(7) Summary of Recommendations

The Study Team had discussions and collected related information to illustrate a functional implementation scheme on the "Project for Energy Efficiency Retrofitting of Central Government Buildings". The following implementation scheme is proposed with due considerations to (i) size of sub-projects varies, but majorities are small ones; (ii) not many government organizations have so far become serious about energy saving. The project proposal paper, which was prepared by JICA Study Team and submitted to Turkish Government, is attached as Annex 9.

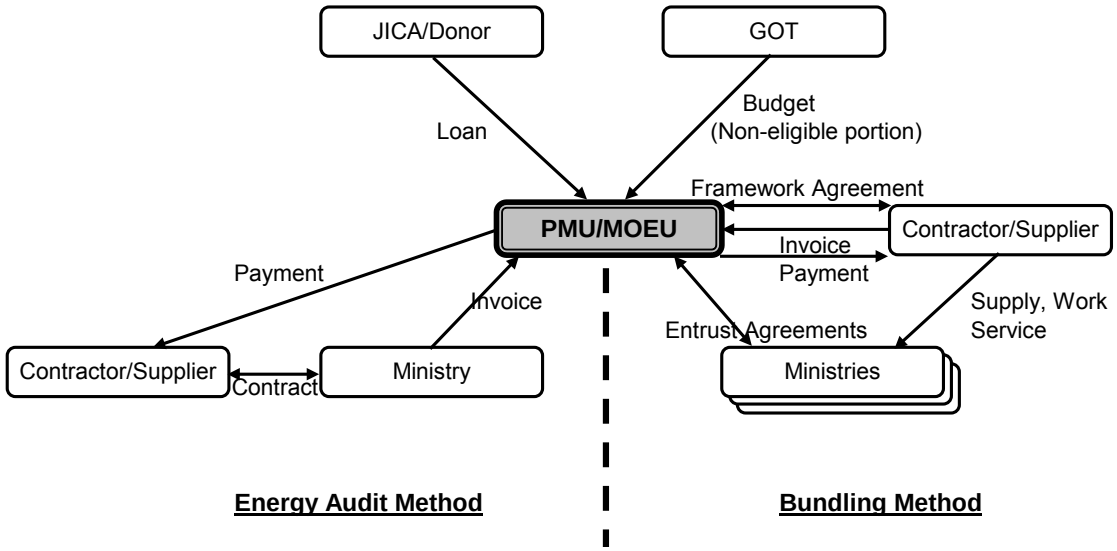


Figure 2.4.2-8 Project Scheme for Energy Efficiency Retrofitting in Government Buildings

The Project has several important features of the Project are as follows;

- Utilization of Two implementation methods (Energy Audit Method and Bundling Method)
- Establishment of a powerful PMU with implementation authorities and enforcement tools
- Structuring framework agreement for a large-number of small-scale sub-projects in consistent with Turkish Law
- Implementation of sub-project by PMU for other ministries by delegation of authority to PMU
- Evaluation of tender not by price of bids, but selecting the economically most advantageous tender by taking into account the factor other than price
- Purchasing only high energy efficiency equipment by using energy labeling regulations

As project preparations for implementation, the following activities are recommended to be carried out in 2013;

- Project formation and preparation of project proposal (including energy audits under 100 Building Projects and under other programs)
- Obtain approval at EECB as the Project to implement an action of No. SP-06/ST-01/A-01 of Energy Efficiency Strategy Paper

- Obtain approval for the Project from the HPC as inter-ministerial government priority project
- Obtain approval under Public Investment Program
- Amendment of relevant sections for framework agreement in Public Procurement Law
- Negotiation with JICA/donor agencies for project loan
- Budgeting (in bulk) as capital investment project in multi-year

ANNEX

Annex 1

Outline and Schedule of the 1st to 6th Missions

Annex 1 Outline and schedule of the 1st to 6th missions

Activity record of the 1st mission is showed in Table 1-1.

In the 1st mission, the Study Team had meetings with MOEU, the relevant governments/organizations, EVDs, and donors. And in parallel site surveys for the buildings, which MOEU selected as the target of 100 Buildings Project, and for the buildings where EE&C technologies are introduced were implemented in Ankara.

On the other hand, the seminar for promoting EE&C was held in the hall of the MOEU head office. Approximately 40 relevant persons, including MOEU, EVD, JICA, and JICA Study Team, participated in this seminar. Japan's experiences for EE&C policy, law/regulation, awareness programs, and potential technologies were introduced.

Table 1-1 1st Mission Activity Record

Date	*Issue*	*Item*
Sep 27 (Tue)	General	Meeting with JICA
	General	Meeting with a local consultant
Sep 28 (Wed)	General	Meeting with MOEU
	Technical	Meeting with Yenimahalle Municipality
	Technical	Site visiting (OSTIM Building)
	Technical	Meeting with TTMD
Sep 29 (Thu)	General	Meeting with MENR
	Seminar	Seminar in MOEU
	Technical	Meeting with EDSM
Sep 30 (Fri)	Technical	Meeting with EKOTEST
	Technical	Site visiting (NEDO pilot Project building)
	Technical	Site visiting (Head Quarter building of Ministry of Culture and Tourizm
	General	Meeting with EIE
Oct 1 (Sat)		
Oct 2 (Sun)		
Oct 3 (Mon)	Finance	Meeting with UNDP
	General	Site visiting (ESER building)
	General	Site visiting (Middle East Technical University)
Oct 4 (Tue)	Awareness	Meeting with MOEU (Website)
	Finance	Meeting with GIZ
	Finance	Meeting with KfW

Date	*Issue*	*Item*
Oct 5 (Wed)	General	Meeting with MOD
	Finance	Meeting with JICA
Oct 6 (Thu)	Finance	Meeting with EU
	Finance	Meeting with WB
	General	Meeting with MOEU
Oct 7 (Fri)	Finance	Meeting with UT
	General	Meeting with JICA

Activity record of the 2nd mission is showed in Table 1-2.

In the 2nd mission, the Study Team had meetings with MOEU, the relevant governments/organizations, EVDs, manufacturers and donors. And site surveys for the governmental buildings, including the target of 100 Buildings Project, were implemented. in Ankara and Istanbul

The seminar for promoting EE&C was held in the hall of the MOEU head office. Approximately 60 relevant persons, including MOEU, EVD, JICA, and JICA Study Team participated in this seminar. Practical measures for construction and quality management of buildings, Energy Efficiency (hereinafter referred to as "EE") simulation tool (Energy Specific Unit Management, (hereinafter referred to as "ESUM"), and contract pattern of ESCO for public buildings in Japan were introduced.

Considering that evaluation of the seasonal performance factor will be added for evaluation of ACs' performance in Turley, JICA Study Team discussed the feasibility of AC field test with related organizations and agencies.

Table 1- 2 2nd Mission Activity Record

Date	*Issue*	*Item*
May 21 (Mon)	General	Meeting with the localconsultant
	General	Meeting with MOEU
	General	Meeting with JICA
May 22 (Tue)	Technical	Site visiting (Ministry of Agriculture old building; Eskisehir Yolu)
	General	Meeting with MOEU
	Finance	Meeting with WB
	General	Meeting with GDRE
May 23 (Wed)	General	Meeting with ESER ESCO and Chairman of EVD Association
	Tariff	Meeting with EMRA
	Finance	Meeting with MOD and UT
	Technical	Site visiting (MENR and TEDAS, Bahcelievler)

Date	*Issue*	*Item*
May 24 (Thu)	Technical	Site visiting (DSI Building, Yucetepe)
	Seminar	Seminar in MOEU
	Technical	Site visiting (Head Quarter building of Ministry of Culture and Tourizm
	Finance	Meeting with EU
	General	Meeting with GDRE
May 25 (Fri)	Technical	Site visiting (Yenimahalle Public Hospital)
	Technical	Meeting with MERKEZI Isitma(Mechanical enginer)
	Finance	Meeting with KfW
	Finance	Meeting with GIZ
	Finance	Meeting with UNDP
	Technical	Site visiting (Ministry of Finance Building,Yücetepe)
	General	Meeting with JICA
May 26 (Sat)		
May 27 (Sun)		
May 28 (Mon)	General	Meeting with TUBITAK
	General	Meeting] and Site visiting (MMO)
	Technical	Meeting with ENVE ENERJI (EVD)
	Technical	Meeting with IZODER
	General	Meeting with JETRO
May 29 (Tue)	Technical	Meeting with IMSAD
	Technical	Meeting with ISTANBUL Tec Univ.
	Technical	Meeting with Panasonic
	Technical	Survey of retail shop
	Finance	Meeting with EIB
	Finance	Meeting with EBRD
May 30 (Wed)	Technical	Meeting with CAMEX
	Finance	Meeting with AFD
	Technical	Site visiting (Government Building (audited by ISTANBUL ENERJI)
	Technical	Meeting with Daikin
May 31 (Thu)	Finance	Meeting with TurSEFF
	Technical	Meeting with Alarco, Carrier, Toshiba
	Technical	Meeting with ISKID, Form
	Technical	Site visiting (Government Building (School))
	Technical	Meeting with Maekawa
	General	Meeting with Mitsubishi Corp.

Activity record of the 3rd mission is showed in Table 1-3.

In the 3rd mission, the Study Team had meetings with MOEU, the relevant governments/organizations, EVDs, and manufacturers in Ankara, Istanbul and Izmir.

The seminar for promoting EE&C was held in the hall of the MOEU head office. Approximately 30 relevant persons, including MOEU, related organizations, EVDs, JICA, and JICA Study Team participated in this seminar. Practical measures to promote EE&C, Financial support for promoting EE&C, ECTT (energy conservation target tool) and comprehensive assessment system for built environment efficiency (CASBEE) in Japan were introduced.

In parallel the Study Team signed the subcontract between ITU (Istanbul Technical University) on 17th July, which intends to illustrate the actual energy consumption of air conditioners in existing buildings in Turkey.

Table 1-3 3rd Mission Activity Record

Date	***Issue***	***Item***
Phase 1		
July 9 (Mon)	General	Meeting with the localconsultant
	General	Meeting with MOEU
	General	Meeting with JICA
July 10 (Tue)	Finance	Meeting with MOEU
	Tariff	Meeting with EMRA
	Technical	Meeting with ESER ESCO
July 11 (Wed)	General	Meeting with MOSIT
	Seminar	Seminar in MOEU
July 12 (Thu)	Finance	Meeting with MOD
	Technical	Site visiting (FORM factory)
	Finance	Meeting with PPA
	Finance	Meeting with GDRE
	Technical	Meeting with ITU
	General	Site visiting (AC shop)
	General	Meeting with SMBC
July 13 (Fri)	Technical	Site visiting (Ministry of Coal)
	Technical	Site visiting (Insulation site)
	Technical	Meeting with TTMD (HVAC Association)
	Finance	Meeting with MOF
	General	Site visiting (AC shop)
	Technical	Meeting with ITU
	General	Meeting with DAIKIN
July 14 (Sat)		
July 15 (Sun)		

Date	*Issue*	*Item*
July 16 (Mon)	Technical	Meeting with EVD
	Technical	Meeting with TNB (Toshiba)
July 17 (Tue)	Technical	Meeting with ITU
	Technical	Meeting with IZODER.
July 18 (Wed)	Technical	Meeting with ZKLD (Light Design Studio) and Endo Lighting
	Technical	Meeting with FORM
	Technical	Site visiting (Insulation retrofitting site)
July 19 (Thu)	Technical	Meeting with EVD (ESKON) and Karşıyaka city
July 20 (Fri)	Technical	Meeting with Ege University
	Technical	Meeting with MMO
	Technical	Site visiting (Insulation Site)
July 21 (Sat)		
July 22 (Sun)		
July 23 (Mon)	Technical	Meeting with ITU
Phase 2		
July 31 (Tue)	Technical	Meeting with ITU
Aug 1 (Wed)	Technical	Meeting with ITU
Aug 2 (Thu)	Technical	Meeting with ITU

Activity record of the 4th mission is showed in Table 1-4.

In the 4th mission, the Study Team had meetings with MOEU, the relevant governments/organizations and EVDs in Ankara and Istanbul. And the Study Team also had meetings with MOEU and EVD Association to prepare the energy audits, which were implemented in the 5th mission.

Table 1-4 4th Mission Activity Record

Date	*Issue*	*Item*
Phase 1		
Sep 10 (Mon)	Technical	Meeting with ITU
	General	Meeting with DAIKIN
Sep 11 (Tue)	Technical	Meeting with ITU
	Technical	Meeting with ISKID
Sep 12 (Wed)	Technical	Meeting with IZODER
Sep 13 (Thu)	Generl	Meeting with MOSIT
Sep 14 (Fri)	Technical	Meeting with EVD Association
	General	Meeting with JICA

Date	*Issue*	*Item*
Phase 2		
Nov 5 (Mon)	Generall	Meeting with JICA
	Finance	Meeting with MOEU
Nov 6 (Tue)	Technical	Meeting with EVD Association
	Finance	Meeting with MOH
Nov 7 (Wed)	Technical	Meeting with MOEU
	Finance	Meeting with DMO
Nov 8 (Thu)	General	Meeting with Local consultant
Nov 9 (Fri)	Finance	Meeting with EU
	General	Meeting with JICA

Activity record of the 5th mission is showed in Table 1-5.

In the 5th mission, the Study Team had meetings with MOEU, the relevant ministries /organizations, EVDs and ITU in Ankara and Istanbul.

Preliminary and detailed energy audits for buildings were conducted at DSI Buildings and EM Hospital (Cooperation with EVD Association).

The workshop for the result of energy audits was held in the hall of the MOEU head office. Approximately 50 relevant persons, including MOEU, EVD, audited organizations (DSI and EM Hospital) and related organizations participated in this workshop.

Table 1-5 5th Mission Activity Record

Date	*Issue*	*Item*
Nov 22 (Thu)	Technical	Meeting with ITU
Nov 23 (Fri)	Technical	Meeting with ITU
Nov 24 (Sat)		
Nov 25 (Sun)		
Nov 26 (Mon)	Technical	Meeting with ITU
Nov 27 (Tue)	Technical	Meeting with EVD Association
	General	Meeting with MOEU
	Technical	Meeting with ITU
Nov 28 (Wed)	Technical	Energy Audit for DSI
	Finance	Meeting with MOEU
Nov 29 (Thu)	Technical	Energy Audit for EM Hospital
	Finace	Meeting with MOD
	Finance	Meeting with MOEU
	General	Meeting with JICA

Date	*Issue*	*Item*
Nov 30 (Fri)	Technical	Meeting with EVDs
	Finance	Meeting with MOF
	General	Meeting with MOSIT
	Technical	Meeting with ITU
Dec 1 (Sat)		
Dec 2 (Sun)		
Dec 3 (Mon)	Technical	Energy Audit for DSI
	Technical	Meeting with ITU
	Technical	Meeting with IZODER
	General	Meeting with DAIKIN
Dec 4 (Tue)	Technical	Energy Audit for DSI
	Finance	Meeting with MOF
	Finance	Meeting with DMO
	Tecnical	Meeting with ITU
Dec 5 (Wed)	Technical	Energy Audit for DSI
	Techinical	Energy Audit for EM Hospital
	Finance	Meeting with MOEU
Dec 6 (Thu)	Techinical	Energy Audit for EM Hospital
	General	Meeting with TTMD
Dec 7 (Fri)	Technical	Energy Audit for EM Hospital
	General	Meeting with EU-JICA-MENR
Dec 8 (Sat)		
Dec 9 (Sun)		
Dec 10 (Mon)	Technical	Meeting with MOEU
Dec 11 (Tue)	General	Meeting with DMO
Dec 12 (Wed)	Workshop	Workshop in MOEU
Dec 13 (Thu)	General	Meeting with MOEU
	General	Meeting with JICA

Activity record of the 6th mission is showed in Table 1-6.

In the 6th mission, the activity record of JICA Study from 2011 to 2013, the result of AC field test was reported by ITU and the detail of comprehensive assessment system for built environment efficiency (CASBEE) in Japan was introduced in the seminar. Approximately 70 relevant persons, including MOEU, MENR, EVD, AC manufacturers and related organizations participated in this seminar and active discussion was carried out. Besides the result and recommendations of the

energy audits, which had been conducted in 5th mission, were shared and discussed with the audited building management people, DSI and EM Hospital. Moreover the need of technical assistance from Japan was clarified through discussions with MOEU, MENR, MOSIT and EVD Association.

Table 1-6 6th Mission Activity Record

Date	*Issue*	*Item*
Jan 25 (Fri)	Technical	Meeting with ITU
Jan 26 (Sat)		
Jan 27 (Sun)		
Jan 28 (Mon)	General	Meetings with MOEU and ITU
Jan 29 (Tue)	General	Meetings with JICA, DSI and EM Hospital
Jan 30 (Wed)	Seminar	Seminar in MOEU, meeting with EVD Association
Jan 31 (Thu)	General	Meeting with MENR and MOSIT
Feb 1 (Fri)	General	Meeting with local consultant and JICA

Annex 2

Information about Multilateral and Bilateral Donor Agencies

Annex 2 Information about Multilateral and Bilateral Donor Agencies

In Turkey, major source of funds for EE loans has been provided by CTF since 2009, co-financed by the Government of Turkey (GOT) and the partner multilateral development banks (MDBs), namely, IBRD, IFC (both WB Group) and EBRD. Nevertheless, the funds earmarked for the CTF Investment Plan for Turkey Stage 1 (CTF financing of USD 250 mil. and co-financing of USD 2,500 mil.) have mostly been allocated, nearing its completion. In early November, at CTF TRUST FUND COMMITTEE MEETING, the Turkish Government has updated its CTF Investment Plan Stage 1 as well as proposed Stage 2 (CFT financing of USD 150 mil. and co-financing of USD 1,600 mil.) for the coming years. (Refer to (1), (2) and (7) for the details of CTF, IBRD/ WB and EBRD activities in EE sector)

As for bilateral funding sources, KfW, AFD and JICA are all willing to finance the future public sector buildings EE projects, but some hurdles must still be overcome before materializing them. KfW, which has been among the first to set target on financing public sector buildings EE project, will provide EUR 110 mil. worth interest subsidized loan to Turkey. And KfW is currently trying to formulate an effective implementation scheme and to find out reliable Turkish counterparts. And for MOEU, KfW is proposing the support with combination of grant financing and technical assistance via GIZ. JICA meanwhile sets EE retrofitting of central government buildings as the initial target to promote EE in Turkey, carrying forward the momentum of MOEU's 100 Buildings Project, has been providing technical support to and sharing Japanese experiences with MOEU. As for AFD, which has started providing sovereign loans to Turkey in 2010, has also started pursuing the possibility of assisting Turkey's energy efficiency in both central and local governments according to the direction of French Government. It has earmarked EUR 100 mil. for EE projects in Turkey. (Refer to (6) and (8) for the details of KfW and AFD activities in EE/ RE sector in Turkey) Since carrying the public sector buildings EE retrofit project on a large scale covering the whole country would require a huge amount of funds, JICA Study Team would recommend Turkish Government to consider cooperation with bilateral donor agencies, referring the implementation scheme, which was proposed by the Study Team. (Refer to Main Report 2.2)

On the technical assistance realm, both GEF and EU currently provide grants to activities that promote EE in Turkey. While GEF, which is the financial mechanism for combating global warming since 1992, has so far funded four projects implemented by MDBs to promote EE in buildings (UNDP/2008), appliances (UNDP/2008), industry (UNDP/2009) and SMEs (IBRD/2012), EU has supported public sector buildings EE retrofit and MOEU capacity development as part of its comprehensive assistance to Turkey as a pre-accession country. (Refer to (4) and (5) for the details of GEF and EU activities in EE Sector in Turkey)

(1) CTF

CTF is a multi-donor trust fund for which the World Bank is a trustee. CTF aims to slow the

growth of GHG emissions in developing countries by helping fund the costs of transitioning to low-carbon economic growth through scaled-up deployment of low carbon technologies and reduction of greenhouse gas emissions in cost-effective ways.

Turkey was the first case to receive CTF loans among 15 recipient countries of CTF. The CTF Investment Plan (IP) for Turkey[1], which is a multi-year business plan that identifies Turkey's programs, was proposed in 2009 to be co-financed by the CTF, MDB (Multilateral Development Bank)s (WB, IFC (International Finance Corporation), EBRD) and Government of Turkey (hereinafter referred to as "GOT"). In early November, GOT has updated its IP Stage 1 and proposed Stage 2 at the CTF Trust Fund Committee meeting held in Istanbul. As shown in Table 2-1, under IP Stage 1, IBRD (International Bank for Reconstruction and Development), IFC (both WB Group), EBRD (European Bank for Reconstruction and Development) have so far received CTF funds (a total USD 172 mil. out of USD 250 mil. planned) to conduct their projects.

Table 2-1 Clean Technology Fund Financing for Turkey Stage 1

Project Name	Executing agency	CTF (USD mil.)	Co-financing (USD mil.)
Private Sector RE and EE Project Phase 2 (RE/EE 2)(approved in Mar. 2009)	IBRD	100	1,030
Commercializing Sustainable energy Finance Program (CSEF) (approved in Sept. 2009)	IFC/EBRD	22	91
Turkey Private Sector Sustainable Energy Financing Facility (TurSEFF) (approved in Jan. 2010)	EBRD	50	210
TEIAS Smart Grid Project	IBRD	50	n.a.
Private Renewable Energy and Energy Efficiency Project	IFC	28	n.a.
Planned total for Stage 1		250	2,500

Source: "Turkey CTF Investment Plan Update and Activation of Stage 2" CTF Trust Fund Committee meeting, Istanbul (November 3, 2012)

The remaining allocation of USD 78 mil. will be used for TEIAS Smart Grid Project (co-financed by IBRD) and Private Renewable Energy and Energy Efficiency (co-financed by IFC). At the CTF Trust Fund Committee meeting, GOT has also proposed IP Stage 2 in which IFC/EBRD's Commercializing Sustainable Energy Finance Facility (CSEF II), EBRD's RE/EE Project (TurSEFF II, ResiSEFF MunSEFF) and IBRD's SME EE Project are included.

[1] According to the CTF Investment Plan approved January 29, 2009 for Turkey, the overall finance needs of USD 3,850 mil. will be co-financed by CTF (USD 400 mil., 10% of the total), MDBs (USD 1,900 mil., of which WB alone finance USD 800 mil..) and GOT (USD 1,550 mil.). The objective of this Plan is to provide support for the low carbon objectives in Turkey's 9th Development Plan (2007-13); the 1st National Communication on Climate Change (NCCC), and related strategies, legislation and programs.(Source: UNDP, "Climate Finance Options" http://www.climatefinanceoptions.org/cfo/node/64)

IFC, EBRD and IBRD plans to get USD 20 mil., USD70 mil. and USD50 mil., respectively, from CTF.

(2) WB (IBRD)

WB has started providing RE sector credit lines in 2004 to the two major development banks, namely, TKB (Development Bank of Turkey) and Industrial Development Bank of Turkey (TSKB). The target sector of the credit line has expanded to included EE sector in 2009 under the credit line entitled, "Private Sector RE and EE Project Phase 2 (RE/EE 2)," which consisted of IBRD component (USD 500 mil.) and CTF component USD 100 mil.). CTF finance is only applicable to emerging RE and EE projects, covering up to 20% and 15%, respectively, of total amount of loans. As well, RE/EE 2 has the 25% cap on the use of the funds, implying that the intermediary financial institutions has to use at least 25% of the total amount of funds borrowed from IBRD/CTF on EE projects. RE/EE 2 has completed its disbursement earlier than planned, and an additional USD 500 mil. has been approved in October 2011 to be disbursed under RE/EE 2.

Table 2-2 Ongoing WB Loan Projects in EE/RE Sector, Turkey

Project Name	TA (million USD)	Credit Line (million USD)	Financial Intermediary
Private Sector Renewable Energy and Energy Efficiency Project (RE/EE 2) (2009-2014)	-	(IBRD) 500 (CTF) 100	TKB, TSKB
RE/EE 2, additional loans (Approved in Oct. 2011)	-	(IBRD) 500	TKB, TSKB
SME -EE Project (to be submitted to WB Board of Directors in 13/12/2012 for approval)	(GEF) 2.8	(IBRD) 200	Halkbank, Vakifbank, Ziraat Bank

Source: WB website

The new project entitled "Turkey SME Energy Efficiency" (SME EE Project) will be approved in December 2012[2]. WB plans to extend a credit line of USD 200 mil. to three local state-owned banks strong in SME financing, namely, Vakif Bank, Halkbank and Ziraat Bank. CTF funds is sought to enable concessional funding to encourage local banks to enter into EE lending, whereas technical assistance funds will be sought from the GEF (Global Environmental Facility). Under the SME EE Project, retrofit to improve energy use in commercial buildings will also be experimented. And to overcome the barriers of transaction costs for many small-scale retrofit investments, WB considers the utilization of "shopping list" (line of eligible products) which enables standardization of loan application and appraisal procedures. As part of technical assistance, WB would also support pipeline development and marketing including performance-based ESCO contracts and ESCO financing.

WB has signed a framework agreement with EU for a joint management of EU's energy sector

[2] WB: Integrated Safeguard Data Sheet Concept Stage, Report No. ISDSC417 (29 Feb, 2012)

funds (a total of EUR 11.8 mil. mainly for RE/EE) under its FY2012 budget, which includes support for WB's SME EE Project, EVD capacity building and ESCO market development.

(3) United Nations Development Program (UNDP)

Under the Country Programme Action Plan for Turkey, UNDP currently implements the Environment & Sustainable Development Programme. Within this Programme, there are 3 Clusters, including Environment Cluster (started in 2005) which covers EE and RE sectors.

UNDP currently focuses mainly on EE, and less on RE. There are three on-going EE&C projects in industry, household appliances and buildings EE sectors (all three funded by GEF) as shown in Table 2-3.

Table 2-3 Ongoing UNDP Project in EE Sector, Turkey

Project Name	Financing	Sector	Duration
Improving Energy Efficiency in Industry	GEF funds	Industry EE	2010-2015
Promoting Energy Efficiency in Buildings		Buildings EE	2011-2015
Market Transformation of Energy Efficient Appliances in Turkey		Appliances EE	2010-2014

Source: UNDP website information

As for the Buildings EE Project, it includes the following four components: a) Capacity development,) b) demonstration, c) monitoring and d) awareness. Turkish side stakeholders include GDRE, MOEU and Housing Development Administration (TOKI). As part of capacity development, UNDP supports MOEU in revising BEP by introducing the concept of Integrated Building Design Approach [3] which combines energy efficiency cost optimization and minimum energy performance of building materials at design stage of the buildings. UNDP is also compiling pilot sample database of buildings mainly with MENR (including MOEU, Ministry of Interior and others). As an effort of showcase (demonstration), the design and construction works of three energy efficient buildings, two owned by MONE and one by MOEU, will be completed by end-March 2013. UNDP will disclose to share all documents (including tender documents) to Turkish counterparts as well as monitor the effects of the project. Integrated Building Design Approach will be disseminated among universities, engineers and architects.

Besides the above mentioned three EE projects, UNDP has "Sustainable Cities" Project in the pipeline which was endorsed by GEF (total project cost: USD 30 mil., with 48 mil. GEF grants). The Project aims to promote EE for an entire city selected. UNDP has already received proposals and commitment letters from three municipalities, namely, Gaziantep, Bursa and Sancaktepe (Istanbul). The C/P ministry is the MOEU, and the project will be concentrated

[3] Integrated Building Design Approach is "a process of design that integrates climatic conditions, the capture and the conservation of the free solar and internal gains, the efficient and comprehensive reduction of all heat losses through walls and ventilation, the accurate control of all external energy introduced for providing thermal comfort, light, and hot water, and – last but not least – user awareness of new behaviors regarding energy use and good operations and maintenance practices" UNDP, Request for Proposal (09 September 2011)

initially on the urban areas, but might eventually cover the rural site in future.

In addition, UNDP has also provided technical and financial support to MOEU (Climate Change Coordination Unit) in cooperation with the British FCO (Foreign Commonwealth Office) to publish the Climate Change Action Plan[4] in end-August 2011. The Action Plan was the final product of FCO (Foreign Commonwealth Office) project (until end-2011) aimed at supporting Turkey's EU accession process[5]. The Climate Action Plan focuses on the following two areas of actions: climate change adaptation and greenhouse gas mitigation, and provides aims and objectives in eight areas including buildings[6].

As well, as part of the project entitled, "Utilization of Renewable Energy Resources and Increasing Energy Efficiency in Southeast Anatolia Region (Southeast Anatolia RE/EE Project)" which aims to attract foreign investments to the Region, UNDP plans to acquire BEP Certificates for 120 buildings, out of which it will conduct 10 energy audits and implement 2 EE retrofit works[7].

(4) GEF

GEF has provided Turkey with the grants totaling USD 64,733,650 and mobilized a total co-financing of USD 388,036,700 during the past two decades since its establishment in 1991[8]. GEF, which has been the financial mechanism for UNFCCC (United Nations Framework Convention on Climate Change) adopted in 1992 at the Earth Summit in Rio de Janeiro, is the centerpiece of the international community's effort to combat global warming. In Turkey, of the 18 projects funded by GEF since 1992, six projects belonged to the focal area of "Climate Change." And the following four projects shown in Table 2-4 were directly related to the energy efficiency sector, totaling USD 15,090,000 of GEF grants with a total co-financing of USD 286,378,500.

[4] http://iklim.cob.gov.tr/iklim/Files/İDEP_Rapor.pdf (Available in Turkish)

[5] British Foreign Commonwealth Office and Turkey have signed in July 2010 a Strategic Partnership which covers cooperation on a wide range of issues including trade and investment, energy, regional stability and education. Accordingly, with the intention of supporting further enlargement of EU, FCO is currently conducting a project to support Turkey's EU accession process which lasts until end-2011. (Sources: (i) Annual Report and Accounts 2010-2011, for the year ended 31 March 2011, (ii) Business Plan 2011-2015,Foreign and Commonwealth Office, May 2011, (iii) FCO website at http://www.fco.gov.uk)

[6] For more details, see Chapter 2.3 "Buildings" and 3.3.2 "Aims and Objectives: Buildings" of the Climate Change Action Plan. http://iklim.cob.gov.tr/iklim/Files/İDEP_Rapor.pdf (Available in Turkish)

[7] Two buildings have been selected: provincial building of MOEU and administrative court

[8] GEF website (http://www.thegef.org/gef/gef_projects_funding) "Turkey"

Table 2-4 Ongoing GEF Funded Projects in EE Sector, Turkey

Project Name	GEF Grant (million USD)	Co-financing (million USD)	Partner Agency
Promote Energy Efficiency in Buildings (Approved in 2008/04/24)	2.72	18.68	UNDP
Market Transformation of Energy Efficient Appliances in Turkey (Approved in 2008/04/24)	2.71	2.299	UNDP
Improving Energy Efficiency in Industry (approved in 2009/01/27)	6.02	12.9	UNDP
Small and Medium Enterprise Energy Efficiency Project (Approved in 2012/06/07)	3.64	252.5	IBRD
Total	15.09	286.379	

Source: GEF website

It is possible for JICA to cooperate with GEF in promoting Turkey's public sector buildings' EE in the future, considering the volume of the GEF grants (23% of the total) and co-financing (74% of the total) mobilized for the improvement of Turkish EE in the past and the fact that Japan has constantly been the second largest donor to GEF after the United States, in addition to the recent appointment of Ms. Naoko Ishii, a senior official in Japan's Ministry of Finance, as the GEF CEO and Chairperson for the four-year term starting on the first of August 2012[9].

(5) Delegation of the European Union (EU) to Turkey

EU intends to implement the new EE Directive (the amendment to the current EU Energy Performance Building Directive/ EPBD), which is currently under scrutiny at the EU Parliament, as well as to ensure the accomplishment of the 20-20-20 EU policy (20% reduction in energy use through improved EE, 20% share of RE sources and 20% CO_2 emission reduction) by 2020. In addition, there is an agreement between EU and the Government of Turkey entitled, "IPA (Instrument for Pre-Accession Assistance) MIPD (Multi-annual Indicative Planning Document) 2011-2013," according to which EU provides grants to support the development of various sectors including energy. Energy sector covers electricity, gas, EE, RE and nuclear and EE is among the most important at the moment. The budget under MIPD 2011-2013 for energy sector is around EUR 113 mil. including EE activities.

EU is currently discussing the following three EE related projects for MOEU:

- 2011 budget, which includes two public buildings retrofitting projects (for demonstration purpose), is awaiting approval by EU headquarter in Brussels as of end-May 2012. The retrofitting costs will be covered by the Turkish side, while EU provides EUR 3.3 mil. in grants to cover 90% of the total cost required for the capacity building of MOEU as well as FS fees for the retrofitting project.
- As part of 2012 budget, a joint management program with WB totaling EUR 11.8 mil. is currently under consideration. Main target is SME industry sector including a) alignment of Turkish legislation to EU Aquis (Energy

[9] GEF website (http://www.thegef.org/gef/node/6014)

Legislation), b) gas sector, c) RE (EUR 2.2 mil.) and d) EE (EUR 4 mil.).

- As for 2013 budget, a project on the monitoring, inspection and verification of Building Energy Performance Certification Scheme for MOEU is currently discussed (the amount of budget not decided yet). The implementation of 2013 budget project will most likely be after 2015, since MOEU has not yet submitted proposal. It would take some time for EU Delegation to Turkey and EU headquarters in Brussels to approve the project. This project consists of the following two components, details of which are shown in Table 2-5.

Table 2-5 Details of EU's EE Related Project under 2013 Budget for Turkey

Component I: Technical and human capacity-building of the national regulatory agency to ultimately comply with EU	
Results	Measurable Indicators
Result 1: Current implementation situation on BEP regulation and EPCs is known and discussed with key stakeholders.	• Number of building certificates issued thus far
	• Number of flaws in certification using existing systems
	• BEP implementation problems enumerated
	• 250 workshop and 100 conference attendees
Result 2: Monitoring, inspection and verification mechanisms (MIV) and processes for BEP certification are developed and begin application.	• 1 MIV scheme, 1 dispute resolution method, 1 software
	• Number of BEP certificate issues resolved
	• 2 pilot locations
Result 3: Energy performance audit methods in buildings are developed and used.	• 1 energy performance audit methodology, 1 energy audit methodology and 2 templates
	• 1 model for cost benefits analyses for existing buildings
	• 500 guidebooks printed and disseminated
Result 4: Capacity of staff assigned to the MIV Centre and related stakeholders is increased.	• 1 curriculum and 100 manuals printed and disseminated
	• 20 persons from MOPWS trained
	• 20 persons from related organizations, ESCOs trained
	• Reports of 4 energy performance audits and 4 energy audits
Result 5: Capacity-building on building typologies aimed at Universities and MOPWS is completed.	• 100 persons trained from MOPWS and Universities
Component II: Analytics, equipment, and staff to ensure proper management and monitoring of the performance of Turkey's building stock	
Result 6: An Energy Performance Monitoring, Inspection and Verification (MIV) Centre infrastructure is established and begins operations.	• 1 furnished Centre with 2 vehicles
	• Number of management and technical staff for the Centre
	• 2 newly-purchased sets of energy audit equipment
Result 7: Analyses of building typologies in the building stock of Ankara, Antalya, and Sivas are completed.	• Number of typologies
	• 1 software for evaluating building by typology
	• Number of hits to online database
	• 500 printed handbooks
Result 8: Evaluation of the energy performance of typical buildings in different typological categories and comparisons with reference buildings defined in BEP-TR (existing software of Turkey) are carried out.	• 40 building audit reports
	• Benchmarks in 40 audits
	• 150 attendees to workshop
	• 150 attendees to conference
Result 9: Internal assessment and monitoring tools are identified and used.	• 8 quarterly reports
	• 1 final evaluation report

(Note) MOPWS: Ministry of Public Works and Settlement (the current Ministry of Environment and Urbanization)

Source: The project report entitled, "Monitoring, Inspection and Verification of Building Energy Performance Certification Scheme for MOPWS," prepared by Ms. Tülin Keskin

(6) KfW (German Development Bank)/ GIZ

KfW has been pursuing the possibility of financing energy efficiency retrofitting of public sector buildings in Turkey since 2011.

In October 2011, GOT and the German Government have made an agreement regarding the German commitment of EUR 110 mil. Accompanied with EUR 2 mil. grants and EUR 6.5 mil. TA for promoting public sector buildings energy efficiency in Turkey. Accordingly, in December 2011, the German Ministry for Environment, Nature Conservation and Nuclear Safety has committed to provide EUR 110 mil. worth interest subsidized loans via KfW accompanied with a grant financing and technical assistance via GIZ.

KfW is currently searching to define the scope of the project as well as identify appropriate implementation scheme and executing agency for promoting public sector buildings EE in Turkey. KfW is also conducting feasibility study for EE buildings funded by MENR/GIZ, based on the results of which MENR plans to formulate Buildings EE Project and conduct donor coordination for its budgeting[10].

As for TA to be provided by GIZ, the agency is already receiving proposals from several public-sector entities and is at the concept design stage of TA projects. The duration of TA is planned to be three years (maximum four years), and the detailed information will not be disclosed until 2013. In early November, GIZ held a whole-day meeting inviting all ministries. The purpose of the meeting was to create programs and projects to enhance EE in public buildings, but concrete outcomes of which is yet unknown. As to KfW's other three on-going EE/RE credit lines, they have been mostly focused on RE sector (such as small-scale hydro power, wind and biomass), and their focus on EE sector started just recently (from the third credit line to TSKB under Climate Protection Programme in 2010) following the advice by the Undersecretariat of Treasury to invest at least 1/3 of the total funds in EE sector.

Table 2-6 Ongoing KfW Credit Lines in EE/RE Sector, Turkey

Project Name	TA	Credit Line	Financial Intermediary
KfW Energy Efficiency Program for SEE (Southeastern Europe) (2010-) a) SME sector b) EE sector	-	a) SME sector: (EU) EUR 40mil. (CEB) EUR20mil. (KfW) EUR 20mil. b) EE sector: (IFC) USD 50mil. (KfW) EUR 35mil.	Akbank, Garantibank, Is Bank, Yapi Kredi Leasing
Climate Protection Programme (Phase 3) (2010-)	-	EUR 55 mil. (Total EUR105 mil. for 1-3 phases)	TSKB
Credit lines for the Serker Bank (Sugar Bank)'s Eco-Credit Line (2009-)	KfW	EUR 20 mil.	SerkerBank

(Note) The funding for SEE Program comes from the European Fund for Southeast Europe, which was initiated by the KfW Entwicklungsbank (The German Development Bank) with the financial support of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the European Commission (http://www.efse.lu)

Source: KfW Office Turkey website and other sources

[10] Information acquired through interview with Department of EU and International Affairs, MENR, Turkey in mid-December 2012.

(7) EBRD[11]

EBRD has allocated more than USD 1.3 bn. (supported around USD 700 mil. worth of projects) to 9 participating countries[12] under the SEFF (Sustainable Energy Financing Facilities), which is one of the six core components of its Sustainable Energy Initiative launched in 2006[13]. SEFF is a credit line or guarantee from EBRD to local banks for on-lending to small and medium clients undertaking industrial and residential energy efficiency and/or renewable energy projects. TurSEFF[14] was launched in 2010 and is the 12th SEFF operated by EBRD. TurSEFF is a credit line dedicated to small-scale investments (up to EUR 10 mil.) in energy efficiency and renewable projects (including ESCO financing) with a total budget of USD 250 mil. funded by EBRD (USD200 mil.), CTF (USD 40 mil.) and JBIC (Japan Bank for International Cooperation) (USD 20 mil.)[15].

TurSEFF has so far allocated USD 250 mil. to five local partner banks, namely, Ak Bank (USD 60 mil.), Deniz Bank (USD 40 mil.), Garanti (USD 60 mil.), Vakif Bank (USD 60 mil.) and IS Bank (USD 40 mil.), and their disbursement have been remarkably fast that the TurSEFF would be completed in few months. In fact, Ak Bank and Garanti Bank have already disbursed 99% of their allocated funds (as of end-May 2012) and other banks (including IS Bank which joined TurSEFF in 2011) are also nearing completion. There are requests from local banks to launch the second phase of credit lines[16].

TurSEFF provides loans in the following four sizes according to types of sub-projects:

- Up to USD 5 mil. per borrower for industry and buildings RE projects (which require full assessment)
- Up to USD 300,000 per borrower for SMEs by utilizing the List of Automatically Eligible Equipments and Suppliers (hereinafter referred to as "the Equipment List")
- Up to USD 75,000 per borrower for residential sector projects utilizing the Equipment List
- Up to USD 1 mil. per borrower for vendor financing (i.e. loans for manufacturers, suppliers and installers of energy efficiency and renewable energy technology, equipment and materials)

EBRD does not directly target public sector buildings at the moment. Nevertheless, TurSEFF seems capable of implementing EE retrofitting investments of public sector buildings

[11] EBRD, "Sustainable Energy Initiative In Turkey" (April 2011)
[12] Bulgaria (2004 & 2005), Ukraine (2006), Georgia (2007), Slovakia (2007), Romania (2008), Kazakhstan (2008), Western Balkans (2009), Moldova (2009) and Russia (2009)
[13] "EBRD SUSTAINABLE ENERGY INITIATIVESUSTAINABLE INITIATIVE ACTION AND RESULTS 2006- 2008" prepared by Josue Tanaka for ENERGY WEEK 2009" (1 APRIL 2009)
[14] TurSEFF website: http://www.turseff.org/
[15] Figures acquired through interview with EBRD Istanbul Office (2012/5/29)
[16] Ibid

indirectly via ESCO financing[17]. TurSEFF has proven its capacity to handle ESCO projects by successfully financing the first real EPC in Turkey with the Carousel Shopping Mall with Johnson Controls (American large-sized ESCO, but not certified EVD in Turkey) and Vakifbank in January 2012[18]. As well, EBRD has just recently compiled an extensive report on Turkish public and private sector energy service company market, in which various possibilities of ESCO financing to improve energy efficiency of public sector buildings were thoroughly analyzed[19].

Two remarkable methods adopted by TurSEFF are worth noting here: 1) utilization of the Equipment List and 2) the existence of a capable project implementation team which can proactively support local banks in developing sub projects and vendors (manufacturers, suppliers and installers) in distributing EE/RE equipments. Both methods seem to have contributed largely to TurSEFF's fast loan disbursement and effective dissemination of energy efficient equipments in targeted regions.

1) Equipment List

Equipment List is tailor-made for each SEFF participating countries[20] and thus TurSEFF has its own Equipment List that most suits the Turkish market condition (i.e. availability of equipments and suppliers in Turkey, levels of awareness of end users and intermediary banks, etc.) It took three months to compile the initial version, after which the List has constantly been revised by assessing and approving applications from suppliers and manufacturers. There is a regular format to fill for analyzing the eligibility of equipments and suppliers. The criteria for selecting equipments is based on EU Standards and at least 20% (or 30% in some cases) energy saving is required compared to the conventional ones. Energy saving of less than 20% is also approved in strategically important cases where certain not-well-known equipments with already proven technology should be disseminated in certain regions of Turkey. TurSEFF in fact places more emphasis on the availability of reliable supplier than newness of the technology in Turkey.

2) Project implementation team

Project implementation team consists of the management team (three international experts including the team leader) and the technical team (one full-time international consultant with three part-time local consultants), which can also mobilizes other technical experts

[17] According to the updated information given by GOT at the CTF Trust Fund Committee meeting held in Istanbul in November 3rd, EBRD would establish new Programs under its Sustainable Energy Finance Facility (SEFF), namely, ResiSEFF which promotes EE in residences and buildings and MunSEFF which promotes RE/EE for municipal infrastructure.

[18] EBRD, "ESCO Success Story"(January 2012) http://www.ebrdseff.com/en/news/250-turseff-finances-first-real-energy-performance-contract-epc-in-the-carousel-shopping-mall-in-turkey-with-johnson-controls-and-vakifbank.html

[19] EBRD, "TURKISH PUBLIC & PRIVATE SECTOR ENERGY SERVICE COMPANY MARKET ASSESSMENT" (February 2012)

whenever necessary. Especially the management team strongly and diligently supports the sub project formation by a) visiting partner banks, giving advices by checking their clients and pipeline projects, b) identifying potential sub-projects by holding regular meetings with interested parties including manufacturers, suppliers, installers, industrial associations and sharing thus acquired information with partner banks and c) utilizing vendor financing in which vendors who can supply particular equipments in targeted regions can receive concessional loans from partner banks on condition that they offer major discounts to end users (e.g. extension of 6 monthly installments to 18 months; no interest imposed on monthly installments; 50% price off from the second purchase) so as to accelerate the dissemination of energy-saving equipments in targeted regions.

(8) AFD

Since it was agreed upon between the governments of Turkey and France in 2004 that AFD will stick with non-soft loans and non-sovereign businesses, AFD as well as PROPARCO, which is AFD's subsidiary dedicated to financing the private sector, have been providing non-sovereign loans to municipalities and private sector via commercial banks. Nevertheless, AFD became able to provide sovereign loans to Turkish government sector due to the parliament approval in 2009 and offered its first sovereign loans in forestry sector to the General Directorate of Forestry in 2010.

Under the Climate Turkey Program (2009-2011), AFD and PROPARCO have promoted RE and Industry EE (mainly for SMEs) by providing three credit lines by AFD to Halkbank (Mar. 2011), TEB Bank (Sep. 2010) and TSKB (Oct. 2009) and two credit lines by PROPARCO to IS Bank (Dec. 2010) and Garanti Bank (Feb. 2009)

Table 2-7 Ongoing AFD Credit Lines in EE/ RE Sector, Turkey

Project Name	TA	Credit Line	Financial Intermediary
Climate Turkey Program (2009-2011: 2 years) (1)AFD credit lines: 1) SME EE/RE credit line to Halkbank (Mar. 2011) 2) SME EE/RE credit line to TEB Bank (Sept 2010) 3) Industry EE/RE credit line to TSKB (Oct 2009) (2) PROPARCO (AFD subsidiary) credit lines/ loans: 1) SME & Industry EE/ RE credit line to Isbank (Dec. 2010) 2) RE sector subordinated loans to Garantibank (Feb 2009)	Funded by grants such as FFEM (French GEF)	A total EUR 300 mil. (1) AFD credit lines: 1) EUR 100 mil. including EUR 60 mil. for EE 2) EUR 50 mil. (more than 50% for EE) 3) EUR 50 mil. (more than 50% for EE) (2) PROPARCO credit lines/ loans: 1) EUR 50 mil. 2) EUR 50 mil. for RE (wind farms)	(1) 1) Halkbank, 2) TEB Bank 3) TSKB (2) 1) Isbank 2) Garantibank

Source: AFD website and other sources

AFD is currently pursuing the possibility of assisting Turkey's energy efficiency in both central and local governments, according to the direction of French Government. AFD has the strength in offering both non-sovereign and sovereign loans to municipalities. Although AFD has not

[20] See SEFF website (http://www.ebrdseff.com/en/seffs.html) for other countries cases.

yet a concrete idea of Turkish counterpart and the implementation scheme, it has already sent a Letter of Interest to UT for financing up to EUR 100 mil. to support EE projects in Turkey. In mid-December 2012, AFD is starting a new program entitled, “EE in SMEs in Turkey, Technical Assistance to KOSGEB” (3-year project between 2013 and 2015) in which promotion of SME EE including EVD capacity development will be pursued.

(9) EIB (European Investment Bank)

EIB have three ongoing projects in RE/EE sector, namely, a) Credit lines to TSKB, TKB and Vakif Bank under the Energy Efficiency Finance Facility (since 2006), b) Credit lines to TSKB and TKB under the Environment and Energy Framework Loan (since 2008) and c) Credit lines to Garanti Bank, Denis Bank, Yapi Kredi and IS Bank under the Climate Change Facility (since 2011). Nevertheless, all the above projects have been mostly focused on RE. With regard to EE sector, EIB is concentrated on private corporate sector and has no intention to pursue public sector EE.