Islamic Republic of Pakistan

National Energy Conservation Center,

Ministry of Water and Power

Islamic Republic of Pakistan

for

Institution – Building and Promotion

of

Energy Saving

Final Report

March 2015

Japan International Cooperation Agency

Nippon Koei Co., Ltd

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FINAL REPORT
for
Expert for Institution - Building and Promotion of Energy Saving

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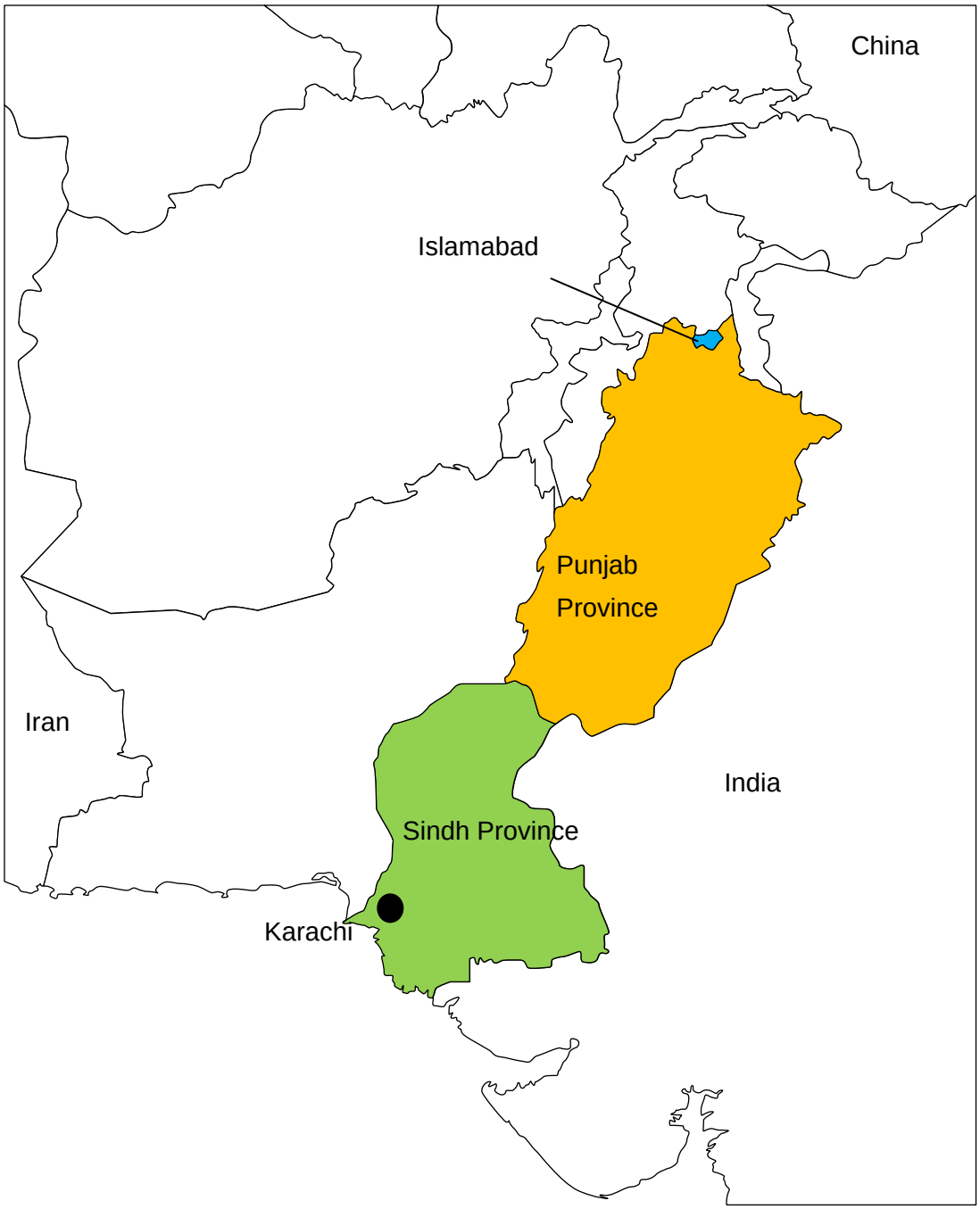


Source : Prepared by the Survey Team based on the map published on the website (http://www.freemap.jp/)

Abbreviations

A&A	:	Agriculture and Administration
A/C	:	Air Conditioner
ADB	:	Asian Development Bank
BEC	:	Building Code of Pakistan (Energy Provision) or Building Energy Code
BEE	:	Bureau of Energy Efficiency, India
BIJLEE	:	Berkeley -India Joint Leadership on Energy and the Environment
BRESL	:	Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labelling
CDA	:	Capital Development Authority
CFL	:	Compact Fluorescent Lamps
CLASP	:	Collaborative Labelling and Appliance Standards Program
DFID	:	Department for International Development
E&C Law	:	Energy Conservation Law
EC	:	Energy Conservation
ECF	:	Energy Conservation Fund
EDB	:	Engineering Development Board
EE	:	Energy Efficiency
EE&C	:	Energy Efficiency and Conservation
EE&C Bill	:	Energy Efficiency and Conservation Bill
EI	:	Energy Intensity
ENERCON	:	National Energy Conservation Center
ERRA	:	Earthquake Reconstruction and Rehabilitation Authority
ES&L	:	Energy Standards & Labelling
FATA	:	Federally Administered Tribal Area
FBR	:	Federal Board of Revenue
FERTS	:	Fuel Efficiency in Road Transport Sector
FESCO	:	Faisalabad Electric Supply Company
GEF	:	Global Environmental Facility
GENCO	:	Generation Company
GEPCO	:	Gujranwala Electric Power Company
GIZ	:	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNP	:	Gross National Product
GOP	:	Government of Pakistan
HESCO	:	Hyderabad Electric Supply Company
HRD	:	Human Resource Development
ICT	:	Islamabad Capital Territory
IEC	:	International Electro-technical Commission
IFC	:	International Financial Cooperation
IESCO	:	Islamabad Electricity Supply Company
ISO	:	International Organization for Standardization
JICA	:	Japan International Cooperation Agency
JIS	:	Japan Industry Standard
JST	:	JICA Survey Team
KESC	:	Karachi Electricity Supply Company

KfW	:	Kreditanstalt für Wiederaufbau
KPK	:	Khyber Pakhtunkhaw
LBNL	:	Lawrence Berkeley National Laboratory
LDA	:	Lahore Development Authority
LESCO	:	Lahore Electricity Supply Company
LUMS	:	Lahore University of Management Sciences
MEPCO	:	Multan Electric Power Company
MEPS	:	Minimum Energy Performance Standards
METI	:	Ministry of Economy, Trade and Industry, Japan
MPNR	:	Ministry of Petroleum & National Resources
MLITT	:	Ministry of Land, Infrastructure and Transport, Japan
MOF	:	Ministry of Finance
MOHW	:	Ministry of Housing and Works
MOIP	:	Ministry of Industries and Production
MOPD	:	Ministry of Planning and Development
MOST	:	Ministry of Science and Technology
MOWP	:	Ministry of Water and Power
MW	:	Mega Watt
NEPRA	:	National Electric Power Regulatory Authority
NGO	:	Non-Governmental Organization
NSC	:	National Standards Committee
OGRA	:	Oil and Gas Regulatory Authority
OIML	:	International Organization of Legal Metrology
PaCCS	:	Pakistan Customs Computerized System
PCRA	:	Petroleum Conservation Research Association
PCSIR	:	Pakistan Council of Scientific and Industrial Research
PE	:	Programme Evaluation
PEC	:	Pakistan Engineering Council
PEECB	:	Pakistan Energy Efficiency and Conservation Board
PEEMA	:	Pakistan Electrical and Electronics Merchants Association
PEFMA	:	Pakistan Electric Fan Manufacturers Association
PESCO	:	Peshawar Electric Supply Company
PKR	:	Pakistan Rupee
PNAC	:	Pakistan National Accreditation Council
PPAF	:	Pakistan Poverty Alleviation Fund
PPP	:	Public-Private Partnership
PPRA	:	Public Procurement Regulatory Authority
PS	:	Pakistan Standard
PSC	:	Project Steering Committee
PSCC	:	Project Stakeholder Coordination Committee
PSO	:	Pakistan State Oil
PSQCA	:	Pakistan Standards and Quality control Authority
QCC	:	Quality Control Centre
QESCO	:	Quetta Electric Supply Company
RDA	:	Rawalpindi Development Authority
REEE	:	Renewable Energy and Energy Efficiency Programme
RFO	:	Residual Fuel Oil
RLF	:	Revolving Loan Fund

SDC	:	Standards Development Center
SECP	:	Security and Exchange Commission of Pakistan
SRO	:	Statutory Regulation Order
SSC	:	System Certification Center
SSGC	:	Sui Southern Gas Company
SUD-Net	:	Sustainable Urban Development Network
TFL	:	Tubular Fluorescent Lamp
TSC	:	Technical Standard Center
TWG	:	Technical Working Group
TV	:	Television
UCB	:	University of California, Berkeley
UFG	:	unaccounted-for gas
UNDP	:	United National Development Programme
UNHABITAT	:	United Nations Human Settlements Programme
UNIDO	:	United Nation Industrial Development Organization
USAID	:	United States Agency for International Development
USEPA	:	United States Environmental Protection Agency
W	:	Watt
WAPDA	:	Water and Power Development Authority
WB	:	World Bank
WeBOC	:	Web Based One Customs

Executive Summary

E1 Background

The Government of Pakistan (GOP) prepared the National Power Policy 2013 as an action plan to reform the energy sector, and to clarify countermeasures from two sides: strengthening of supply and improving energy efficiency in consumers. Currently, the GOP is in the process of finalizing the Energy Efficiency and Conservation Bill 2014 (EE&C Bill) to promote energy efficiency in consumers. The Minimum Energy Performance Standards (MEPS) and labelling framework will be the two main tools to address EE&C, which is already included in the energy sector reform. To assist the concerned ministries and other relevant government departments that lack experience in this area, as well as to provide assistance for the successful implementation of EE&C Bill, the Japan International Cooperation Agency (JICA) established the Program Loan in cooperation with the World Bank (WB) and Asian Development Bank (ADB).

The Pakistan governmental organization will take action to issue regulations on MEPS and labelling for at least three energy-intensive appliances or technologies, in accordance with one of the disbursement conditions for Program Loan, 'Policy Matrix" of "Energy Sector Reform Program."

In addition, International donors considered technical support in order to promote implementation of items for reforming power sector, and decided to support the establishment of MEPS and labelling framework based on experience in Japan.

Scope of the above action by the Pakistan governmental organization:

- To review the draft MEPS and labelling for fans, compact fluorescent lamps and motors (for tube wells and water pumps) prepared by ENERCON with the assistance of the United Nations Development Programme (UNDP).

- For ENERCON, to draft the MEPS (called "energy consumption standards" in EE&C Bill 2014) and associated labelling for three additional energy-intensive appliances or technologies with the assistance of JICA.

- For Pakistan Energy Efficiency & Conservation Board (PEECB), to approve and issue MEPS and associated labelling for fans, compact fluorescent lamps and motors (for tube wells and water pumps) with the assistance of UNDP.

- For ENERCON, to prepare a roadmap by 31 December 2014 for the phasing out of fans, compact fluorescent lamps and motors that do not comply with the three MEPS.

Hence, this survey is being carried out to support the establishment of MEPS and labelling framework in order to improve and implement the energy sector reform smoothly and introduce EE&C institutional framework in Pakistan.

E2 Objectives of the Survey

The general objectives of the Survey are to provide support for the establishment of MEPS against energy-intensive appliances, and for the preparation of labelling framework after reviewing the current condition and trends related to EE&C in Pakistan. The specific objectives of this survey are listed below.

1) To give ENERCON advice in their review of the draft MEPS and labelling for fans, compact fluorescent lamps and motors (for tube wells and water pumps).

2) To provide support for the preparation of draft MEPS and associated labelling for three additional energy-intensive appliances or technologies.

3) To provide support for the preparation of a roadmap by 31 December 2014 for the phasing out of fans, compact fluorescent lamps and motors that do not comply with the three MEPS.

4) To propose countermeasures for further promotion of EE&C in Pakistan.

E3 Methodology of the Survey

E3.1 Members of the JICA Survey Team

The three experts of the JICA Survey Team are listed in Table E3-1.

Table E3-1 The JICA Survey Team

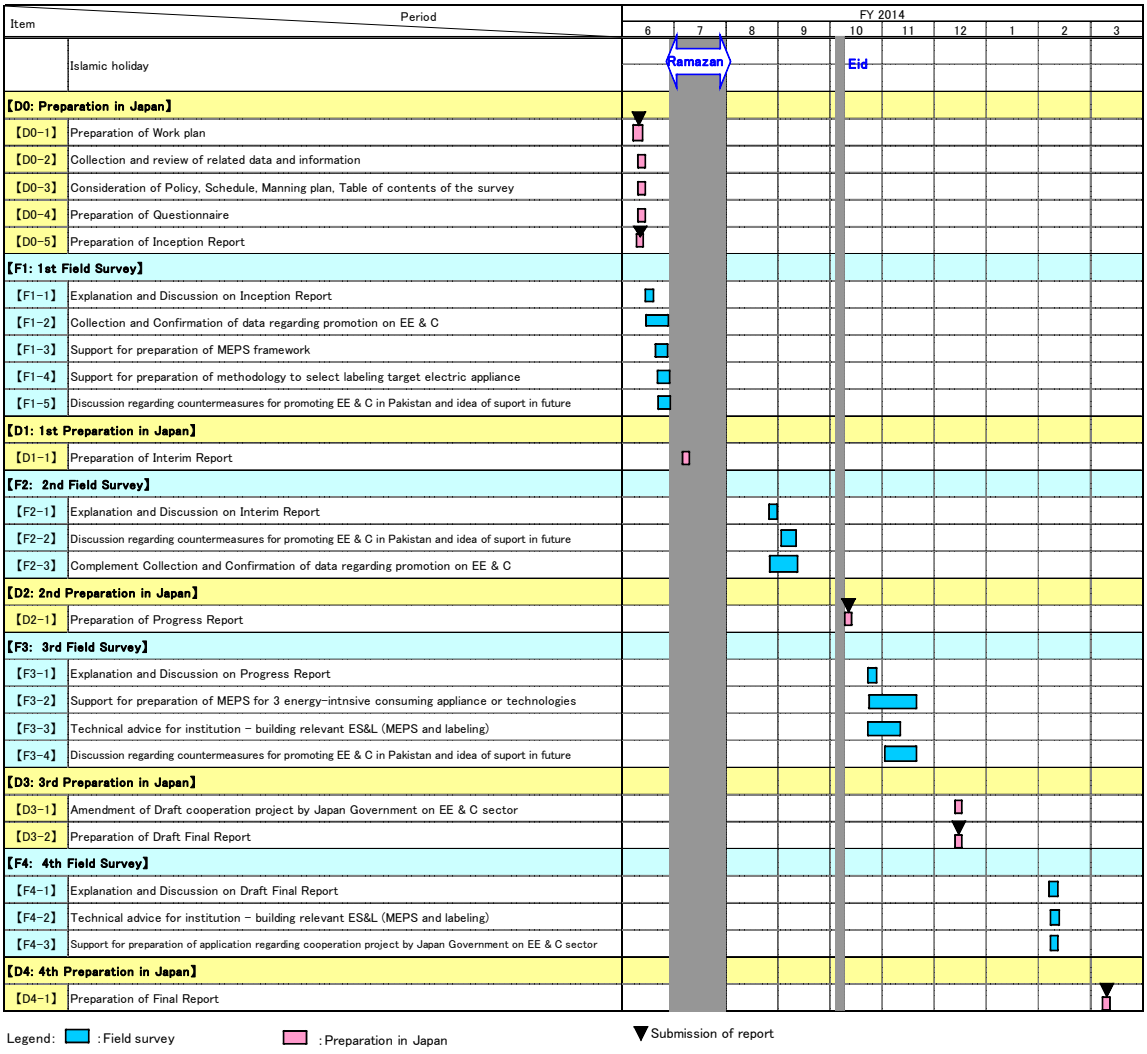
Name	Position
Hideaki KUROKI	Team Leader, Policy for EE&C
Norio FUKUSHIMA	Minimum Energy Performance Standard (MEPS) / Labelling 1
Hidehito WAKABAYASHI	Minimum Energy Performance Standard (MEPS) / Labelling 2

Source: Prepared by the JICA Survey Team

E3.2 Implementation Schedule

The Surveys will be carried out from mid June 2014 to end March 2015 (about 10 months).

The schedule of the Surveys is shown in Figure E3-1.



Source: Prepared by the JICA Survey Team

Figure E3-1 Implementation Schedule

E4 Achievement of ENERCON with assistance of JICA Survey Team

E4.1 Review of the draft MEPS and labelling for fans, compact fluorescent lamps and motors

ENERCON reviewed the draft MEPS and labelling for fans, compact fluorescent lamps and motors (for tube wells and water pumps) prepared by ENERCON with the assistance of the United Nations Development Programme (UNDP) based on advice from JST.

JST discussed with ENERCON based on the consideration to improve draft MEPS and labelling until 3rd field survey, then sent letter with recommendations to ENERCON. ENERCON reviewed draft MEPS and labelling with utilizing recommendations from JST. Recommendations form JST is shown in Table E4-1.

The revised documents that were reviewed by ENERCON are publicized on website of ENERCON below.

http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=63&Itemid=63

Table E4-1 Recommendations for ES&L Framework

Item	Summary	Reference
Enactment of EE&C Act	It is necessary to enact EE&C Act before December 2014, in order to avoid the vacancy of the organization to approve the framework of the implementation of ES&L.	Section 3.11.1
Amendment of 'Labeling Policy'	Some words were included as proposed changes/additions to '*Labeling Policy/Procedure for Grant & Monitoring of Energy Labels in Pakistan*' vide Document No. ES&L/P-01/2012 ('Labeling Policy'), in order to manifest or show compliance with the 'Policy Matrix" of "Proposed Programmatic Approach and Policy-Based Loan for Subprogram Islamic Republic of Pakistan: Sustainable Energy Sector Reform Program" ('Policy Matrix), and improve ES&L framework in Pakistan.	Section 3.11.2
Amendment of 'MEPS for fans'	Some words were included as proposed changes/additions to 'Minimum Energy Performance Standards (MEPS) for fans', vide Document No.EES-01/2013 ('MEPS for fans'), in order to manifest or show compliance with 'Policy Matrix", and to improve ES&L framework in Pakistan.	Section 3.11.3
Review of ES&L that is prepared by ENERCON, with the assistance of BRESL	Some words are proposed to be reviewed in the draft ES&L for AC electric fans, compact fluorescent lamps (CFLs) and electric motors, respectively.	Section 3.11.4 and Sections 3.3, 3.4 and 3.5
Issuance to ES&L document by Ministry of Water and Power	In order to comply with the 'Policy Matrix', 'Labeling Policy' and 'MEPS for fans', 'Other guidelines' are proposed to be issued by Ministry of Water and Power.	Section 3.11.5
Increase of steps of labelling criteria	Most countries have set four or more steps for their respective labelling criteria. But, Pakistan adopted three-step labelling based on the willingness and opinion of manufacturers as important stakeholders. It is strongly recommended to increase the steps of labelling criteria after the long-term consideration.	Section 3.11.6

Source: Prepared by the JICA Survey Team

E4.2 Preparation of draft MEPS and associated labelling for TV receivers, Tube Fluorescent Lamps, Micro wave ovens

JST discussed with ENERCON based on the consideration to select additional three MEPS and labelling until 3rd field survey, then agreed with ENERCON to select TV receivers, Tube Fluorescent Lamps, Micro wave ovens as subject to additional three MEPS and labelling.

Then, ENERCON prepared draft MEPS and associated labelling for TV receivers, Tube Fluorescent Lamps, Micro wave ovens based on technical advice from JST.

MEPS should be approved by Pakistan Standards and Quality Control Authority (PSQCA), but draft MEPS will be finalized by ENERCON continuously, because approval procedure of MEPS will take about one year.

E4.3 Issuance of MEPS and labelling for fans, compact fluorescent lamps and motors

EE&C Bill 2014 remained on the table for enactment during period of this survey, therefore Pakistan Energy Efficiency & Conservation Board (PEECB) was not established. Thus, JST proposed and agreed that Ministry of Water and Power (MOWP) would issue the documents instead of PEECB, in consultation with ENERCON.

MOWP issued the documents regarding MEPS and labelling for fans, compact fluorescent lamps and motors, responding to request from ENERCON.

E4.4 Preparation of roadmap for the phasing out of appliances or technologies that do not comply with the three MEPS

JST discussed with ENERCON based on the consideration to prepare roadmap until 3rd field survey, then agreed outline and item of roadmap with ENERCON.

ENERCON prepared roadmap with assistance of JST, further publicized roadmap on website of ENERCON below.

http://www.enercon.gov.pk/index.php?option=com_content&view=article&id=63&Itemid=63

E5 Proposal of support project in the future

In order to promote EE&C in Pakistan in the future, at first ES&L scheme should be implement surely from now, so that was facilitated through ENERCON activities included this survey, then the other countermeasure regarding EE&C should be deployed.

As course of development;

1) Countermeasure1: to accelerate the spread of ES&L
   (e.g. Measurement & Verification, awareness, financial assistance measure),
2) Countermeasure 2: to move ES&L from voluntary basis to mandatory basis
   (e.g. Enforcement of financial assistance measure, enforcement of testing laboratory, support to move mandatory basis),
3) Countermeasure 3: to review building code (energy provision) and,
4) Countermeasure 4: to facilitate qualified person for energy management system,

are recommended.

Details of proposed programs were shown in chapter 4.

CHAPTER 1

INTRODUCTION

Chapter 1 Introduction

1.1 Background of the Survey

In Pakistan, the peak power demand is increasing due to the rapidly growing population; however, the supply capacity does not meet the peak demand. The gap between supply and demand reaches approximately 6,000 MW during the peak summer season, creating a shortfall of about one-third of the available power. Although scheduled load-shedding as well as unannounced power interruptions are carried out at an average of 10-14 hours per day, this situation has caused severe negative impact on daily economic activities.

The Government of Pakistan (GOP) prepared the National Power Policy 2013 in September last year as an action plan to reform the energy sector and to clarify countermeasures from two sides: strengthening of supply and improving energy efficiency in consumers. Currently, GOP is in the process of finalizing the Energy Efficiency and Conservation Bill 2014 (EE&C Bill) to promote energy efficiency in consumers.

In the future, countermeasures regarding Energy Efficiency & Conservation (EE&C) will be carried out by the introduction of EE&C Bill. Minimum Energy Performance Standards (MEPS) and labelling framework will be the two main tools to address EE&C, which is already included in energy sector reform. To assist the concerned ministries and other relevant government departments which lack experience in this area, as well as to provide assistance for the successful implementation of EE&C Bill, the Japan International Cooperation Agency (JICA) established the Program Sector Loan in cooperation with the World Bank (WB) and Asian Development Bank (ADB).

The Pakistan governmental organization will take action to issue regulations on MEPS and labelling for at least three energy-intensive appliances or technologies, in accordance with one of the disbursement conditions for Program Sector Loan, 'Policy Matrix" of "Energy Sector Reform Program".

In addition, International donors considered technical support in order to promote implementation of items for reforming power sector, and decided to support the establishment of MEPS and labeling framework based on experience in Japan.

Scope of the above action by the Pakistan governmental organization:

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- For Pakistan Energy Efficiency & Conservation Board (PEECB), to approve and issue MEPS and associated labelling for fans, compact fluorescent lamps and motors (for tube wells and water pumps) with the assistance of UNDP.
- For ENERCON to prepare a roadmap by 31 December 2014 for the phasing out of appliances or technologies that do not comply with the three MEPS.

In addition, JICA is considering technical support in order to promote implementation of items for reforming the power sector, and will support the establishment of MEPS and labelling framework based on experience in Japan.

Hence, this survey is being carried out to support the establishment of MEPS and labelling framework in order to improve and implement the energy sector reform smoothly and introduce EE&C institutional framework in Pakistan.

1.2 Objectives of the Survey

The general objectives of the survey are to provide support for the establishment of MEPS against energy-intensive appliances, and for the preparation of labelling framework after reviewing the current condition and trends related to EE&C in Pakistan. The specific objectives of this survey are listed below.

1) To give ENERCON advice in their review of the draft MEPS and labelling for compact fluorescent lamps, fans and motors (for tube wells and water pumps).
2) To provide support for the preparation of draft MEPS and associated labelling for three additional energy-intensive appliances or technologies.
3) To provide support for preparation of a roadmap by 31 December 2014 for the phasing out of fans, compact fluorescent lamps and motors (for tube wells and water pumps) that do not comply with the three MEPS.
4) To propose countermeasures for further promotion of EE&C in Pakistan.

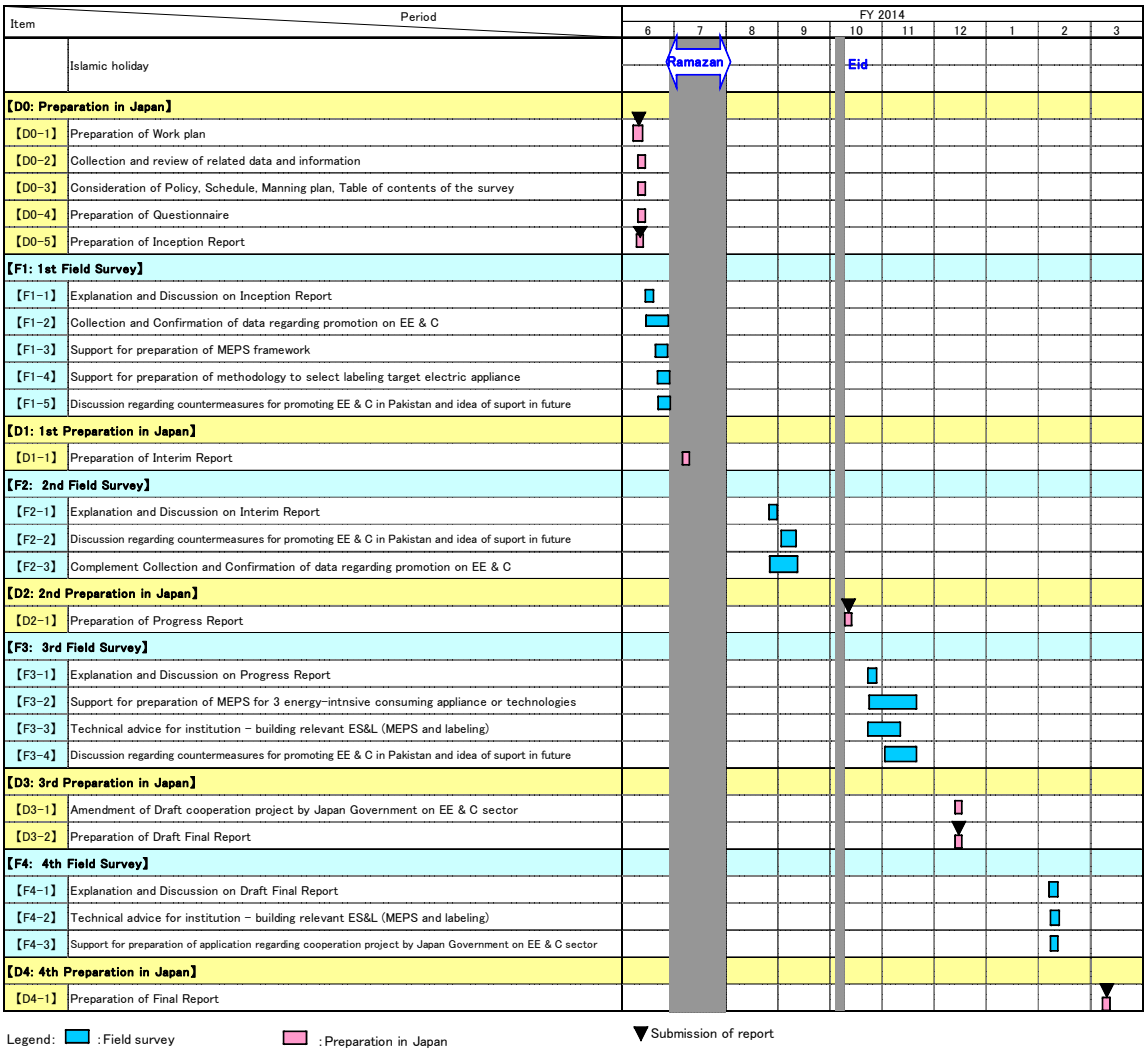
1.3 Survey Area

The study area of this project is shown in the location map. It includes:

1) Islamabad
2) Lahore City area: Punjab Province
3) Karachi City area: Sindh Province

1.4 Schedule of the Survey

The surveys will be carried out from mid June 2014 to end March 2015 (about ten months). The schedule of the surveys is shown in Figure 1.4-1.



Source: Prepared by the JICA Survey Team

Figure 1.4-1 Implementation Schedule

CHAPTER 2

BASIC DATA AND INFORMATION REGARDING EE & C IN PAKISTAN

Chapter 2 Basic Data and Information Regarding EE&C in Pakistan

2.1 Socioeconomic Situation, Power Policy, and Energy Supply-Demand Situation in Pakistan

2.1.1 Socioeconomic Situation in Pakistan

1) Population of Pakistan

According to the census in November 2013, Pakistan has the 6th largest population in the world. It is estimated that the population of Pakistan will exceed 240 million in 2030. The actual and forecast population in Pakistan from 1998 to 2030 is shown in Table 2.1-1.

Table 2.1-1 Actual and Forecast Population in Pakistan from 1998 to 2030

(Unit: million persons)

	1998	2000	2005	2010	2011	2012	2013	2015	2020	2025	2030
MOF source	132.43	-	-	-	177.03	180.71	184.35	191.72	210.12	227.26	242.06
UN source	-	143.83	157.97	173.15	-	-	-	188.14	203.35	-	-

Source: Pakistan Market and Market Development, JETRO

2) Population by Region

Pakistan consists of four provinces (Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan), and two federal administration areas (FATA and Islamabad Capital Territory). Population by region in 2005 and from 2010 to 2013 given in Table 2.1-2 shows that Punjab is the largest province with more than half of the entire population of Pakistan.

Table 2.1-2 Population by Region in 2005 and from 2010 to 2013

(Unit: million person, %)

Region	2005		2010		2011		2012		2013	
Punjab Prov.	85.904	55.1	94.745	54.6	96.545	54.4	98.355	54.4	100.174	54.3
Sindh Prov.	36.654	23.5	41.248	23.8	42.188	23.8	43.132	13.4	24.788	13.4
Khyber Pakhtunkhwa Prov.	20.893	13.4	23.273	13.4	23.770	13.4	24.277	23.4	24.788	13.4
Balochistan Prov.	7.852	5.0	8.853	5.1	9.064	5.1	9.278	5.1	9.495	5.2
FATA	3.649	2.3	4.107	2.4	4.206	2.4	4.307	2.4	4.410	2.4
Islamabad Capital Territory	1.090	0.7	1.283	0.7	1.322	0.7	1.362	0.8	1.401	0.8
TOTAL	156.043	100.0	173.509	100.0	177.095	100.0	180.711	100.0	184.349	100.0

FATA: Federally Administered Tribal Areas

Source: Pakistan Market and Market Development, JETRO

3) Population by Age

In 2013, the population below 15 years old accounted for one third of the entire population of Pakistan. Estimated population by age from 2013 to 2030 is shown in Table 2.1-3.

Table 2.1-3 Estimated Population by Age from 2013 to 2030

(Unit: million persons, %)

	2013		2015		2020		2025		2030	
Age Range	Pop.	%	Pop.	%	Pop.	%	Pop.	%	Pop.	%
00 - 04	22.40	12.2	22.76	11.9	23.28	11.1	22.44	9.9	20.35	8.4
05 - 09	20.87	11.3	21.33	11.1	22.35	10.6	22.95	10.1	22.18	9.2
10 - 14	19.56	10.6	20.07	10.5	21.24	10.1	22.28	9.8	22.88	9.5
15 - 19	20.78	11.3	20.12	10.5	20.01	9.5	21.19	9.3	22.24	9.2
20 - 24	18.72	10.2	19.80	10.3	20.05	9.5	19.95	8.8	21.14	8.7
25 - 29	16.16	8.8	17.13	8.9	19.71	9.4	19.98	8.8	19.89	8.2
30 - 34	13.85	7.5	14.72	7.7	17.04	8.1	19.62	8.6	19.91	8.2
35 - 39	11.57	6.3	12.40	6.5	14.62	7.0	16.94	7.5	19.53	8.1
40 - 44	9.69	5.3	10.36	5.4	12.27	5.8	14.49	6.4	16.81	6.9
45 - 49	7.85	4.3	8.49	4.4	10.20	4.9	12.01	5.3	14.31	5.9
50 - 54	6.44	3.5	6.88	3.6	8.26	3.9	9.95	4.4	11.84	4.9
55 - 59	5.16	2.8	5.53	2.9	6.57	3.1	7.93	3.5	9.60	4.0
60 - 64	4.03	2.2	4.31	2.2	5.13	2.4	6.14	2.7	7.45	3.1
65 +	7.28	3.9	7.82	4.1	9.39	4.5	11.39	5.0	13.93	58
TOTAL	184.35	100.0	191.72	100.0	210.12	100.0	227.26	100.0	242.06	100.0

Source: Pakistan Market and Market Development, JETRO

4) Gross National Product

Sectoral gross national product (GNP) of Pakistan from 2005/06 to 2013/14 is shown in Table 2.1-4. In recent years, GNP of Pakistan has been growing at more than 4% annually.

5) Income Environment

The average number of people per household by consumer expenditure per person is shown in Table 2.1-5. It indicates that the expenditure per person increases with lower average number of people per household.

The average monthly income per household is shown in Table 2.1-6. Annual growth of total average monthly income per household was approximately 18% from 2010/2011 to 2011/2012.

Table 2.1-4 GNP by Sector of Pakistan from 2005/06 to 2013/14

(Unit: PKR million)

Sector	2005 / 06	2006 / 07	2007 / 08	2008 / 09	2009 / 10	2010 / 11	2011 / 12	2011 / 12
A. Agriculture	1,775,346	1,836,125	1,869,310	1,934,691	1,939,132	1,977,178	2,045,481	2,113,930
B. Industrial Sector	1,616,157	1,741,085	1,888,600	1,790,263	1,851,564	1,938,457	1,989,984	2,059,526
Mining & Quarrying	254,345	273,032	281,635	274,710	282,269	269,798	282,154	303,547
Manufacturing	1,065,323	1,161,551	1,232,430	1,180,964	1,197,163	1,227,091	1,253,286	1,297,245
- Large scale	*903,323*	*989,896*	*1,050,276*	*986,887*	*990,928*	*1,007,331*	*1,019,201*	*1,048,078*
- Small scale	*89,116*	*96,470*	*104,519*	*113,474*	*123,083*	*133,556*	*144,778*	*156,699*
- Slaughtering	*72,884*	*75,185*	*77,635*	*80,603*	*83,152*	*86,204*	*89,307*	*92,48*
Electricity Generation & Distribution & Gas Distribution	110,109	96,066	131,767	115,812	135,098	224,814	230,948	223,556
Construction	186,380	210,436	242,768	218,777	237,034	216,754	223,596	235,178
C. Services Sector	4,324,274	4,565,759	4,791,238	4,855,033	5,010,698	5,208,136	5,486,218	5,689,778
Wholesale & Retail Trade	1,523,067	1,612,086	1,703,741	1,652,874	1,682,465	1,718,014	1,746,463	1,790,423
Transport, Storage & Communication	959,499	1,025,694	1,082,452	1,136,990	1,170,612	1,198,896	1,305,766	1,350,706
Finance & Insurance	282,919	308,673	328,071	296,427	286,775	274,674	277,443	295,865
Housing Services	504,743	524,929	545,950	567,941	590,718	614,460	639,062	664,567
General Government Services	425,218	436,848	437,742	462,193	499,038	569,191	632,130	667,559
Other Private Services	628,828	657,529	693,282	738,608	781,089	832,901	885,354	920,658
GNP*	8,366,061	8,759,743	8,911,894	9,209,409	9,463,047	9,780,265	10,171,894	10,758,039

Source: Pakistan Economic Survey 2012-13, webpage of the Ministry of Finance

*Note: Including net factor income from abroad which is not shown in the table.

Table 2.1-5 Average Number of People per Household by Consumer Expenditure per Person (Unit: person)

Consumer Expenditure Range per Person (PKR)	< 1,553 Lowest 20%	1,553 – 2,486 Next 20%	2,487 – 3,148 Next 20%	3,149 – 4,998 Next 20%	> 4,998 Highest 20%
Urban Area Person/Household	8.37	7.78	7.29	6.28	5.08
Rural Area Person/Household	8.13	7.29	6.55	5.77	4.54
Pakistan Person/Household	8.16	7.40	6.77	5.96	4.84

Source: Pakistan Market and Market Development, JETRO

Table 2.1-6 Average Monthly Income per Household (Unit: PKR)

	2010 / 2011	2011 / 2012	Annual Growth Rate
Urban Area	27,664	34,780	25.7%
Rural Area	18,713	20,877	11.6%
Pakistan	21,785	25,679	17.9%

Source: Pakistan Market and Market Development, JETRO

6) Consumer Expenditure

Average monthly consumer expenditure per household is shown in Table 2.1-7. Annual growth of total average monthly consumer expenditure per household was approximately 16% from 2010/2011 to 2011/2012.

Consumer expenditure rate by consumer goods category is shown in Table 2.1-8.

Table 2.1-7 Average Monthly Consumer Expenditure per Household (Unit: PKR)

	2010 / 2011	2011 / 2012	Growth Rate
Urban Area	23,959	28,996	21.0%
Rural Area	16,919	18,887	11.6%
Pakistan	19,336	22,379	15.7%

Source: Pakistan Market and Market Development, JETRO

Table 2.1-8 Consumer Expenditure Rate by Consumer Goods Category (Unit: %)

	2010 / 2011			2011 / 2012		
Goods Category	Urban	Rural	Pakistan	Urban	Rural	Pakistan
Food & Beverage, Cigarette	41.1	54.7	48.9	38.2	50.6	45.0
Clothes and Shoes	4.7	5.5	5.1	5.1	6.2	5.7
Transportation and Communication	6.7	5.5	6.0	7.0	6.2	6.5
Cleaning, Laundry and Personal Appearance	3.6	3.8	3.7	3.7	3.7	3.7
Hobby	0.8	0.2	0.4	0.8	0.2	0.5
Education	4.8	2.5	3.5	6.6	3.4	4.8
Household	21.0	8.7	13.9	19.7	7.9	13.2
Fuel and Lights	7.1	8.0	7.6	6.9	8.7	7.9
Others	10.3	11.1	10.8	12.1	13.1	12.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Pakistan Market and Market Development, JETRO

2.1.2 Power Policy in Pakistan

The National Power Policy 2013 was published and uploaded on the website of the Ministry of Water and Power (MOWP) in September 2013. Key points of the policy are summarized in Table 2.1-9.

Table 2.1-9 Key Points of the National Power Policy 2013

	Policy
Vision	Pakistan will develop the most efficient and consumer-centric power generation, transmission, and distribution system that meets the needs of its population and boosts its economy in a sustainable and affordable manner.
Challenge	Pakistan's power sector is currently afflicted by a number of inefficiencies that have led to a crisis. 1. The supply-demand gap has been continuously growing over the past five years, and such enormous gap has led to load-shedding of 12-16 hours across the country. 2. The highly expensive generation cost of electricity, at PKR 12/kW, is due to an increased dependence on expensive thermal fuel sources. 3. The inefficient power transmission and distribution system that currently records losses of 23-25% are due to poor infrastructure, mismanagement, and theft of electricity. The aforementioned inefficiencies have resulted to theft, high cost of generation, debilitating levels of subsidy, and circular debt.
Goals	In order to achieve the long-term vision of the power sector and overcome its inefficiencies, the Government of Pakistan (GoP) has set the following nine goals: 1. To build a power generation capacity that can meet Pakistan's energy needs in a sustainable manner. 2. To create a culture of energy conservation and responsibility. 3. To ensure the generation of inexpensive and affordable electricity for domestic, commercial, and industrial use by using indigenous resources such as coal (thar) and hydropower. 4. To minimize pilferage and adulteration of fuel supply. 5. To promote world-class efficiency in power generation. 6. To create a cutting edge transmission network. 7. To minimize inefficiencies in the distribution system. 8. To minimize financial losses across the system. 9. To align the ministries involved in the energy sector and improve governance of all related federal and provincial departments as well as regulators. A clear strategy has to be articulated for each of the aforementioned goals in order to actualize the power sector's aspirations.
Targets	Supply-Demand Gap: for Goals 1 and 2 Decrease supply-demand gap from 4,500-5,000 MW today to zero by 2017. Affordability: for Goal 3 Decrease generation cost from USD 0.12/kW to USD 0.10/kW by 2017. Efficiency: for Goals 4 to 6 Decrease transmission and distribution losses from 23-25% to 16% by 2017. Financial Viability and Collections: for Goal 8 Increase collection from 85% to 95% by 2017. Governance: for Goal 9 Decrease decision-making processing time in MoWP and related departments and regulators from long to short duration.
Policy Principle	The policy and strategy are formulated based on "efficiency" and "competition".
Strategy	There are nine strategies for achieving the nine goals, respectively, as follows: 1. Supply Strategy to meet Goal 1

	To build a power generation capacity that can meet Pakistan's energy needs in a sustainable manner. - Investment can only be encouraged if the sector will be made attractive and bankable by eliminating all subsidies to prevent build-up of circular debt. - The preference shall be on affordable to upfront or feed-in tariff, which shall set the upper ceiling. (In the short term) - The government has already brought the existing capacity online by retiring the circular debt, which has resulted in an additional supply of over 1,700 MW. - In tandem, an aggressive rehabilitation and expansion program for the generation company (GENCO) is underway, which will add 1,447 MW within a year. This program includes rehabilitation projects in Guddu, Jamshoro, and Muzzafargarh that will yield 700 MW, and an expansion project in Guddu that will add 747 MW. - Maximum delay limits for payable set for RFO (45-60 days) and gas (35-45 days) should also be applied to hydro independent power producer (IPP) and the Water and Power Development Authority (WAPDA). (In the medium term) - MoWP will attract new investments and expedite the pipeline projects as a national priority. - Five projects, with a total of 256 MW, have reached financial close, while one project (100 MW) will reach it within 2013. The Uch-II Power Project (404 MW) has reached financial close and is expected to be online by the end of 2013. - A cumulative 2,726 MW of wind electricity (if deemed feasible) could be online in 2016. - A 341 MW solar energy project is currently under feasibility assessment and could be online by 2015, if deemed feasible. - Six hydropower projects with a total of 388 MW are expected to be completed by February 2015. - The 247 MW Gulpur Hydropower Project will be completed by December 2017, the Neelum-Jhelum Hydropower Project by November 2016, and a fourth and fifth Tarbela expansions totalling to 1,910 MW will be online. - The government is also poised to announce a coal corridor that has a capacity to generate 6,000–7,000 MW in the near future. (In the long term) - Large infrastructure programs including the Indus Basin Cascade will be aggressively developed. Detailed engineering design for the Dasu (2,160 MW), Patan (2,800 MW), and Thakot (2,800 MW) hydropower projects is being carried out and will optimally be constructed through a build-operate-transfer (BOT) public-private partnership (PPP) scheme. - Bunji and Diamer-Basha hydropower projects, with a potential of 7,000 MW and 4,500 MW, respectively, could ensure the energy independence and security of Pakistan. (In order to achieve medium- and long-term goals) - The government will need to develop infrastructure and provide incentives in order to attract greater private sector investment. - The government will need to set the foundations of energy cities and corridors, and sponsor PPPs for coal and run-of-river projects. - The government will have to assign "key clients or relationship managers" in MoWP who will function as "one window operation" for investors in order to ensure the timely completion of investments and projects. 2. <u>Demand Strategy to meet Goal 2</u> To create a culture of conservation and responsibility. 3. <u>Affordable Power Strategy to meet Goal 3</u> To ensure the generation of inexpensive and affordable electricity for domestic, commercial, and industrial uses. - The strategy should focus on shifting Pakistan's energy mix toward low-cost sources such as hydro, gas, coal, nuclear, and biomass. - Development of coastal energy corridors based on imported coal (later mixed with local coal), rapid proliferation of coal mining all across the country, especially in Thar, and conversion of expensive RFO-based plants to coal are the central tenets of the coal policy.

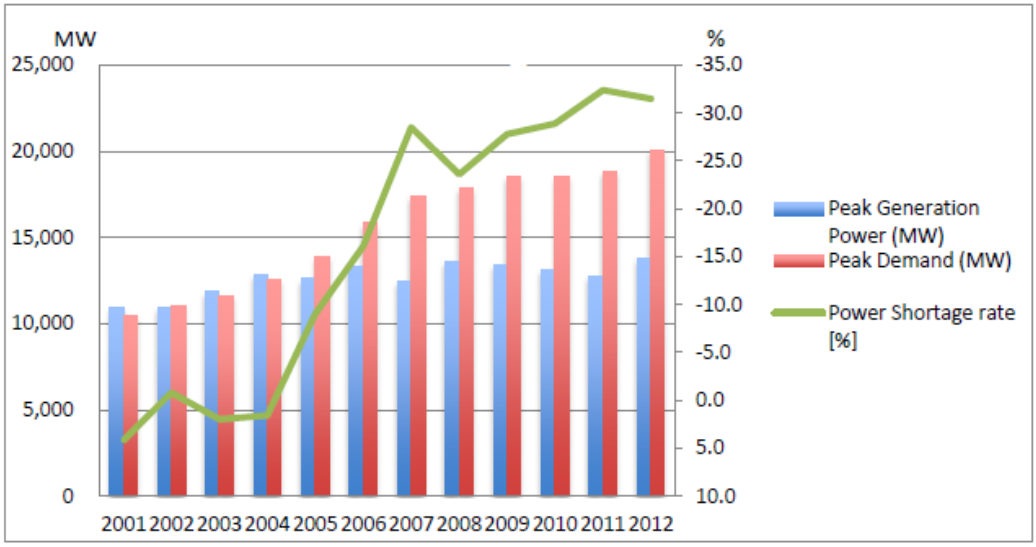
	- The proposed strategy will change the energy mix of Pakistan in favor of low-cost sources and significantly reduce the burden of energy to the end consumer. 4. Supply Chain Strategy to meet Goal 4 To attack pilferage and adulteration of fuel supply. - The strategy will focus on redirecting the supply of fuel from inefficient GENCOs to the most efficient IPPs, which have the potential of saving PKR 3 billion per month and generating an additional 500 MW. - The MoWP will sign performance contracts with GENCOs, Pakistan State Oil (PSO), and fuel transporters, and hold them accountable for the quality and theft of oil. 5. Generation Strategy to meet Goal 5 To promote world-class efficiency in power generation. - The strategy focuses on establishing plant efficiency through external heat rate testing, merit order building, and allocating fuel to the more meritorious plants. - Merit order will allow fuel allocation on the basis of efficiency and optimize dispatch and payments. - The strategy calls for the privatization or O&M-based leasing of GENCOs. 6. Transmission Strategy to meet Goal 6 To create a cutting-edge transmission network. 7. Distribution Strategy to meet Goal 7 To create a cutting-edge distribution network. 8. Financial Strategy to meet Goal 8 To minimize financial losses across the system. 9. Governance Strategy to meet Goal 9 To align the ministries involved in the energy sector and improve their governance.
Prioritization	To maximize the impact of the various strategic initiatives. (In the short term) - Bring existing capacity online, stop all forms of theft, rationalize tariff, sign performance contracts, and ensure transparency. (In the medium term) - Bring low-cost pipeline projects online, and jump-start coal and hydropower projects. (In the long term) Finish large infrastructure hydropower projects and retire high cost energy contracts to ensure that Pakistan moves toward low-cost electricity generation.
Impact	The successful implementation of this policy will lead to enormous improvements within the power sector. - By 2017, the supply-demand gap could be eradicated completely. - After the term of the current government, power surplus can be regionally traded. - After the turn of the decade, Pakistan could be transformed from an energy-strapped importer of power to a regional exporter of power. - The cost of power generation will be reduced to an affordable amount. - Improvements in transmission and distribution efficiency will decrease the burden of power to the end consumer. In summary, prosperity and social development will become a reality in Roshan Pakistan.

Source: National Power Policy 2013, MoWP

2.1.3 Energy Supply-Demand Situation in Pakistan

1) Energy Supply-Demand Situation in Pakistan

Comparison of energy demand and installed facilities capacity are shown in Figure 2.1-1. The peak demand continues to increase rapidly every year, but the peak generation of power continues to remain below it.

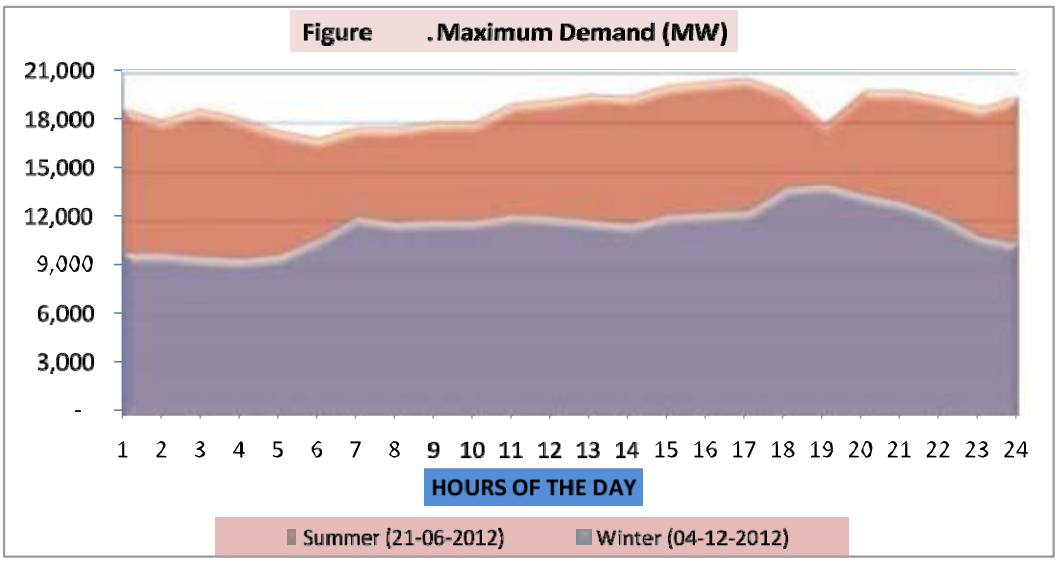


Source: NEPRA State of Industry Report 2013

Figure 2.1-1 Comparison of Energy Demand and Installed Facility Capacity

2) Demand Curve

Maximum demand is shown in Figure 2.1-2. The peak load comes between 15:00 and 18:00 during the summer season.

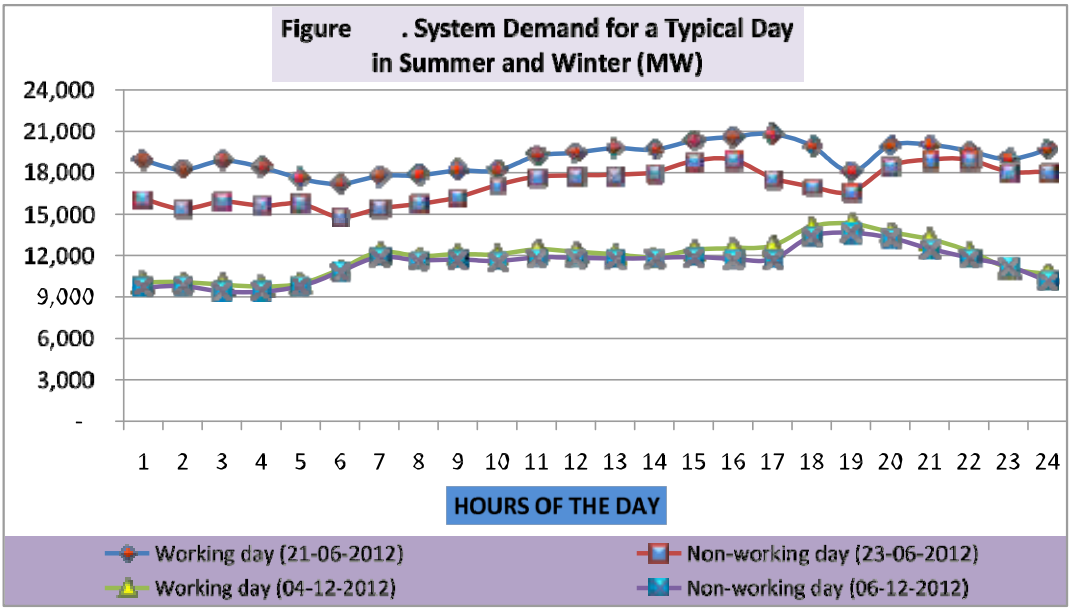


Source: NEPRA State of Industry Report 2013

Figure 2.1-2 Maximum Demand (MW)

3) Energy Supply-Demand Situation in Pakistan

System demand for a typical day in summer and winter is shown in Figure 2.1-3. Demand curve is almost the same between working day and non-working day.



Source: NEPRA State of Industry Report 2013

Figure 2.1-3 System Demand for a Typical Day in Summer and Winter

2.2 EE&C Bill, Legal System, and Organization in Pakistan

2.2.1 EE&C Bill in Pakistan

The Energy Efficiency and Conservation Bill, 2014 (EE&C Bill, 2014) has already been approved and submitted to the Parliament by the Council of Common Interest (all provincial chief ministers meeting held on 29th May 2014) for discussion and final approval. The budget session has already taken place in June 2014.

The key points of the Draft EE&C Bill, which is publicly available, are summarized in Table 2.2-1.

According to the Draft EE&C Bill, 2014:

- The National Energy Conservation Center (ENERCON) will establish new organization after the final approval of EE&C Bill, 2014.
- Pakistan Energy Efficiency and Conservation Board (PEECB) will be established.
- PEECB has the authority to approve energy efficiency standards and ensure their enforcement and compliance.
- ENERCON has the authority to prepare and recommend energy efficiency standards.

Table 2.2-1 Summary of Draft EE&C Bill

	Summary	
Establish Board	Federal government shall, by notification in the official gazette, establish a Board to be known as the Pakistan Energy Efficiency and Conservation Board (PEECB).	
Members of Board	1. Federal Minister for Water and Power	Chairman
	2. Federal Secretary, Ministry of Water and Power	Vice chairman
	3. Federal Secretary, Ministry of Finance	Member
	4. Federal Secretary, Ministry of Planning and Development	Member
	5. Federal Secretary, Ministry of Petroleum and NR	Member
	6. Federal Secretary, Ministry of Science and Technology	Member
	7. Federal Secretary, Ministry of Industry	Member
	8. Federal Secretary, Ministry of Housing and Works	Member
	9. Federal Secretary, Ministry of Climate Change	Member
	10. Secretary of the Designated Department, Government of Punjab	Member
	11. Secretary of the Designated Department, Government of Sindh	Member
	12. Secretary of the Designated Department, Govt. of Khyber Pakhtunkhwa	Member
	13. Secretary of the Designated Department, Government of Balochistan	Member
	14. Chairman, OGRA	Member
	15. Chairman, NEPRA	Member
	16. One Nominee from Chamber of Commerce and Industry	Member

	17. Managing Director, ENERCON — Member 18. -23. Six from the Private Sector of which 3 would be paid full time — Member
Functions and Powers of the Board	1. Be custodian of national policy for energy conservation and ensure proper utilization, planning, and management of energy in all sectors of national economy; 2. Coordinate, supervise, and carry out the enforcement of the provisions of this Act; 3. Create awareness and disseminate information related to efficient use of energy resources; 4. Coordinate integration and inculcation of energy conservation concerns in national development plans and policies; 5. Approve energy efficiency standards and ensure their enforcement and compliance; 6. Direct the ENERCON in the conduct of research and development, and preparation and execution of demonstration projects and national programs on energy conservation; 7. Recommend to the federal government the adoption of measures directly or indirectly conducive to energy conservation; 8. Promote investment by the public and private sectors in energy conservation through partnership or otherwise; 9. Encourage and facilitate import and local manufacture and indigenous technologies for the promotion of energy conservation through all legal and policy support; 10. Institute national energy conservation/efficiency and management awards for various categories of energy consumers for the promotion and encouragement of energy conservation. 11. May make regulations (Sec.17)
Establishment of ENERCON	1. Soon after the commencement of this Act, the federal government shall, by notification in the official gazette, establish an Authority to be called the National Energy Efficiency and Conservation Authority (ENERCON). 2. ENERCON shall be a corporate body having perpetual succession and a common seal with powers, subject to the provisions of this Act, to acquire, hold and dispose of property, both moveable and immoveable and shall have the capacity to sue and be sued.
Powers and Functions of ENERCON	1. Serve as the sole focal federal authority for initiating, catalyzing, carrying out, and coordinating the implementation of all energy conservation programs in all sectors of economy; 2. Administer, implement, and enforce the provisions of this Act and the rules and regulations made thereunder; 3. Prepare or update national energy conservation policy for the approval of the Board; 4. Prepare draft regulations to be approved and issued by the Board pursuant to the provisions of this Act; 5. Recommend national energy efficiency standards to the Board and ensure implementation of these standards; 6. Coordinate energy conservation policies and programs nationally and internationally; 7. Establish protocols of coordination between relevant functionaries of the government and serve as the information house on energy conservation and management; 8. Initiate demonstration and research and development programs in support of its functions; 9. Establish infrastructure and take appropriate institutional development and capacity building measures for effective implementation of the provisions of this Act; 10. Establish systems and procedures for surveys, surveillance, monitoring, inspection and audits to prevent the inefficient use of energy resources and recommend implementation of specific energy conservation measures; 11. Establish, maintain, and certify one or more laboratories as approved laboratories for conducting tests and analysis to help ENERCON in the performance of its functions and to conduct research in various aspects of energy conservation; 12. Seek information or data relevant to its functions from any person or organization for quantitative or technological analysis; 13. Recommend to the federal government and or the provincial government the adoption of financial and fiscal incentives or schemes for achieving energy conservation objectives; 14. Initiate requests for foreign technical and financial assistance for the purposes of this Act, enter into arrangements with foreign agencies and organizations for exchange of information

	and materials, and participate in international meetings and seminars; 15. Obtain information or data relevant to the functions of ENERCON from any person in such form as ENERCON may specify; 16. Undertake inquiry or investigation on energy conservation issues, either on its own accord or upon complaint from any person or on the advice of the Board; 17. Summon and enforce the attendance of any person or an officer, employee, proprietor, partner, manager, director, or chief executive of an entity and require him to supply any information or document needed for the conduct of an inquiry or investigation into any issue being carried out pursuant to the provisions of this Act; 18. Direct an initial energy use assessment to be carried out for any upcoming project and submitted to ENERCON before commencement thereof; 19. Carry out energy audits either by itself or direct any person to receive an energy audit by any accredited or designated energy auditor for any facility, enterprise, factory, building, or object for the purpose of identification of energy conservation issues and making recommendations for corrective measures thereof; 20. Request for tests and analysis from its own laboratory or from a certified laboratory of an equipment, gadget, accessory, or hardware to measure its energy characteristics; 21. Prohibit manufacture, sale, or import of equipment or appliances which are not energy efficient and ensure display of such particulars through labels on equipment or appliances as may be necessary; 22. Fix and realize fee, rates, and charges for rendering any service or providing any facility or information or data audit or assessment or test carried out pursuant to the provisions of this Act and the rules and regulations made thereunder; 23. Appoint such technical and legal experts and administrative staff as it considers necessary for the efficient performance of its functions on such terms and conditions as may be prescribed; and 24. Perform any other function assigned to it by the federal government or the Board, including, but not limited to: - Arrange, conduct, and monitor the training of relevant professionals for their performance as energy auditors/managers; - Facilitate, manage, or designate authority for the appropriate registration of energy auditing firms/individuals and professionals; and - Direct, coordinate, renew, and terminate the services of energy auditors, relevant trainers, and energy efficiency inspectors as may be specified by regulations.
Power and Function of Federal Government	1. Specify the norm for process and energy consumption standards for any equipment (Sec.9(a)). 2. Specify equipment or class of equipment (Sec.9(b)). 3. Prohibit manufacture or sale or import of equipment, unless such equipment conforms to energy consumption standards (Sec.9(c)). 4. Prescribe penalties for energy inefficient equipment (Sec.9(v)). 5. May make rules (Sec.16).

Note: Underline added.

Source: Selected by the JICA Survey Team as per summary from the latest EE&C Bill.

2.2.2 Building Code of Pakistan (Energy Provision)

PEC has launched the Building Code of Pakistan (Energy Provision) in Pakistan through an SRO, it is called as Building Energy Code (BEC). BEC entered to the implementation phase from 2014, but due to financial constraints, they are facing certain problems for ensuring its implementation. Financial assistance including technical support is needed for the following activities in the wake of implementation;

- Capacity building of engineers, professional and Building Control Authority personnel,

through training workshops, short courses etc. at country level.

- Strengthening/ upgrading capacity and testing facilities at Engineering universities for testing of equipment/ devices.
- Inclusion of energy efficiency/ management through BEC in the undergraduate curriculum.
- Development of BEC (Phase-2) for low end users (upto 25KV).
- Enabling legislative environment and implementation introducing incentives/ penalties.

The Project is divided two phases as shown below:

Phase-1: of energy provision for Industrial sector.

Phase-2: of energy provision for domestic consumers up to 25 KW.

PEC was established under the Parliament Act in the year 1976 for regulating engineering professions, therefore, being a regulator, the Government of Pakistan allows them to carry out work independently. Hence, they have issued SRO regarding Energy Code in Pakistan which is to adopted by all the public sector organizations, private sector organizations. checks and balances on the building code is the responsibility of Building Authorities, Capital Development Authority(CDA) for Islamabad, Rawalpindi Development Authority (RDA) for Rawalpindi and Lahore Development Authority (LDA) for Lahore for instance.

As they have the building code prepared by PEC, therefore, instead of creating separate document of energy code, they created a chapter for energy code in the Building Code of Pakistan which was prepared in collaboration with ENERCON. PEC will review the energy code after one year and thereafter they will review periodically every three years in order to measure the advantages and disadvantages. BEC are not on voluntary basis; rather these are mandatory, but a few provisions are still voluntary. But, BEC remains NON penalty framework at beginning of 2015.

At this stage PEC are planning to implement. Obviously it will take some time. As soon as PEC finalize the implementation mechanisms, necessary penalties will be enforced. PEC has the power of civil court and they can issue summons for any violation of provision of Building Code of Pakistan. Civil court means an institution which exercise judicial power to enforce laws in true letter and spirit. Therefore, PEC has civil court powers and may act judiciously to enforce the Building Codes in Pakistan in truel letter and spirit. Second, if any one violates the building codes, PEC can propose punishment as well. As per PEC Act 1976 Section 20, sub-section 3, “For the purpose of any inquiry, the enrolment committee shall be deemed to be

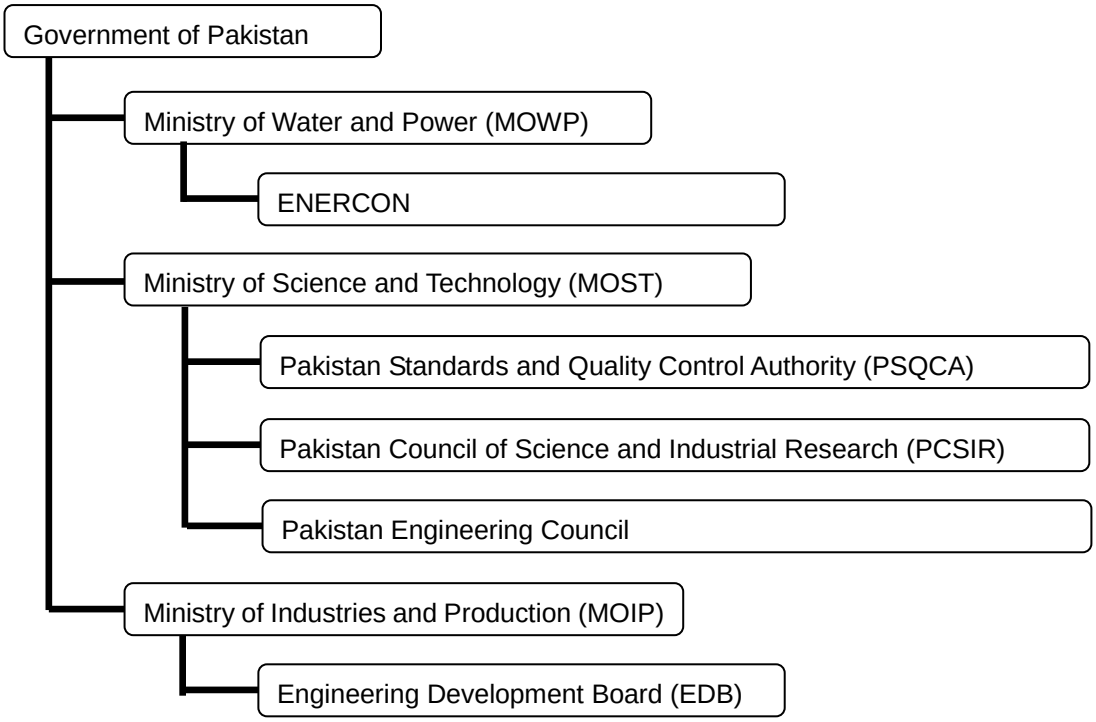
a court within the meaning of the Qanun-e-Shahadat, 1984 (P.O. No. 10 of 1984), and shall exercise all the powers of a civil court for summoning witnesses, for compelling the production of documents and for issuing commissions."

In Pakistan, the administrative units are comprised of Provinces, Districts, towns and several municipalities. Officials at district/tehsil levels are better equipped and trained to approve layout plan and BEC in the urban areas which are mainly based on industry like Faisalabad, Lahore, Karachi etc. Similarly, people who are living in rural areas (villages) or in municipalities need capacity building, training and infrastructure so that they can be familiar with BEC.

2.2.3 Relevant Government Organizations

Relevant government organizations are shown in Figure 2.2-1.

In Pakistan, in addition to ENERCON, the Pakistan Standards and Quality Control Authority (PSQCA) and Pakistan Council of Science and Industrial Research (PCSIR), which are under the umbrella organization of the Ministry of Science and Technology (MOST) and the Engineering Development Board (EDB), under the umbrella organization of the Ministry of Industries and Production (MOIP), are also working on EE&C.



As Member of Board of ENERCON (Before establishment of new ENERCON)
(1) Ministry of Finance (MOF)
(2) Ministry of Planning and Development (MOPD)
(3) Ministry of Petroleum and NR (MOP)
(4) Ministry of Science and Technology (MOST)
(5) Ministry of Industries and Production (MOIP)
(6) Ministry of Housing and Works (MOHW)
(7) Government of Punjab
(8) Government of Sindh
(9) Government of Khyber Pakhtunkhwa
(10) Government of Bolochistan
(11) Oil and Gas Regulatory Authority (OGRA)
(12) National Electric Power Regulatory Authority (NEPRA)
(13) Chambers of Commerce and Industry

Source: Prepared by the JICA Survey Team

Figure 2.2-1 Relevant Government Organizations

2.2.4 National Energy Conservation Centre (ENERCON)

The National Energy Conservation Centre (ENERCON) was established in 1986. ENERCON is one of the centres under MOWP, and has twelve engineers.

An overview of ENERCON is shown in Table 2.2-2. The organizational chart of ENERCON is shown in Figure 2.2-2.

Current Budget of Existing ENERCON is shown in Table 2.3-3. Current Budget of Existing ENERCON in recent year is less than 25 million PKR, and Employee-related Expenses had majority. ENERCON does not have the sufficient budget to carry out various EE&C activities freely.

Current Staffing Plan of Existing ENERCON and Organizational Chart of Existing ENERCON is shown in Table 2.2-4 and Figure 2.2-2. So far ENERCON does not have the section regarding ES&L. But, as shown in Figure 2.2-3, ENERCON has plan to establish ES&L section in that future.

ENERCON founded Energy Conservation Fund (ECF) as company to provide customers financial support. Summary of ECF is shown in Table 2.2-5. Origin of ECF is Fuel Efficiency in Road Transport Sector (FERTS). But, at present ECF contribute in variable EE&C activities. Until recently ECF run Revolving Fund of 300 million PKR. ECF loans the fund with management fee of 3-4% to leasing companies. In addition, in the case where the fee is lower than the interest rate of any banks, ECF loans the fund with adding 10% margin. The fund of ECF is safely retained, not by directly loaning but by loaning to leasing companies.

ECF has allocated 10 million PKR as per recent ECF Board of Director meeting decision for different EE promotional activities and it will somehow cover the MEPS information dissemination as well.

Table 2.2-2 Overview of ENERCON

History	Founded in December 1986 under the Ministry of Planning and Development. Transferred to the Ministry of Water and Power in October 1993. Transferred to the Ministry of Environment in January 1996. Became one of the departments in February 1997. Administrative power of ENERCON was transferred to the Ministry of Water and Power in July 2011. One of the prominent and utmost institutions under MOWP which aims to promote energy efficiency and conservation in Pakistan now.
Vision	To move Pakistan towards an energy efficient and environment friendly tomorrow.
Mission	Cultivating a new energy culture focusing on achieving sustainable development through conservation and efficient use of energy resources.

Source: Prepared by the JICA Survey Team based on the webpage of ENERCON

Table 2.2-3 Current Budget of Existing ENERCON (Unit: PKR million)

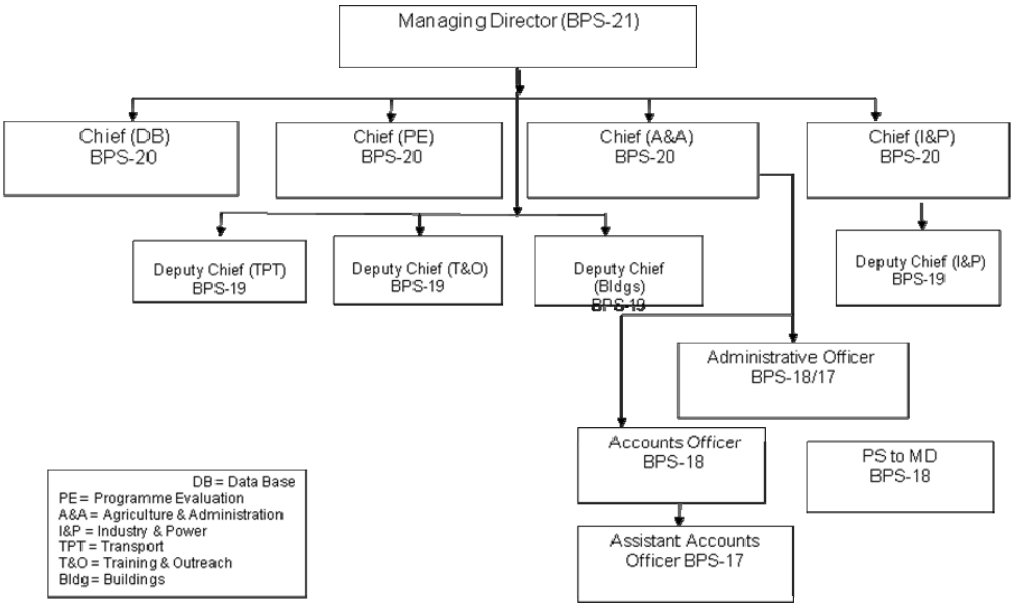
	2011/12	2012/13	2013/14
Employee-related Expenses	-	-	17.7
Other Operational Expenses	-	-	5.5
Total	28.0	20.0	23.2
Liabilities	-	-	10.0
Additional Requirement (For technical activities)			10.0

Source: Information from ENERCON

Table 2.2-4 Current Staffing Plan of Existing ENERCON

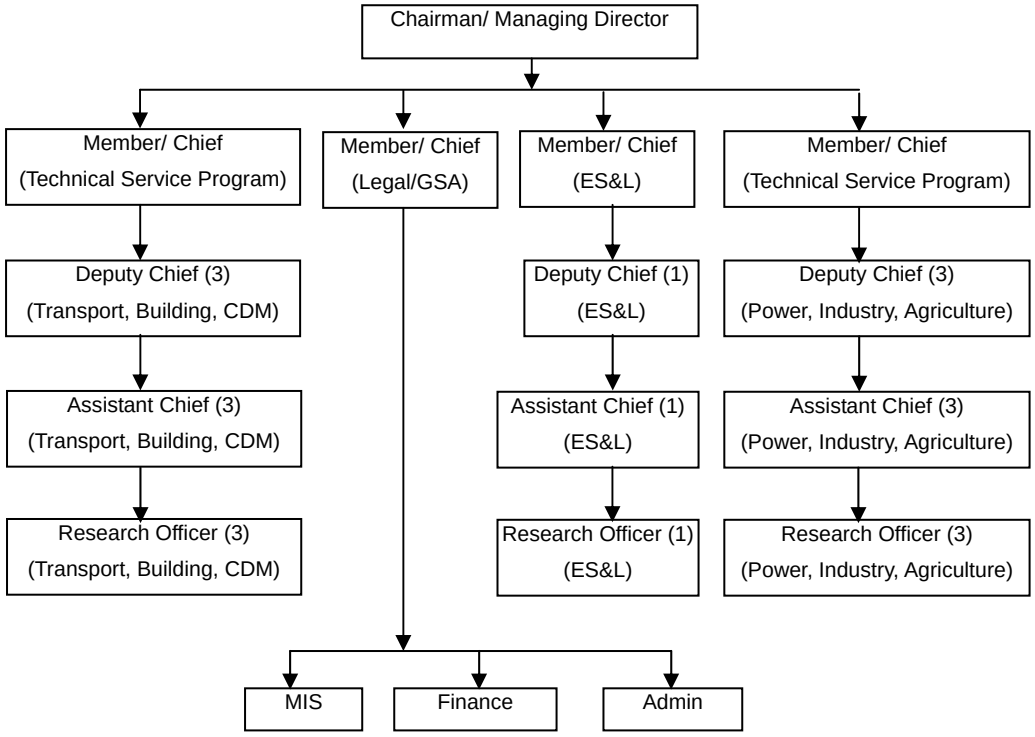
	No. of Post	Remark
A) Managing Director	1	
B) Chief	4	Agriculture and Administration, Programme Evaluation, Database, Industry and Power
C) Deputy Chief	4	Building, Training and Outreach, Industry and Power, Transport
D) Internal Division	4	Accounts officer, Assistant accounts officer, Private secretary, Administrative officer
E) APS	7	Please inform their role
F) Assistant	5	Please inform their role
G) Other Workers	9	Draftsman (1), UDC (1), LDC (1), Driver (4), Dispatch rider (1), Machine operator (1)
H) Naib Qasid	14	Office boy
Total	48	Vacant (12)

Source: ENC/WP/2014/Admin/16(5)



Source: Information from ENERCON

Figure 2.2-2 Organizational Chart of Existing ENERCON



Source: Information from ENERCON

Figure 2.2-3 Organizational Chart of New ENERCON (as of end of November 2014)

Table 2.2-5 Summary of Energy Conservation Fund

	Summary	
History	Origin of this fund is Fuel Efficiency in Road Transport Sector (FERTS). FERTS project was funded by Global Environmental Facility (GEF) with seven million USD grant. The project was implemented by UNDP in conjunction with the ENERCON being the focal agency on behalf of Govt. of Pakistan. FERTS established 50 Tune-up Canters, carried out 15 special studies, training of 1,100 auto mechanics and 900 prospective entrepreneurs through 40 workshops in major cities of Pakistan and undertook a phased out media campaign during its currency and also undertook information and outreach activities. One of the mandates of FERTS was to establish a Revolving Loan Fund (RLF) with the seed money of three million USD out of the total grant of seven million USD by GEF. Therefore, ECF was registered as a corporate body with Security & Exchange Commission of Pakistan (SECP), Islamabad on January 11, 2002. Thereafter the fund amounting to three million USD was converted into Pak Rupees and parked with ECF.	
Legal Status	The Company is Limited by Guarantee not having share capital and is formed not for profit within the meaning of Section 42 of the Companies Ordinance, 1984. Company is governed by its Articles of Association in line with the Companies Ordinance, 1984.	
Record of activities	ECF has been offering soft term loans for the leasing / financing of Motor Vehicle Tune-up equipment through the leasing sector under its Fuel Efficiency in Road Transport Sector RLF across Pakistan. At present the engine tune-up capabilities in the country are of poor quality. The tune-up of engines is normally conducted manually by informally trained mechanics that learn the trade through on the job training process. They by and large rely on subjective sensory clues and personal experience. ECF therefore conducts Training Program for auto mechanics and auto electricians. ECF has recently installed LED/SMD based tube lights in ENERCON building resulting in considerable savings in the lighting load. Moreover ECF is also providing Technical assistance is to various public and private organizations for procuring energy efficient lighting solutions. ECF has carried out initial Energy Assessments in various industries, schools, hospitals, and Government buildings. The recommendations of ECF have helped identification of energy losses and resulted in minimizing energy costs and increase in productivity of these entities.	
Amount of fund	More than 300 million PKR	
Members of Board	1. Secretary Ministry of Water & Power	Chairman/Director
	2. Secretary Finance Division	Member/Director
	3. Secretary Economic Affairs Division	Member/Director
	4. Managing Director ENERCON	Member/Director
	5. Resident Representative UNDP	Member/Director
	6. Financial Expert from civil society	Member/Director
	7. Representative of reputable NGO	Member/Director
	8. Private sector expert	Member/Director
	9. Environmental Specialist with capacity in energy	Member/Director

Source: Information from ENERCON

2.2.5 Pakistan Standards and Quality Control Authority (PSQCA)

The Pakistan Standards and Quality Control Authority (PSQCA), under the Ministry of Science and Technology, is the national standardization body. In performing its duties and functions, PSQCA is governed by the PSQCA Act, 1996. PSQCA came into operation from 1st December 2000. It works with 81 scientists/engineers and 254 support staff as self-financed organization, and has been given the task of not only the formulation of Pakistan Standards but

also the promulgation thereof. PSQCA is a member of the International Organization for Standardization (ISO), International Electro-technical Commission (IEC), and International Organization of Legal Metrology (OIML). PSQCA has also been established to advise the government on standardization policies, programmes, and activities to promote industrial efficiency and development, as well as for consumer protection. The main function of the department is to foster and promote standards and conformity assessment as means of advancing the national economy, promoting industrial efficiency and development, ensuring the health and safety of the public, protecting the consumers, facilitating domestic and international trade, and furthering international co-operation in relation to standards and conformity assessment.

PSQCA is working for the development of standards of various electronic items and also provides testing facilities.

Components of PSQCA and The organizational chart of PSQCA are shown in Table 2.2-6 and Figure 2.2-4. The head office of PSQCA is based in Karachi. Whereas PSQCA-TSC-Lahore has only material testing facilities such as tensile strength test, bending test, hardness test, impact test of steel and other materials, PSQCA-QCC-Lahore has some electrical testing facilities for safety standards.

The enactment process for standards is shown in Figure 2.2-5. PSQCA has the power to approve Pakistan domestic standards based on international standards through a technical committee study.

Table 2.2-6 Appliances with Mandatory Inspection Conducted in the Energy Field

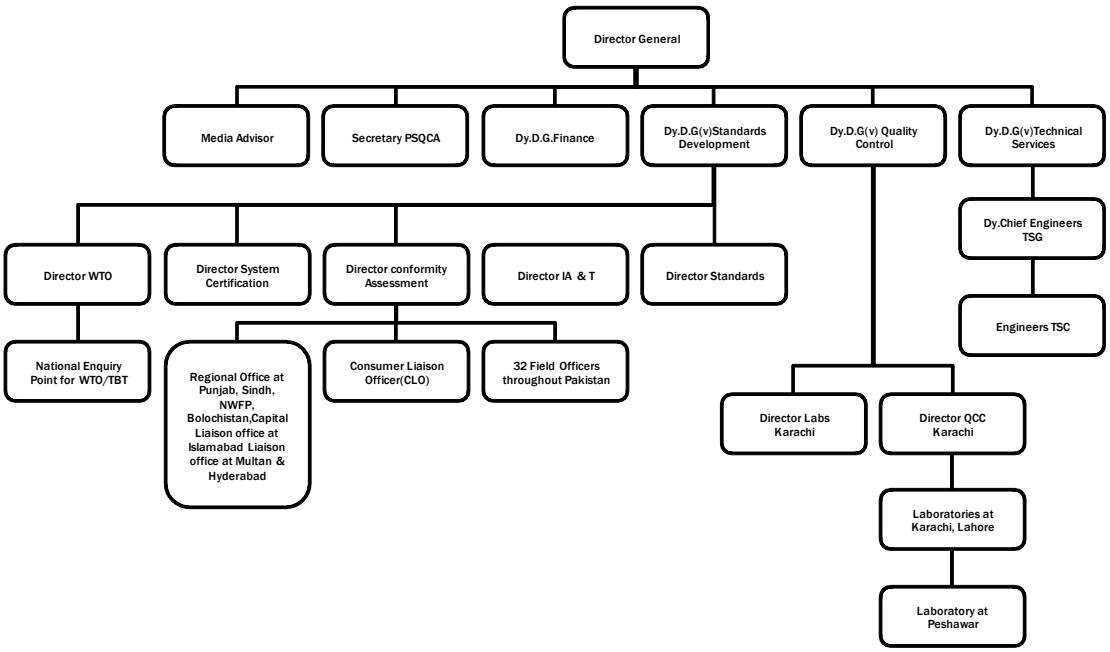
(1) Tungsten Filament Lamps for General Services (Electric Bulbs)
(2) Tubular Fluorescent Lamps for General Lighting Services (Tube Light)
(3) PVC Insulated Cable (Non-armored) for Electric Power & Lighting
(4) Induction Motor
(5) Methods for measuring the performance of Electric Kettles/Jugs
(6) Methods for measuring the performance of Electric Toaster
(7) Ballast for Fluorescent Lamps

Source: Prepared by the JICA Survey Team

Table 2.2-7 Components of PSQCA

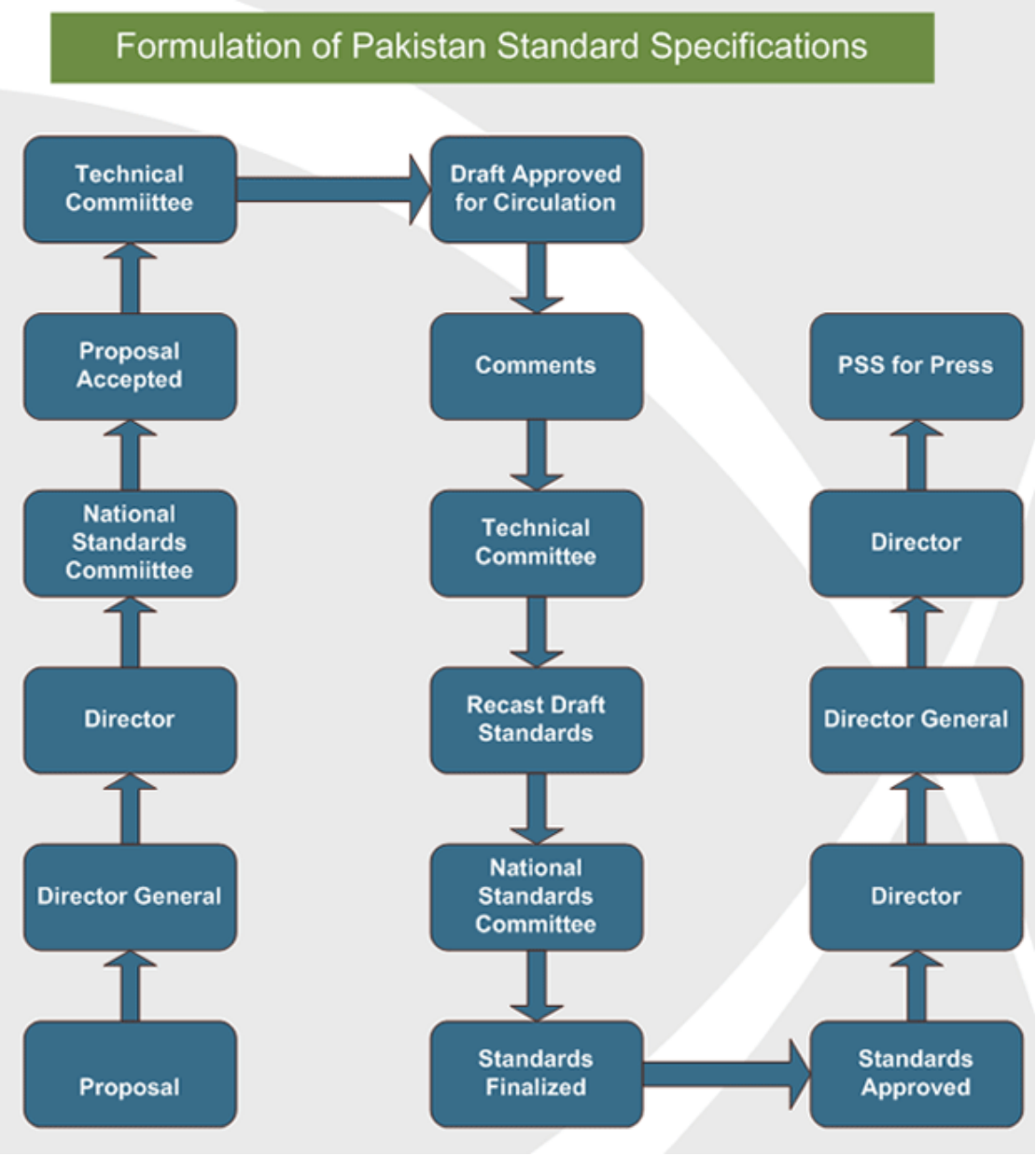
Standards Development Centre (SDC).	Established in 1951 under the Ministry of Industries (MoST, 1995) Formulation of national standards as per mandate of the PSQCA Act, keeping in view the concept of quality, safety, and health efficiency as basic parameters for sustainable development.
Quality Control Centre (QCC)	Established in 1951 under the Ministry of Industries (MoST, 1995) The QCC undertakes testing of industrial raw material and finished products for conformity assessment to establish their quality, with reference to national/international standards.
Technical Services Centre (TSC)	Established in 1975 under the Ministry of Industries (MoST, 1995) The TSC is focused on research and development on metal and metallurgical industrial products.
System Certification Centre (SCC)	PSQCA, which is responsible to develop and strengthen the quality infrastructure of Pakistan, has established SCC. SCC is an independent operational arm of PSQCA. Main responsibility of SCC is to provide certification and training services to local SMEs in particular and all businesses in general in the areas of management system standards.

Source: Prepared by the JICA Survey Team



Source: Webpage of PSQCA

Figure 2.2-4 Organizational Chart of PSQCA



Source: Webpage of PSQCA

Figure 2.2-5 Enactment Process for Standards

2.2.6 Pakistan Council of Scientific and Industrial Research (PCSIR)

The Pakistan Council of Scientific and Industrial Research (PCSIR) was established in 1953 under the Societies Act to promote the cause of science and technology in the country. Since 1973, it is functioning under the Act of Parliament, which was amended in 1984. The chief executive of the council is the chairman who is appointed by the federal government. The 21-member council is the policy making body of the PCSIR, which is composed of the chairman,

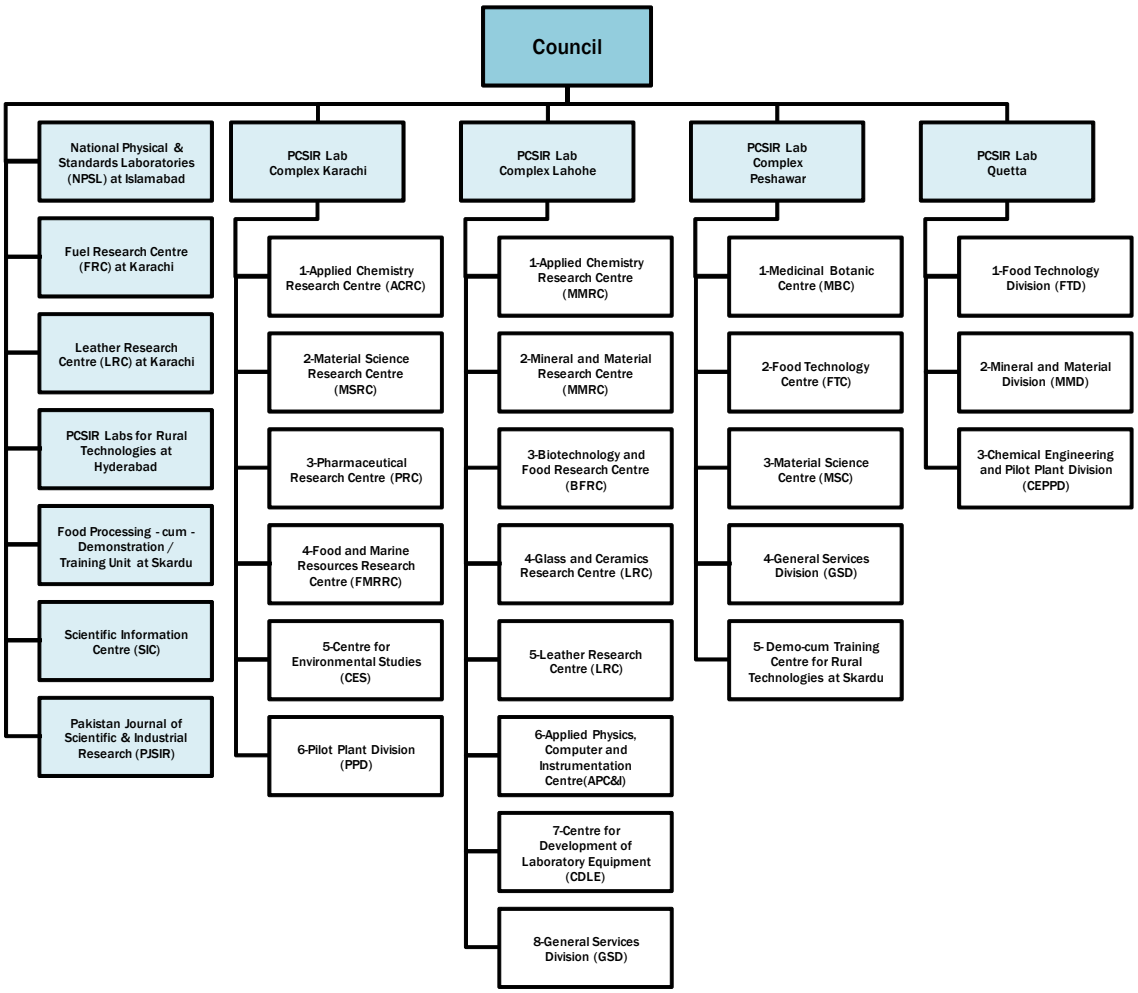
three members of the governing body, three directors of PCSIR laboratories, four representatives from four ministries, four directors of industries (one from each province), and six representatives of the industry.

The governing body is the executive organ of the council and consists of the chairman and three full-time members, viz. member (science), member (technology) and member (finance), nominated by the government. The head office of the PCSIR is functioning in Islamabad where the offices of the chairman, member (science), member (technology), member (finance), and secretary of PCSIR are located. The science wing is headed by the member (science), who supervises matters relating to R&D, training, international affairs, and scientific information services. The technology wing is headed by the member (technology), who looks after the matters relating to technology, industrial liaison, and civil works. The finance wing is headed by the member (finance) who is in charge of activities in finance and audit and accounts divisions. The chairman is assisted by the secretary and the administration and establishment wings, works directly under him.

There are 11 laboratories/units and five HRD centres established throughout the country, headed by director generals/directors who directly report to the chairman. In the head office, 150 officers/staff including seven directors are working in different divisions/wings. There are 570 scientists/engineers/technologists working in different laboratories supported by 859 technicians/skilled workers/supporting staff and 1,125 non-technical (administrative/ accounts/security) staff.

PCSIR is the only accredited organization which maintains safety and performance both collectively at the maximum level while testing the electronic products and has sufficient capacity to test motors. However, it does not have the facilities to test televisions (TVs) and air conditioners (A/C). The testing of A/C is very expensive and unaffordable, so PCSIR is not working on the establishment of this facility. The only option to test the A/C is to send it abroad; this cuts the testing cost for the A/C. Moreover, PCSIR has been serving approximately 400 clients in Pakistan, so its labs are usually engaged and overloaded with work.

PCSIR has a plan to establish labs for testing refrigerators, freezers, water coolers, and other products. The testing lab is scheduled to be finalized in 2015. PCSIR has facilities to test these divisions as per IEC standards:



Source: Prepared by the JICA Survey Team based on webpage of PCSIR

Figure 2.2-6 Organizational Chart of PCSIR

2.2.7 Pakistan Engineering Council (PEC)

The Pakistan Engineering Council is a statutory body, constituted under the PEC Act 1976 (V of 1976) amended up to 24th January 2011, to regulate the engineering profession in the country such that it shall function as key driving force for achieving rapid and sustainable growth in all national, economic and social fields. The council shall as its mission set and maintain realistic and internationally relevant standards of professional competence and ethics for engineers, and licence engineers, and engineering institutions to competently and professionally promote and uphold the standards.

Its main statutory functions include registration of engineers, consulting engineers, constructors/operators and accreditation of engineering programmes run by universities/institutions, ensuring and managing of continuing professional development, assisting the Federal Government as think tank, establishing standards for engineering products and services besides safeguarding the interest of its members. The council shall encourage, facilitate and regulate working of professional engineering bodies for creativity

and as custodians of engineering under the umbrella of the Council.

PEC interacts with the Government, both at the Federal and Provincial level by participating in Commissions, Committees and Advisory Bodies. PEC is a fully representative body of the engineering community in the country.

PEC has also been providing support to the Government in conducting technical enquiries and recommending remedial measures on the subjects referred. Over the years, the Pakistan Engineering Council has become an influential voice, which speaks for the engineering profession as a whole in the country. It forms an effective bridge between Government, industry and education.

PEC maintains a very lean secretariat at its Head Quarters at Islamabad and branch offices in all the provincial capitals.

PEC had prepared the documents below;

- Building Code of Pakistan Seismic Provisions-2007 (For periodic updating)
- Building Code of Pakistan Energy Provision-2011 (Implementation Plan)
- Pakistan Electric and Telecom Safety code (First draft finalized)
- National Fire Safety Code (Under development process)

2.2.8 Engineering Development Board (EDB)

The Engineering Development Board (EDB) is the apex government body under the Ministry of Industries and Production entrusted to strengthen the engineering base in Pakistan. The members of the EDB Board of Directors are listed in Table 2.2-7.

EDB provides the following free advisory services in setting up engineering and industrial-related business ventures:

- Orientation and Awareness;
- Research and Development Services; and
- Customized Training Services through Specialized Service Agencies.

Table 2.2-8 Board of Directors of EDB

Chairman	Minister for Industries
Officials Members	Secretary, Ministry of Industries & Production Secretary, Ministry of Commerce Secretary, Finance Division Chairman, Federal Board of Revenue Chairman, Pakistan Engineering Council
Private Members	Mr. Abdul Razzak Dawood, Chairman, Descon Engineering (Pvt) Ltd, Lahore Mr. Ali A Agha, Executive Director & Vice President, ICI Pakistan, Lahore Chairman, Pakistan Automotive Manufacturers Association (PAMA), Karachi Chairman, Pakistan Association of Automotive Parts Accessories Manufacturers (PAAPAM), Lahore Mr. Bilal Haider Agha. Technimen Agha (Pvt) Ltd, Islamabad Mian Suhail Hussain, Managing Director, Gresham's Eastern (Pvt) Ltd, Karachi Mr. Khawar Rafiq, Chief Executive Officer (CEO), Royal Fan, GujratMr. Noman Wazir, Chairman, FF-Steel, Frontier Foundry (Pvt) Ltd, Khyber Pakhtunkhaw

Source: Information from EDB

2.2.9 Public Procurement Regulatory Authority (PPRA)

Governmental purchasing programme for ES&L is being run in Japan, Korea and China. Further some other countries of EU and Unites States of America have also adopted the government purchasing programme for ES&L. So, Public Procurement Regulatory Authority may become related organization, in case that Pakistan Government will introduce such scheme in the future.

PPRA is an autonomous body endowed with the responsibility of prescribing regulations and procedures for public procurements by Federal Government owned public sector organizations with a view to improve governance, management, transparency, accountability and quality of public procurement of goods, works and services. It is also endowed with the responsibility of monitoring procurement by public sector agencies/organizations and has been delegated necessary powers under the Public Procurement Regulatory Authority Ordinance 2002. The Summary of Public Procurement Regulatory Authority is shown in Table 2.2-8.

Public procurement is done under Act 2002 which established the Public Procurement Regulatory Authority and subsequently some rules were framed in the year 2004. PPRA rules are compliant with the International Best Practices. Basic emphasis is on open competition to increase fair and transparent competition. Provinces have their own regulatory authorities and they have their own set of rules. Federal Government Departments follow PPRA Rules, 2004 for governmental purchasing. If the government procurement is established for ES&L, then ENERCON will also have to follow the prevalent PPRA rules 2004 as well.

There are certain thresholds in public procurement that if the public procurement exceeds

100,000 PKR that procurement would be advertised in the national newspaper for competition. On PPRA Rules, 2004, rule-5 where there is a provision for international and intergovernmental relationships. If the World Bank gives loan to Government of Pakistan so these public procurement rules are not yet be applicable and the WB guidelines will be applicable.

Federal Government has not any interference because Provinces are independent/autonomous unit. But federal government can discuss with provinces, if the provinces agreed, then they can move forward for governmental purchasing for ES&L.

Table 2.2-9 Summary of Public Procurement Regulatory Authority

	Summary
Establish Authority	The Authority shall be a body corporate, having perpetual succession and a common seal, with powers subject to the provisions of this Ordinance, to acquire and hold property, both moveable and immovable, and sue and be sued by the name assigned to it by sub-section..
Members of Board	1. Secretary, Finance Division — Chairman 2. Secretary, Ministry of Industries and Production — Member 3. Secretary, Defence Production Division — Member 4. Secretary, Ministry of Water and Power — Member 5. Secretary, Ministry of Housing and Works — Member 6. Secretary, Ministry of Communications — Member 7. Three Members from private sector to be nominated by the Federal Government — Member 8. Managing Director — Member
Functions and Powers of the Authority	1. Subject to other provisions of this Ordinance, the authority may take such measures and exercise such powers as may be necessary for improving governance, management, transparency, accountability and quality of public procurement of goods, services and works in the public sector; 2. Monitor application of the laws, rules, regulations, policies and procedures in respect of, r relating to, procurement; 3. Monitor the implementation of and evaluate laws, rules, regulations, policies and procedures in respect of, or relating to, inspection or quality of goods, services and works and recommend reformulation thereof or revisions therein as it deems necessary; 4. Recommend to Federal Government revisions in or formulation of new laws, rules and policies in respect of or related to public procurement; 5. Make regulations and lay down codes of ethics and procedures for public procurement, inspection or quality of goods, services and works; 6. Monitor public procurement practices and make recommendations to improve governance, transparency, accountability and quality of public procurement; 7. Monitor overall performance of procuring agencies and make recommendations for improvements in their institutional set up; 8. Provide and coordinate assistance to procuring agencies for developing and improving their institutional framework and public procurement activities; 9. Submit reports to the Government in respect of public procurement activities of procuring agencies; 10. Call any functionary of procuring agencies to provide assistance in its functions and call for any information from such agencies in pursuance of its objectives and functions; and 11. Perform any other function assigned to it by the Federal Government or that is incidental or consequential to any of the aforesaid functions.

Source: Selected by the JICA Survey Team as per summary from Pakistan Procurement Code

2.2.10 Private Organization

1) Pakistan Electrical and Electronics Merchants Association (PEEMA)

PEEMA is an affiliated association of the Chamber of Commerce and Ministry of Commerce and the members are manufacturers and importers of electrical equipment such as Haier and

PEL.

2) Pakistan Electric Fan Manufacturers Association (PEFMA)

PEFMA has 167 members of electric fan producing companies. Out of them, 150 are actively producing fans with different kinds and designs as per standards developed by PSQCA.

Information obtained from the interview with the chairman of PEFMA is shown in Table2.2-8.

Table 2.2-10 Information Obtained from Interview with Chairman of PEFMA

Information from ENERCON Regarding ES&L	The government through ENERCON contacted PEFMA regarding development of MEPS. Most pertinently, PEFMA had attended all meetings held from time to time under Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labelling (BRESL) Project for the development of standards of fan. Upon invitation of UNDP under its BRESL Project, PEFMA had also participated in the inaugural ceremony/campaign launched by UNDP.
Advantage and Disadvantage due to Introduction of ES&L from Viewpoint of PEFMA	Advantage: As most of the branded fan producing companies like Royal Fans have capacity to achieve five stars standards, it will be advantageous for them. Disadvantage: * It will also be disadvantageous for branded companies because if government gives five stars labels to all the companies, then the branded companies will face great hardships as customers will say that non-branded company sells fans with five stars label but at almost less price. While same energy efficient fans will be sold, the branded fans will be more expensive than the non-branded fans; therefore, it will create a problem for the branded companies.
Market Share of Each Product which PEFMA's Member Company Produces	50% market share of organized. 50% market share of unorganized.
Strategy of Innovation and Selling of Products of PEFMA's Member Companies	Members of PEFMA had frequent visits to China, Thailand and Korea to give training to their experts and for knowledge sharing for innovation. Whatever they see abroad, they try to produce in Pakistan in accordance with the standards of PSQCA.
Annual Production Amount of Member Companies in 2013 and Forecast in 2014 by the Type and Rated Power of Products	2013: 8-9 million units for local. 2013: 2-2.5 million units for export. 2014: 8-9 million units for local. 2014: 2 million units for export. In 2014, it will be less compared with 2013 due to the fluctuation of foreign exchange rates.
Testing Laboratory	Most of the member companies have their own in-house small laboratory to test their fans at the minimum level. PEFMA has its own lab for testing the fans. From time to time, they upgrade their labs keeping in view the quantity of production.

Source: Prepared by the JICA Survey Team

* In the initial period, because almost all fans do not comply with the criteria of MEPS as mentioned in Clause 3.3.2, such disadvantage will not occur. But such disadvantage may appear in the future in case that labelling criteria will remain the same in the long term. So, the JICA Survey Team suggested the periodical review of criteria of MEPS and labelling in order to prevent such problem.

2.3 Implemented or Planned Project Regarding EE&C by International Donors

2.3.1 United Nations Development Programme (UNDP)

The United Nations Development Programme (UNDP) supports the Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labelling Project (BRESL).

The BRESL Project is aimed at accelerating the adoption and implementation of energy standards and labels (ES&L) program in Asia. The project also facilitates harmonization of testing procedures, standards, and labels among developing countries in Asia, when appropriate.

The summary of BRESL (first phase) is shown in Table 2.3-1. China plays a leading role in the BRESL Project. An agency of the Government of China is the designated executing and implementing agency for BRESL in 2013 and 2014.

The feasibility study of BRESL is shown in Table 2.3-2. Feasibility study for six appliances (compact fluorescent lights (CFLs), air conditioner, refrigerator, rice cooker, electric motor, ballast for TFL) has been implemented by BRESL.

At present, the second phase of BRESL is planned from 2015 to 2019. BRESL will give priority to the following products for the second phase of regional cooperation and harmonization: air conditioner, motor, washing machine, light-emitting diode (LED) lights, television receivers (TVs), electric iron, microwave oven, distribution transformers, refrigerators, ballast and others that may be further identified. Also, BRESL will give priority to the following activity areas for the second phase of regional cooperation and harmonization: laboratory comparison test, acceptable testing tolerance for energy efficiency, compliance of ES&L, networking, public awareness campaign, training and capacity building, incentive policy in promotion of energy efficient products, impact evaluation protocol for ES&L program, information dissemination, new energy efficient technologies and other areas that may be further identified.

Table 2.3-1 Summary of BRESL (First Phase)

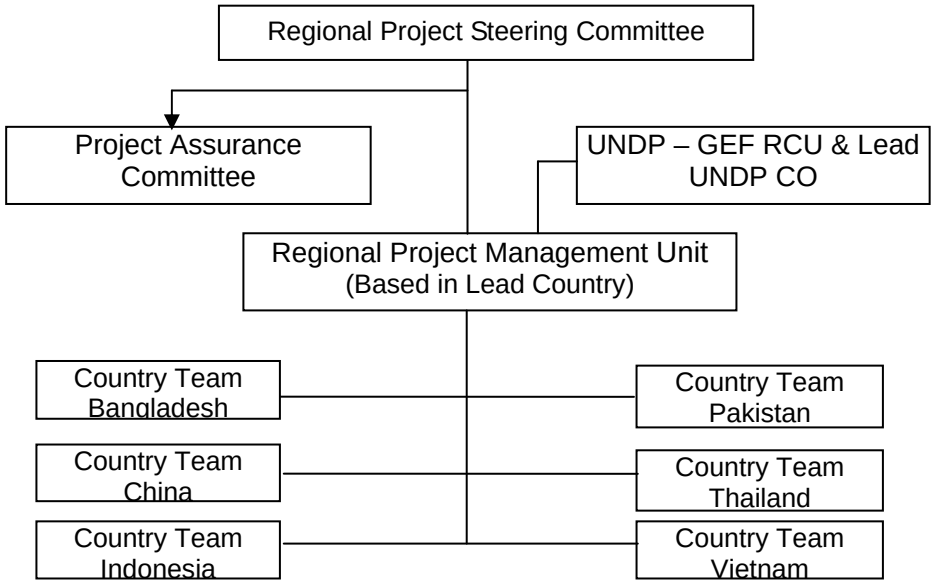
Participating Countries	Six countries: Bangladesh, China, Indonesia, Pakistan, Thailand, and Vietnam
Target Products	Six appliances: Refrigerators, room air conditioners, electric motors, ballasts for FTLs, electric fans, compact fluorescent lamps
Implementation	China is the host country. China NDRC is the executing agency and China CSC is the designated implementing agency.
Duration	Five years; from 2010 to 2014
Components and Activities	Component 1: ES&L Policy-Making Program Activity 1.1: Strengthening of the Policy Context for Energy Standards and Labels Activity 1.2: Adoption and Implementation of Energy Standards and Labelling Component 2: ES&L Capacity-Building Program Activity 2.1: Training to Strengthen and Enable Public Institutions to Support Development and Implementation of ES&L Programs Activity 2.2: Capacity Enhancement in the Development and Implementation of Standards and Labelling for the Six Targeted Products Activity 2.3: Strengthening of National and Regional Testing and Certification Infrastructure Activity 2.4: Strengthening of Data Collection and Reporting Procedures on Equipment Availability and Sales by Efficiency Level in Participating Countries Component 3: ES&L Manufacturer Support Program Activity 3.1: Product Technical Analysis and Reports Activity 3.2: Educational Workshops for Manufacturers and Retailers on Impacts of Standards on Manufacturers and Retailers and Ways to Work with Standards to Increase Profitability Activity 3.3: Technical Assistance to Manufacturers Component 4: ES&L Regional Cooperation Program Activity 4.1: Project Website Activity 4.2: Lessons Learned Reports Activity 4.3: Regional Energy Efficiency Standards and Labelling Network Activity 4.4: Regional ES&L Harmonization Initiative Activity 4.5: Preparation of a Plan for Regional Activities and Coordination after the GEF-Funded Project Ends Component 5: ES&L Pilot Projects Activity 5.1: Government Procurement (Bangladesh, Indonesia, Thailand, and Vietnam) Activity 5.2: Database (and Website) of Energy-Efficient Equipment (Bangladesh and China) Activity 5.3: Development of Consumer Education Schemes (Bangladesh, Indonesia and Pakistan) Activity 5.4: ES&L Initiatives Financing (Indonesia) Activity 5.5: Regional Harmonization Promotion (China)

Source: Summarized by the JICA Survey Team based on the BRESL Website

Table 2.3-2 Feasibility Study of BRESL

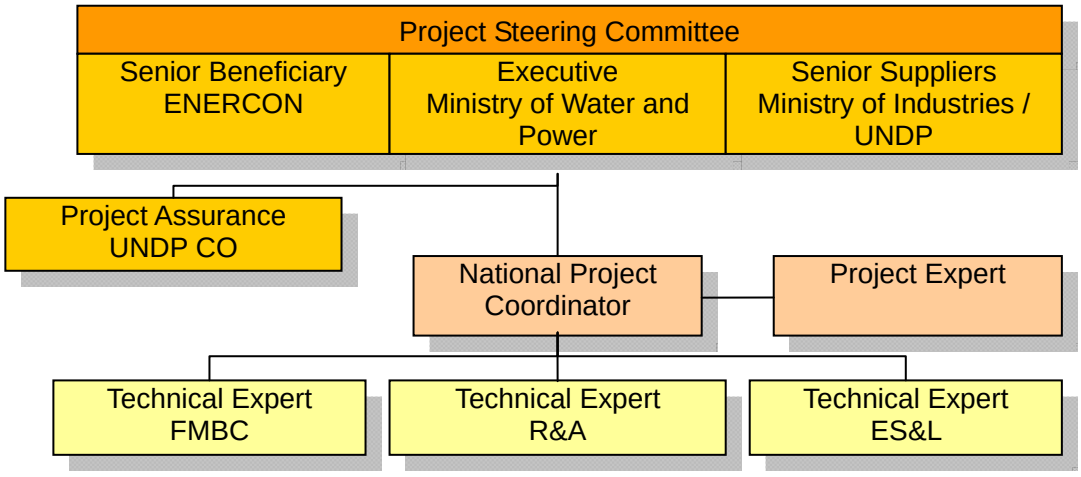
1.	TWG Feasibility Study Report on Regional ES&L Harmonization for Fans (May 2013)
2.	TWG Feasibility Study Report on Regional ES&L Harmonization for CFL (January 2013)
3.	TWG Feasibility Study Report on Regional ES&L Harmonization for Room Air Conditioners (December 2012)
4.	TWG Feasibility Study Report on Regional ES&L Harmonization for Refrigerator (October 2012)
5.	TWG Feasibility Study Report on Enhancing Regional Harmonization for the BRESL Product Rice Cooker (October 2012)
6.	TWG Feasibility Study Report on Regional ES&L Harmonization for Electric Motors (September 2012)
7.	TWG Feasibility Study Report on Regional ES&L Harmonization for Ballast for FL (September 2011)

Source: Summarized by the JICA Survey Team based on the BRESL Website



Source: Annual Work Plan 2014 of BRESL

Figure 2.3-1 Management Arrangements at the Regional Level on BRESL



Source: Annual Work Plan 2014 of BRESL

Figure 2.3-2 Project Organization on BRESL in Pakistan

2.3.2 Asian Development Bank (ADB)

ADB carried out the project for replacement of three million inefficient incandescent bulbs into CFLs in 2013. The project was signed in December 2009. This will reduce peak load by about 1,000 MW and result in savings of about 2,100 GWh. Summary of the national CFL project is shown in Table 2.3-3.

ADB newly signed the agreement of Programmatic Approach and Policy-Based Loan in April 2014. This is a cooperative loan programme with JICA and WB; the payment of loan had been carried out in April.

Table 2.3-3 Summary of the National CFL Project

Managing Entity	Ministry of Water and Power
Coordinating Entity	Pakistan Electric Power Company
Implementing Entities	Eight Distribution Companies: Islamabad Electric Supply Company (IESCO), Peshawar Electric Supply Company (PESCO), Gujranwala Electric Power Company (GEPCO), Lahore Electric Supply Company (LESCO), Faisalabad Electric Supply Company (FESCO), Multan Electric Power Company (MEPCO), Hyderabad Electric Supply Company (HESCO), Quetta Electric Supply Company (QESCO) and Karachi Electric Supply Company (KESC)
Number of CFLs	20 million CFLs in Phase 1 10 million CFLs in Phase 2
Mechanism	Upto two CFLs will be delivered to each residential customer, who is not in default on its current electricity bill payments, in exchange for two working incandescent bulbs (IBs) of 40-100 watts and appropriate customer voucher, which shall be dispatched prior to the CFL distribution to each customer with his/her monthly electricity bill.

Source: PEPCO presentation document on Regional DNA Forum, Kathmandu, Nepal held in September 2011

2.3.3 World Bank (WB)

WB carried out the project for efficiency of gas. The summary of project for efficiency of gas is shown in Table 2.3-4.

WB carried out the cooperative loan programme with JICA and ADB as mentioned before.

Table 2.3-4 Summary of Project for Efficiency of Gas

Managing Entity	MOPNR
Implementing Entities	Sui Southern Gas Company (SSGC)
Summary	Under the project, a 5,750 km long pipeline will be repaired in order to prevent leakages. The pipeline will also be installed with sophisticated monitoring equipment to reduce the incidence of theft. The project will be completed by June 2017, and upon completion will help increase the supply of gas to consumers, maintain adequate gas pressure, ensure better service delivery and improve SSGC's efficiency. In addition, the project will help curtail emission of greenhouse gases through avoidance of direct methane gas leakages into the atmosphere.
Objective	The development objective of the Natural Gas Efficiency Project is to enhance the supply of natural gas in Pakistan by reducing the physical and commercial losses of gas in the pipeline system. There are three components to the project. The first component of the project is unaccounted-for gas (UFG) reduction. The second component of the project is appliance efficiency pilot project. The third component of the project is technical assistance.

Source: Website of the World Bank and Tribune published on June 6, 2012

2.3.4 Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) was established on 1st January 2011. GIZ supports the Government of Pakistan in four priority areas, namely: primary education, health, renewable energy, and energy efficiency.

GIZ provides support to ENERCON, PCSIR, and PSQCA in the development of MEPS and labelling for the electrical appliances, which allows the consumer to select energy efficient equipment. This technical assistance was implemented from 2005 to 2010. The report on the performance test for fans has been prepared in collaboration with ENERCON. As UNDP starts BRESL program in 2010, GIZ stopped its assistance program regarding MEPS and labelling in 2010. GIZ has not joined MEPS and labelling in Pakistan since 2010.

GIZ started the Renewable Energy and Energy Efficiency Programme (REEE) which promotes the application of sustainable energy efficiency improvement in industry, particularly textile, food and beverages, steel re-rolling, and edible oil sectors in 2010.

The summary of the feasibility study regarding ES&L with assistance of GIZ is shown in Table 2.3-5. Summary of clarified information through the feasibility study is shown in Tables 2.3-6 to 2.3-7. GIZ carried out the survey for four appliances, namely: ceiling fan, refrigerator, washing machine, and gas water geysers. In 2009, the three appliances were imported from several foreign countries, excluding ceiling fan which was produced domestically.

Table 2.3-5 Summary of Feasibility Study Regarding ES&L with Assistance of GIZ

Background	Pakistan recorded an economic growth of 7% in the last five years (as of 2009). This high economic growth together with rising population has put immense pressure on energy resources which now results in frequent load shedding that poses a serious threat to industrial and economic growth. The Government of Pakistan has initiated several measures to promote energy efficient appliances that can make a part of energy conservation campaign and reduce burden on Pakistan's energy resources. In this regard, ENERCON, the lead national organization for promotion of energy conservation, has initiated a program to develop energy efficiency standards and labelling system for energy efficient appliances. A working group comprising ENERCON, GTZ, PCSIR, and PSQCA has been established to formulate and develop the program. The group has identified four appliances in the first phase including ceiling fans, refrigeration equipment, washing machine, and gas water geysers.
Scope of Work	1. Collection of market representative samples for their energy efficient rating. 2. Recommendation of parameters and outputs for energy efficiency tests for each appliance to be tested. 3. Comparison of energy efficiency standards developed for selected appliance in various countries. 4. Collection and testing of sample for selected appliance at designated labs including compilation and analysis of test results. 5. Development of final report and analysis spectrum of energy efficiency for these appliances on the basis of test results prepared by PCSIR.
Target Appliances	1. Ceiling fan 2. Refrigeration equipment 3. Washing machine 4. Gas water geysers

Source: Final Report, GTZ Contract No. 83046341, Development of Energy Efficiency Standards and Labelling Program, GTZ

Table 2.3-6 Number of Manufacturers in Pakistan (In 2009)

Appliance	Numbers of Manufacturers
Ceiling Fan	141 manufacturers
Refrigeration Equipment	10 manufacturers
Washing Machine	10 manufacturers
Gas Water Geysers	6 manufacturers

Source: Final Report, GTZ Contract No. 83046341 Development of Energy Efficiency Standards and Labelling Program, GTZ

Table 2.3-7 Production Data of Major Manufacturers (In 2009)

Ceiling Fan		
Power Requirement	Market Share in Percentage	Number of Units
Between 60-90 watts	25.0%	872,500
Between 91-110 watts	35.0%	1,221,500
Between 111-130 watts	35.0%	1,221,500
131 watts and above	5.0%	174,500
Total	100.0%	3,490,000

Refrigerators and Freezers			
Name of Manufacturer	Application	Market Share in Percentage	Number of Units
Dawlance	Domestic Ref. and Chest Freezers	46.9%	608,000
PEL	Domestic Ref. and Chest Freezers	22.0%	285,000
Waves	Domestic Ref. and Chest Freezers	9.7%	125,000
Orient	Domestic Ref. and Chest Freezers	6.5%	84,500
Varioline	Commercial Ref. and Freezers	6.0%	78,000
Haier	Domestic Ref. and Chest Freezers	5.8%	74,500
Shadman Electronics	Commercial Ref. and Freezers	2.4%	30,500
Mumtaz Engineering	Commercial Ref. and Freezers	0.7%	9,500
	Total	100.0%	1,295,000

Washing Machine		
Name of Manufacturer	Market Share in Percentage	Number of Units
Super Asia	29.1%	190,000
Dawlance	24.5%	160,000
Haier	11.9%	78,000
Toyo	6.9%	45,000
Indus	6.9%	45,000

Boss	6.1%	40,000
GFC	4.6%	30,000
Waves	3.1%	20,000
PEL	2.3%	15,000
United	1.5%	10,000
Others	3.1%	20,000
Total	100.0%	653,000
Gas Water Geysers		
Name of Manufacturer	Market Share in Percentage	Number of Units
Super Asia	30.8%	96,000
Delite	11.5%	36,000
Canon	7.7%	24,000
Ambassador	7.7%	24,000
Carnavell	6.4%	20,000
Admiral	3.8%	12,000
Others	32.1%	100,000
Total	100.0%	312,000

Source: Final Report, GTZ Contract No. 83046341, Development of Energy Efficiency Standards and Labelling Program, GTZ

Table 2.3-8 Testing Facilities in Pakistan (In 2009)

Appliance	Testing Laboratories
Ceiling Fan	PCSIR Lahore and FDI Gujrat
Refrigeration Equipment	PCSIR Lahore is upgrading lab for this capability. Haier (private sector) carries out tests.
Washing Machine	PSCIR Lahore and Dawlance (private sector)
Gas Water Geysers	PCSIR Lahore

Source: Final Report, GTZ Contract No. 83046341, Development of Energy Efficiency Standards and Labelling Program, GTZ

2.3.5 Kreditanstalt für Wiederaufbau (KfW)

KfW is mostly involved in large scale energy generating projects (for instance hydropower projects in Pakistan); improving the infrastructure of the building; integrating solar PV's and solar water heater systems etc.

KfW have commissioned a study of SME's (small and medium term enterprises) for those industries that are involved in construction material business. KfW hired a US consulting firm to carry out the survey in March 2014. The results indicate that there are 3 companies that are

involved in producing insulation material for buildings and 2 companies that are making double pane windows. The cost of production is very high and the market is yet not ready for such high cost equipment.

KfW are creating a facility known as “Pakistan Microfinance Investment Company”. It will be a collaborative venture of KfW, Pakistan Poverty Alleviation Fund (PPAF) and DFID. This investment company will partner and give guarantee to the commercial banks. It will be an incentive for the Banks to provide soft loans to the vendors, and these vendors can further provide financing installment schemes or loans to consumers. In this way consumers will be able to take loans for promoting energy efficiency. The Investment company will be registered as an independent entity by March 2015. It will act as a guarantor to the commercial banks to provide loans further for promoting energy efficiency. This initiative will be a good incentive for the retailers to provide support, creating facilities and services for renewable energy.

The mirco-financing scheme which is currently availableallows up to Rs.500,000/- loan maximum. There is potential in such schemes, lot of people are doing this privately but such schemes are not being carried out on a large scale.

A similar program is being implemented by KfW in Bangladesh, which acts as acentral body for providing concessional loans to small businesses and industries for promoting renewable energy and energy efficiency products.

2.3.6 United Nations Human Settlements Programme (UNHABITAT)

The United Nations Human Settlements Programme, UN-HABITAT, is the participating agency in the Joint Programmes for the Environment and Disaster Risk Management. It has been working since 2005 supporting the Government of Pakistan Earthquake Reconstruction and Rehabilitation Authority (ERRA), in the successful owner driven reconstruction of over 600,000 houses destroyed in the Kashmir earthquake. This programme included the identification and promotion of both indigenous knowledge and the introduction of modern innovation and best practice to ensure reconstructed houses were not only hazard resistant but also to improve environmental performance.

In the field of urban environment, Sustainable Urban Development Network (SUD-Net) is an innovative network of global partners promoting a multilateral and inter-disciplinary approach to sustainable urban development. UN-HABITAT supports local and national governments through SUD-Net and its component, the Cities in Climate Change initiative to address key urban environmental issues related Climate Change.

UNHABITAT carried out the project "Improvement of Thermal Performance of RC Slab Roofs" on 2010. Project summary is available to refer on website of ENERCON.

2.3.7 International Financial Cooperation (IFC)

In case that appliance of sub-standard with MEPS will be banned to import in the future, it is very important to collaborate with Customs. International Financial Cooperation (IFC), that is member of World Bank, assisted with Pakistan on custom automation system.

IFC are working with Pakistan Customs on trade facilitation which covers a number of things including automation, risk management and coordinated cargo inspections. This is a World Bank Group project, not IFC alone, as IFC are part of joint World Bank Group global practice. The idea is to reduce time, cost and documentation to trade at all land ports as well as in Karachi. It is called as Pakistan Customs Computerized System (PaCCS).

IFC will be supporting automation of specific cargo clearance procedures starting with land ports, both on the Eastern and Western border, with an aim to create a more conducive environment for handling trade. The main focus will be to merge certain procedures into Web Based One Customs (WeBOC). But IFC are not supporting a wholesale automation. IFC are being supported by DFID and Australian Government on land ports and looking for a partner for work at Karachi port. The work will complement an Action Plan we recently prepared for the government to improve Pakistan's ranking on the Doing Business report.

Focal person of IFC is member customs and chief international customs at Federal Board of Revenue (FBR).

2.4 Japanese E&C Law, Other Legal Systems and Organization in Japan

1) Japanese E&C Law

The Energy Conservation Law (E&C Law) is the basis of all energy conservation policies in Japan. It was established in 1979, triggered by the oil crisis.

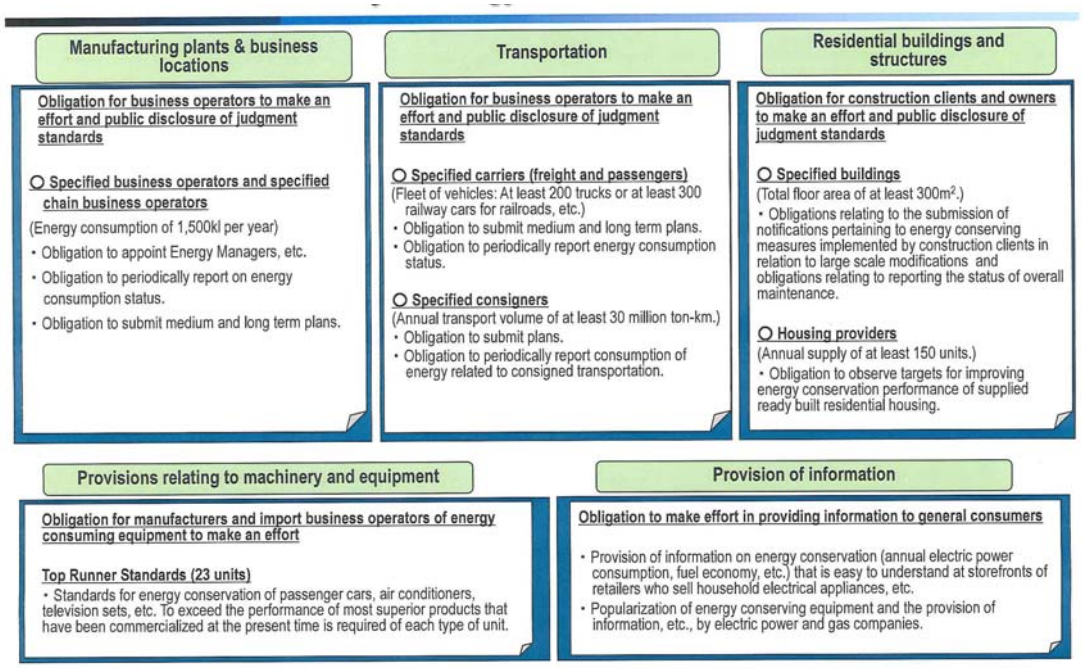
The summary of the E&C Law in Japan is shown in Figure 2.4-1. The E&C Law consists of five parts, namely: manufacturing plants, transportation, residential building, machinery and equipment, and information for general customers. The first three parts are regulation of resource-intensive consumers; the fourth part is regulation of manufacturers of machinery and equipment; and the last part has obligations for energy suppliers.

The procedure for resource-intensive consumers according to the E&C Law in Japan is shown in Figure 2.4-2. Resource-intensive consumers have obligation to submit appointment

nomination for energy management officer, periodical reports, and medium- to long-term plans to METI. In parallel, they must submit periodical reports, medium- to long-term plans to relevant minister; for example, hospital building gives periodical report to the Minister of Health, Labour and Welfare.

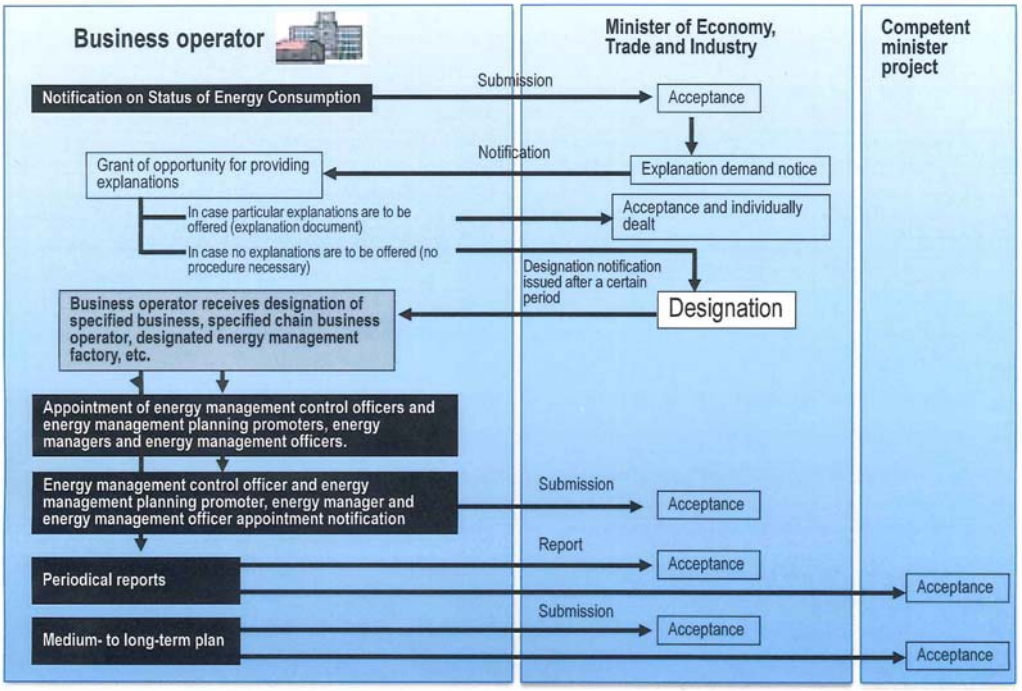
For reference of a similar programme with MEPS, the summary of the Top Runner Program is shown in Table 2.4-1. The Top Runner Program aims to promote the further improvement of energy consumption efficiency of machinery and equipment. Thus, while the energy efficiency of existing electrical appliance is set against the criteria of MEPS, the criteria of the Top Runner Program is set higher with values exceeding the energy efficiency of existing electrical appliance in order to expect further improvement.

The summary of two types of energy labelling in Japan is shown in Table 2.4-2. Japan has two types of labelling. One describes the degree of achievement against the criteria of the top runner by percentage; In case of exceeding 100%, the appliance has already achieved and has higher efficiency than the requirement of the top runner. The other one describes relative achievement degree of energy efficiency through five steps. This is designed in order to clarify relative achievement degree more plainly in retail shops.



Source: Published Material on Webpage of METI, Energy Conservation Policy of Japan, ANRE in November 2011

Figure 2.4-1 Summary of E&C Law for Resource-Intensive Consumers in Japan



Source: Published Material on Webpage of METI, Energy Conservation Policy of Japan, ANRE in November 2011

Figure 2.4-2 Procedure According to the E&C Law in Japan

Table 2.4-1 Summary of Top Runner Program (Similar Programme with MEPS)

Aim	Promotion for further improvement of energy consumption efficiency of machinery and equipment is conducted by stipulating performance of currently commercialized products with most superior energy consumption efficiencies (Top Runner products) with consideration for future prospects of their performances and technical developments, as fuel economy standards for automobiles and judgment standards (hereinafter referred to as Energy Conservation Standards) of manufacturers for improving performance of specific equipment such as electrical equipment (household electrical appliances and OA equipment).
Policy of Selecting Target Appliance	1. Machinery and equipment that are used in large quantities in Japan. 2. Machinery and equipment that consume significant amount of energy when used. 3. Machinery and equipment for which improvement of energy consumption efficiency is particularly important (those that have room for improving efficiency).

Source: Published Material on Webpage of METI, Energy Conservation Policy of Japan, ANRE in November 2011

Table 2.4-2 Summary of Two Types of Energy Labelling in Japan

Energy Conservation Label	Stipulated by JIS standards for 18 equipment, primarily household equipment with a large amount of general consumer usage in particular, among equipment that are subject to Top Runner standards.
Unified Energy Conservation Label	A unified energy conservation label that covers air conditioners (for household use), televisions, electric refrigerators, electric toilet seats and fluorescent lighting apparatuses (for household use) to facilitate recognition and comparison of energy conservation performance by consumers when products are purchased and displayed by retailers in five stage ranking from five stars down to one star (multistage evaluation).

Source: Published Material on Webpage of METI, Energy Conservation Policy of Japan, ANRE in November 2011

2) Other Legal Systems

The summary of other legal systems in Japan is shown in Table 2.4-3. The root is the E&C Law in energy conservation field; Regulation of transportation and building is prepared as per notification.

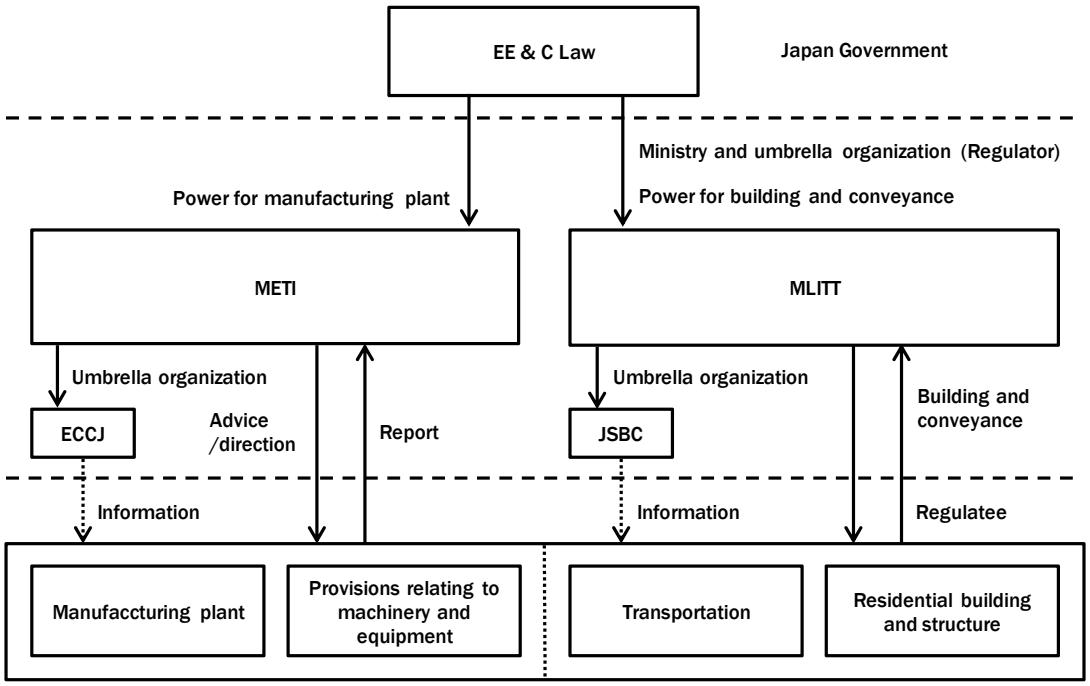
Table 2.4-3 Summary of Other Legal Systems in Japan

Level	Item
Law	Energy Conservation Law
Cabinet Order	Enforcement Order on the Rational Use of Energy
Ministerial Ordinance	Ordinance on the Rational Use of Energy
Notification	1. Policy on the Rational Use of Energy 2. Standards of Judgment for Manufacturing Plant, etc., on the Rational Use of Energy 3. Guideline for Manufacturing Plant, etc. on the Rational Use of Energy 4. Standards of Judgment for Freight Conveyance on the Rational Use of Energy 5. Standards of Judgment for Passenger Conveyance on the Rational Use of Energy 6. Standards of Judgment for Construction Clients, etc., and Owners of Specified Buildings on the Rational Use of Energy 7. Guideline for Design, Construction, Maintenance of Residential Buildings on the Rational Use of Energy

Source: Published Material on Webpage of METI, Energy Conservation Policy of Japan, ANRE in November 2011

3) Organization

The organization on the rational use of energy in Japan is shown in Figure 2.4-3.



Source: Prepared by the JICA Survey Team

Figure 2.4-3 Organization on the Rational Use of Energy in Japan

2.5 EE&C Act, Other Legal Systems and Organization in Nearby Country (India)

1) EE&C Act

The Energy Conservation Act enacted in the Indian Parliament in 2001 (Central Act 52 of 2001) provides for efficient use of energy and its conservation. For matters connected therewith or incidental thereto, under the provisions of the Energy Conservation Act 2001, the Government of India established the Bureau of Energy Efficiency (BEE), a statutory body under the Ministry of Power, on 1st March 2002, to enforce the act at the central level.

Chapter IV of the act states the powers and functions of BEE. Section 17 of the act provides that the designated agency (that is an agency designated to enforce the Energy Conservation Act in each state by concerned state governments as per the act) may appoint, after the expiry of five years from the date of commencement of this act, as many inspecting officers as may be necessary for the purpose of ensuring compliance with energy consumption standard specified under Clause (a) of Section 14 or ensure display of particulars on label on equipment or appliances specified under Clause (b) of Section 14 or for the purpose of performing such other functions as may be assigned to them. Thus, state-designated agencies are appointed to streamline the activities at the state level in India.

2) MEPS and Labelling in India

Developing the Minimum Energy Performance Standards (MEPS) and labelling for equipment/appliances and buildings are regulatory interventions and market transformation initiatives for energy efficiency. MEPS and labelling are implemented due to the requirement of the national legislation.

Since the 1970s, especially after the oil crisis in 1973 and later during the mid-80s, serious efforts had been implemented for energy conservation. Awareness among the public and professionals were also spreading fast. However, initial activities were focused on oil and natural gas, which were to be imported at high cost. Thus, the Petroleum Conservation Research Association (PCRA) was created in 1978, aiming at a savings of import bill by not less than INR 80,000 million. The energy intensity (EI) of India, and especially EI of certain subsectors of energy use in the economy, was found to be too high in comparison with other countries. Many developed countries including Japan demonstrated that EI could be drastically reduced through multi-faceted efforts. Electricity sector was found wanting, especially when generation of electricity will have to be stepped up substantially. Thus, the idea of developing renewable energy sources and legal interventions for improving the efficiency of electricity production, transmission, distribution, and utilization was proposed and promoted. The creation of BEE as a statutory body under the Ministry of Power followed. In order to enforce measures that are absolutely essential to be followed in the area of energy efficiency, as per the Constitution of India, it was necessary to have constitutional powers for the agencies and officials engaged in it. Enactment of a law is the right course for having such powers to compel the defaulters to fall in line and help the state to improve its energy performance.

The following Table 2.5-1 shows the steps to introduce MEPS and labelling in India.

Table 2.5-1 Steps for Introduction of MEPS and Labelling in India

Process/ Parameters	MEPS and Labelling in India	Remarks
1. Decide on the introduction of standards and labelling	1. Decision at the government level.	1. Based on detailed survey and analysis from authenticated data available on appliances, volume by number as well as energy consumption, peak load coincidence, energy intensity, annual sales growth and penetration, compliance and guidelines are followed according to existing technical/industrial standards (e.g., IS Standards). *Note:* These are essential for further policy and programme design.
2. Decide on the principles of MEPS	1. Discussions at the academic, industry, and government levels. 2. Responses on pollution from industries, power shortages.	1. Baseline energy efficiency index prevailing and its compliance 2. Infrastructure facility manufacturers/OEMs facility 3. Independent test labs (NABL-accredited) 4. Acceptable standards other than IS/BIS 5. Create awareness on the need
3. Set up legal framework	1. Enact the Energy Conservation Act. 2. Establish a central agency (BEE). 3. Establish a state/regional level institutional mechanism. 4. Special courts/appellate: integrated with existing or separate to be judiciously arrived at (sprit: provide/ facilitate legal assistance to stakeholders). 5. Decide on how to implement MEPS.	1. Act 52 of 2001 2. Review of present legally-enabling provisions on technical standards with respect to design, operation, maintenance (e.g.: OEM certified repair and service centres; consumer advocacy; consumer grievance redress mechanism with respect to operational deficiencies). 3. Deployment of inspectors to ensure implementation of MEPS.
4. Set up policy framework	1. Monitor devices and equipment and create database on energy wasting types. 2. Decide on devices and areas to be addressed initially and in later phases (Fix objective sectors for raising energy efficiency) . 3. Direct national energy conservation activities. 4. Define the role of related existing institutions like BIS and NABL. 5. Design the labelling program/details.	1. Research, analysis and coordination 2. Financing mechanism (may be based on market transformation mechanism; bankable bundled projects) 3. Procurement policy interventions 4. Vender development by government-owned organizations and large organizations
5. Disseminate information and knowledge nationwide	1. Benchmark industrial energy efficiency considering efficiency levels elsewhere. 2. Media publicity on intention and benefits and involve consumer organizations. 3. Involve educational institutions. 4. Involve industry associations. 5. Involve NGOs and other stakeholders.	1. Seminars, contests, publication of articles, incentives, publicity 2. Funded demonstration/pilot projects 3. Stakeholder consultations at stages prior to MEPS evolution, programme rollout and interim launching
6. Set up institutional framework	1. Create state-level designated agencies. 2. Develop testing capability (laboratories, accreditation). 3. Establish energy conservation building codes. 4. Announce method of certification, label validity period, labs for testing, label ranges, rating levels. 5. Train manpower. 6. Ensure program integrity.	1. Infrastructure development, administrative and legal steps 2. Networking 3. For OEMS, set an easy and convenient procedure to enroll under this programme for securing labels.
7. Implement labelling projects	1. Limited no. of items or sectors in industry, commerce, household and buildings (Demo). 2. Evaluate the program, Set MEPS. 3. Ascertain barriers and challenges in implementation and for upscaling. 4. Put in place incentive schemes to users, manufacturers and industries. 5. Eliminate unorganized markets in steps. 6. Prescribe penalty for non-compliance. 7. Continue strategic publicity campaign. 8. Direct public procurements based on payback criteria.	Continue MEPS and labelling (Upscale). Identify more appliances to bring under MEPS.

Source: Prepared by the JICA Survey Team
Based on the information from:
(a) Energy Conservation Act 2001 of India
(b) Energy Efficiency Standards and Labelling in India: Current Situation and Challenges by Alvin Jose, Consultant, TERI/BEE Feb. 2011
(c) Initiation of MEPS and S and L - Indian Experience - Narayanan A M, Energy Practitioner
(d) BEE Energy Analysis Project Report - Akshit Gupta, IIIT Delhi
(e) Savings, Beliefs and Demographic Change - Electricity Survey – 2, Jason Palmer, Nicola Terry, Peter Armitage, Daniel Godoy Shimizu, Cambridge Architectural Research Ltd., Element Energy Loughborough University

A Collaborative Labelling and Appliance Standards Program (CLASP) under the Berkeley-India Joint Leadership on Energy and the Environment (BIJLEE) initiated work in India in early 2001 with a scoping mission and later in October 2001 with the passage of the Energy Conservation Act (EC Act), with a comprehensive work plan. Standards and labelling were among the priority action items under the EC Act for BEE to implement. CLASP was funded by the United Nations (UN) Foundation, United States Agency for International Development (USAID), and United States Environmental Protection Agency (USEPA). CLASP in partnership with the University of California, Berkeley (UCB), the Lawrence Berkeley National Laboratory (LBNL), the government, private sector, and educational institutions of US and India had aimed at developing standards and labels for improving energy efficiency for up to three products by 2005, while simultaneously building the institutional capacity necessary to maintain the program beyond CLASP's period of intervention.

3) Organization

As mentioned earlier, the BEE was established as a statutory body under the Ministry of Power in March 2002 to enforce the act at the national level. The mission of BEE is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act 2001, with the primary objective of reducing energy intensity of the Indian economy. This will be achieved with active participation of all stakeholders, resulting in accelerated and sustained adoption of energy efficiency in all sectors. The role of BEE is to coordinate with designated consumers, designated agencies and other organizations and recognize, identify, and utilize the existing resources and infrastructure in performing the functions assigned to it under the Energy Conservation Act, providing regulatory and promotional functions.

Chapter IV of the Energy Conservation Act 2001 endorses BEE to have power and functions to enable the Energy Star and Labelling Programmes through the following subsidiary regulations:

The central government may, by notification, in consultation with BEE (Section 14):

(a) Specify the norms for processes and energy consumption standards for any equipment, appliances which consumes, generates, transmits or supplies energy (Sec.14(a));

(b) Specify equipment or appliance or class of equipment or appliances, as the case may be, for the purposes of the act (Sec.14(b));

(c) Direct the display of such particulars on label on the equipment or on appliance specified

under clause (b) and in such manner as may be specified by the regulations (Sec.14(d));

The bureau may perform such functions and exercise such powers as may be assigned to it by or under this act and in particular, such functions and powers include the function and power to (Section 13(2)) recommend to the central government the particulars required to be displayed on the label on equipment or on appliances and the manner of their display under clause (d) of section 14.

2.6 Research of EE&C Consciousness and Energy Demand

2.6.1 Objective of Research

The survey has been implemented to establish the regulatory framework of EE&C such as labelling system through interviews with households mainly. The interviews focused on the estimation of the energy consumption to identify the major electrical home appliances considered to have remarkable energy saving potential, which may be the reasonable selection for MEPS and labelling scheme with ENERCON.

Aiming to formulate the criteria of MEPS and labelling, the interviews were completed to collect the basic data and information regarding home electrical appliances in Pakistan. The ultimate goal is to identify the three major home electrical appliances to promote MEPS and labelling in Pakistan.

2.6.2 Methodology

1) Samples and Items

Samples and items for research of EE&C consciousness are shown in Table 2.6-1.

The three home appliances are to be identified for the effective development and promotion of ES&L comparing each annual energy consumption estimated theoretically. Household interviews were conducted for 120 samples in three major cities (30 households in Islamabad, 30 households in Lahore, and 60 households in Karachi) which are supposed to represent the typical average households in Pakistan. One hundred and twenty households were interviewed to ask the daily hours of use for the home appliances as follows:

Table 2.6-1 Samples and Items for Research of EE&C Consciousness

	Households		Commercial		Industry/Factory	
	Punjab	Sindh	Punjab	Sindh	Punjab	Sindh
Numbers of Respondents	60	60	25	25	10	10
Items	1. Annual income 2. Family members 3. Area of housing 4. Monthly consumption of electricity		1. Annual turnover 2. Number of employees 3. Area of building 4. Monthly consumption of electricity		1. Annual production 2. Number of employees 3. Area of factory and building 4. Monthly consumption of electricity	
Major Electrical Appliances	1. Categories, specifications, and numbers of electrical appliances purchased 2. Status and condition of daily use of electrical appliances					
EE&C Consciousness	1.Importance to purchase electrical appliances 2. Information source 3. Conducted actions for EE&C		1. Importance to purchase electrical appliances 2. State of management of energy conservation 3. Conducted actions for EE&C 4. Expected initiatives by the government for energy solution in terms of EE&C			

Source: Prepared by the JICA Survey Team

2) Target Appliances for Household Interviews

Daily electricity consumption per each appliance is collected through the interviews with 120 households in the three major cities as model households in Pakistan. The following table has been prepared to estimate the electricity consumption by simulated typical average households in Pakistan in the three major cities of Islamabad, Lahore, and Karachi.

List of Appliances Checked

a. Lighting (CFL, Incandescent, Linear FL (T10/T12), Oil Lamp and Others)

b. Refrigerators

c. Televisions

d. Room Air Conditioners

e. Washing Machines

f. Water Dispensers

g. Water Pumps

h. Personal Computers

I. Electric Irons

j. Fans

3) Calculation Method

In order to estimate the annual electricity consumption of each appliance, the following formula is used:

Consumption Formula

ConA= Pl x n1 x n2 x ConD x Op

ConA: Annual electricity consumption per one appliance (kWh/year)
Pl: Penetration level (%)
n1: Number of households
n2: Number of appliances in one household
ConD: Daily electricity consumption per one appliance (kWh/unit day)
Op: Annual operation days (days/year)

In addition, the daily electricity consumption per one appliance was calculated as follows:

For lighting, Televisons, water dispensers, water pumps, electric irons, and fans: Specific wattage (W) x Average operating hours (h/day);

For AC and refrigerator: measured data of daily electricity consumption by the sub-contracted consultant;

For washing machine: measured data in Japan, because of combination of electricity consumption of washing and drying time;

For personal computer: measured data in Japan, because of combination of electricity consumption of operating and stand-by time; and

For low electricity contract household of 700 W or less: model of appliance used, because of larger electricity consumption reported than the contract amount.

4) Conditions for Calculation

The conditions for calculation of electricity consumption of the subject home appliances in Karachi, Lahore, and Islamabad City areas are fixed. (Based on the existing research data and the results of the sub-contract under this study, the lacking data were supplemented by estimation.)

The common conditions are described in Table 2.6-2.

Table 2.6-2 Number of Electricity Contract of Households in Karachi, Lahore and Islamabad

Contract		Karachi	Lahore	Islamabad
		K-Electric	LESCO	IESCO
		No. of Customers		
C-1	0-100 W	310,720	579,106	389,136
C-2	101-300 W	765,544	1,426,787	958,744
C-3	301-700 W	378,609	705,635	474,158
C-4	701-5000 W	119,419	222,568	149,557
C-5	Above 5000 W	1,642	3,060	2,056
Total Households		1,575,934	2,937,156	1,973,651

Official statistics

Estimated by the each ratio of Karachi contract numbers (C-1~C-5) to be against to 1,575,934.

Karachi: 1,575,934 (Source: K-Electric, September 2014)

Lahore: 2,937,156 (Source: NTDC Power System Statistics, June 2013).

Islamabad: 1,973,651 (Source:http://www.iesco.com.pk/index.php/organisation/iesco-consumers)

Source: Prepared by the JICA Survey Team (Each source of contract number is mentioned bottom of table.)

5) Schedule of interview and measurement:

From 27th June 2014 to middle of September 2014.

2.6.3 Results

The results of the calculation of energy consumption by appliance and by electricity contract size are described below. In general, the group of households with contract over 5 kW is very few.

1) Summary of research of EE&C consciousness for households

In Karachi;

On the most important points of selection household appliances, large part of consumer select convenience (38%) and electric consumption (33%).

On their keen interest appliance to buy newly, large part of consumer select AC (45%).

On conducted actions for EE&C, large part of consumer carry out lighting switch turn off always when nobody is in the room (67%).

In Islamabad;

On the most important points of selection household appliances, large part of consumer select

electric consumption (33%), price (30%) and convenience (27%).

On their keen interest appliance to buy newly, large part of consumer select AC (33%).

On conducted actions for EE&C, large part of consumer carry out lighting switch turn off quite always when nobody is in the room (43%).

In Lahore;

On the most important points of selection household appliances, large part of consumer select electric consumption (33%), price (30%) and convenience (27%).

On their keen interest appliance to buy newly, large part of consumer select AC (33%).

On conducted actions for EE&C, large part of consumer carry out lighting switch turn off quite always when nobody is in the room (43%).

2) Summary of research of EE&C consciousness for commercial

On importance for high efficiency equipment with star rating, almost consumers agree “very much” (96%).

On their keen interest appliance to buy newly, large part of consumer select package AC (90%).

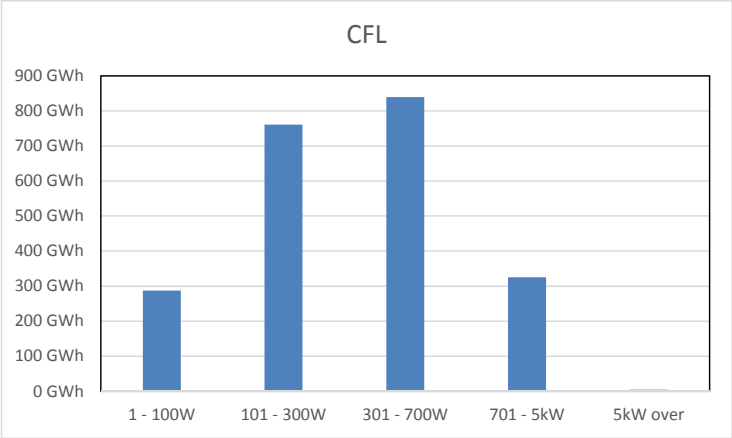
3) Summary of research of EE&C consciousness for industrial

On importance for high efficiency equipment, all consumer agree “yes” (100%).

On their keen interest appliance to buy newly, large part of consumer select high efficiency motor (30%).

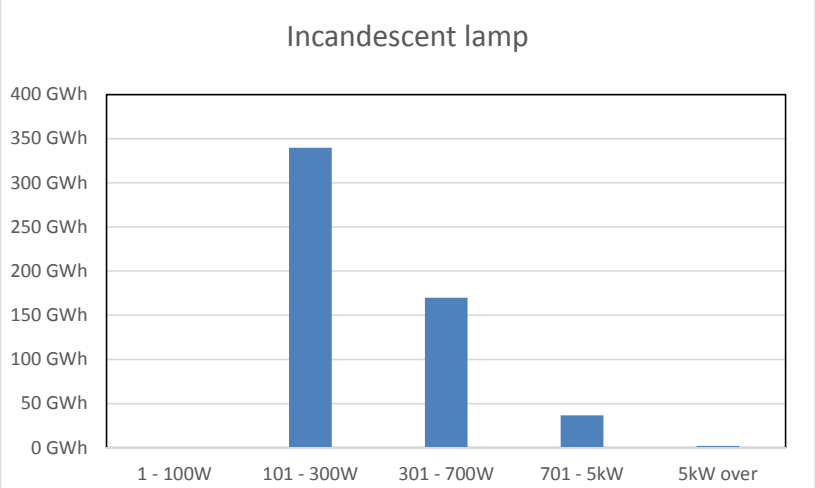
4) Estimation of annual electricity consumption of CFL and Other Lightings

The electricity consumptions of CFLs, incandescent lamp, and TFL are shown in Figures 2.6-1, 2.6-2, and 2.6-3, respectively. Penetration of CFL is high, but incandescent lamps are used in low contract households. TFLs are used in high contact households. In case of CFLs, the group of households with contract of 101 to 300 W and 301 to 700 W consumes much electricity. In case of TFL, the group of households with contract of 100 to 300 W consumes much electricity.



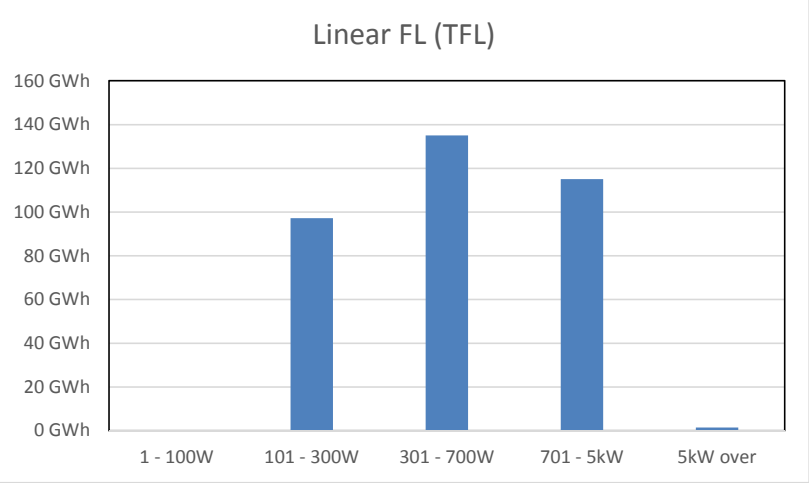
Source: Prepared by the JICA Survey Team

Figure 2.6-1 Electricity Consumption of CFL



Source: Prepared by the JICA Survey Team

Figure 2.6-2 Electricity Consumption of Incandescent Lamp

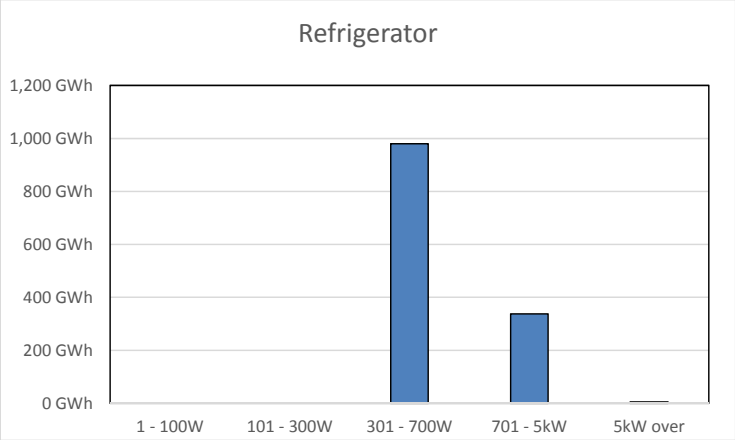


Source: Prepared by the JICA Survey Team

Figure 2.6-3 Electricity Consumption of TFL

5) Estimation of annual electricity consumption of Refrigerator

Electricity consumption of refrigerators is shown in Figure 2.6-4. Households with contract of 300 kW or over have refrigerators. The group of households with contract of 301 to 700 W consumes much electricity.

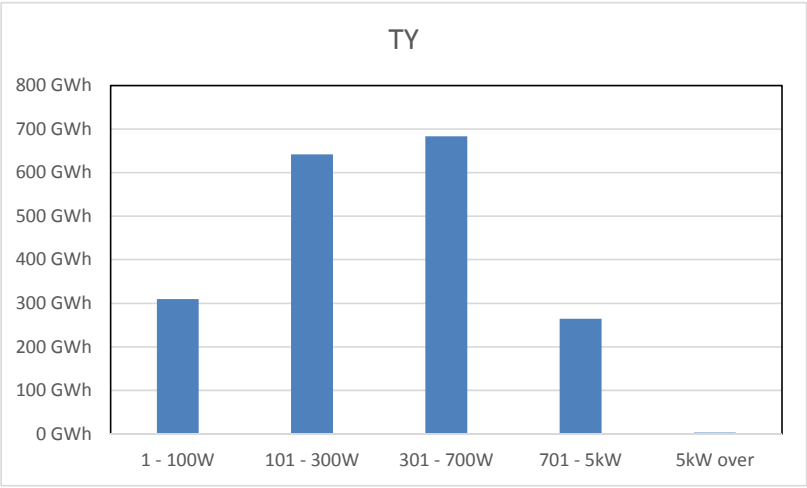


Source: Prepared by the JICA Survey Team

Figure 2.6-4 Electricity Consumption of Refrigerators

6) Estimation of annual electricity consumption of Television receivers (TVs)

Electricity consumption of TVs is shown in Figure 2.6-5. TVs are used in low contract to high contract households. Households with contract of 1 to 100 W also have and use PCs. The group of households with contract of 101 to 300 W and 301 to 700 W consumes much electricity.

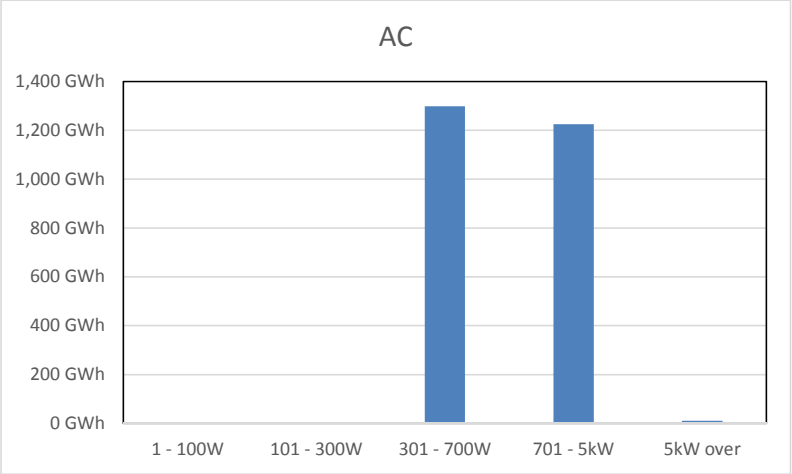


Source: Prepared by the JICA Survey Team

Figure 2.6-5 Electricity Consumption of TVs

7) Estimation of annual electricity consumption of Air Conditioner

Electricity consumption of air conditioners is shown in Figure 2.6-6. Households with contract of 300 kW or over have air conditioners.

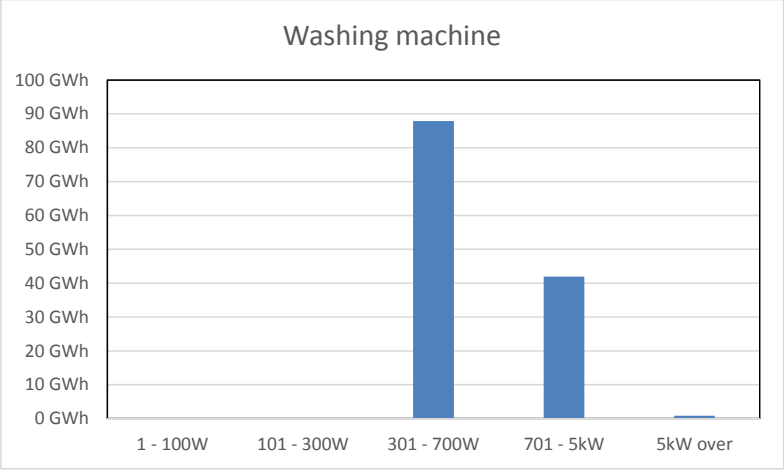


Source: Prepared by the JICA Survey Team

Figure 2.6-6 Electricity Consumption of Air Conditioners

8) Estimation of annual electricity consumption of Washing Machine

Electricity consumption of washing machine is shown in Figure 2.6-7. Households with contract of 300 kW or over have washing machines.



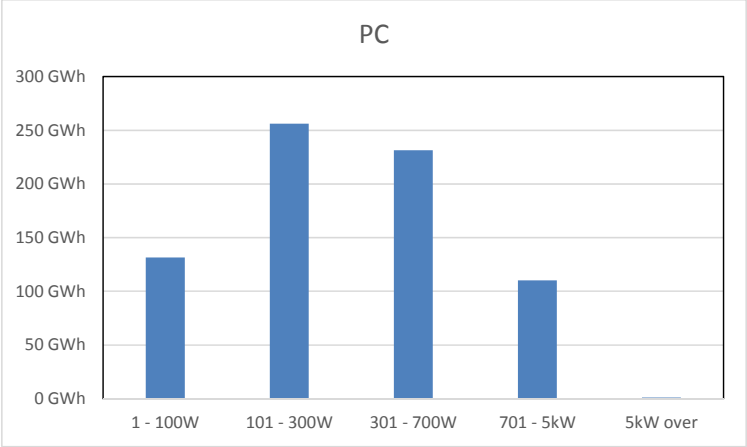
Source: Prepared by the JICA Survey Team

Figure 2.6-7 Electricity Consumption of Washing Machines

9) Estimation of annual electricity consumption of PC

Electricity consumption of PCs is shown in Figure 2.6-8.

Households with contract of 1 to 100 W have and use PCs and also consume electricity. The group of households with contract of 101 to 300 W and 301 to 700 W consumes much electricity.

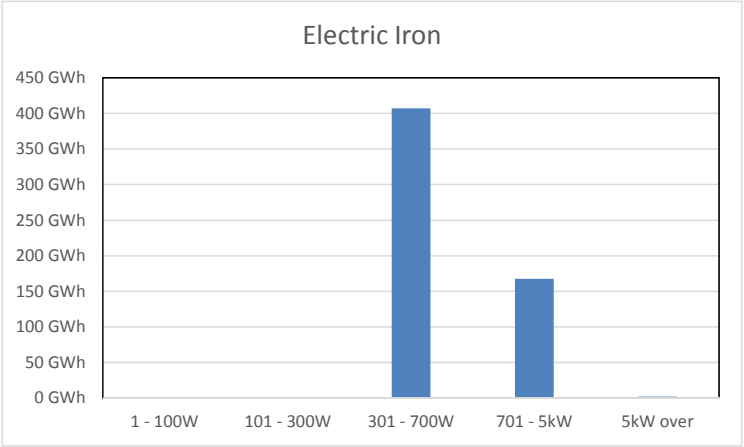


Source: Prepared by the JICA Survey Team

Figure 2.6-8 Electricity Consumption of PCs

10) Estimation of annual electricity consumption of Electric Iron

Electricity consumption of electric irons is shown in Figure 2.6-9. Households with contract of 300 kW or over have electric irons.



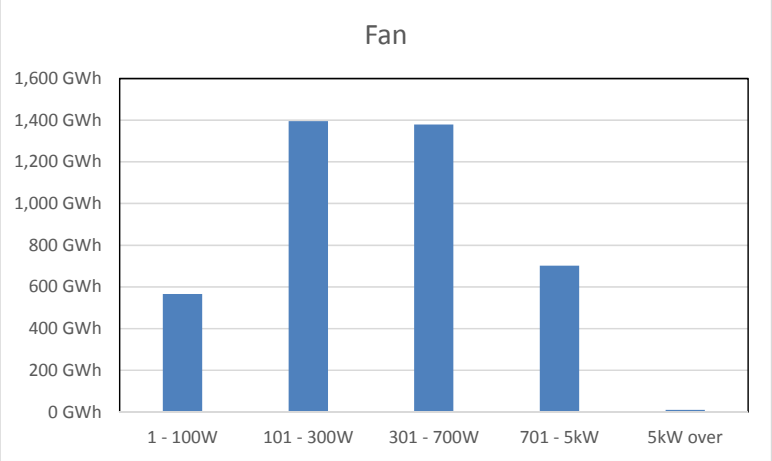
Source: Prepared by the JICA Survey Team

Figure 2.6-9 Electricity Consumption of Electric Irons

11) Estimation of annual electricity consumption of Fans

Electricity consumption of fans is shown in Figure 2.6-10. All households use fans.

Household with contract of 1 to 100 W have and use PCs. The group of households with contract of 101 to 300 W and 301 to 700 W consumes much electricity.



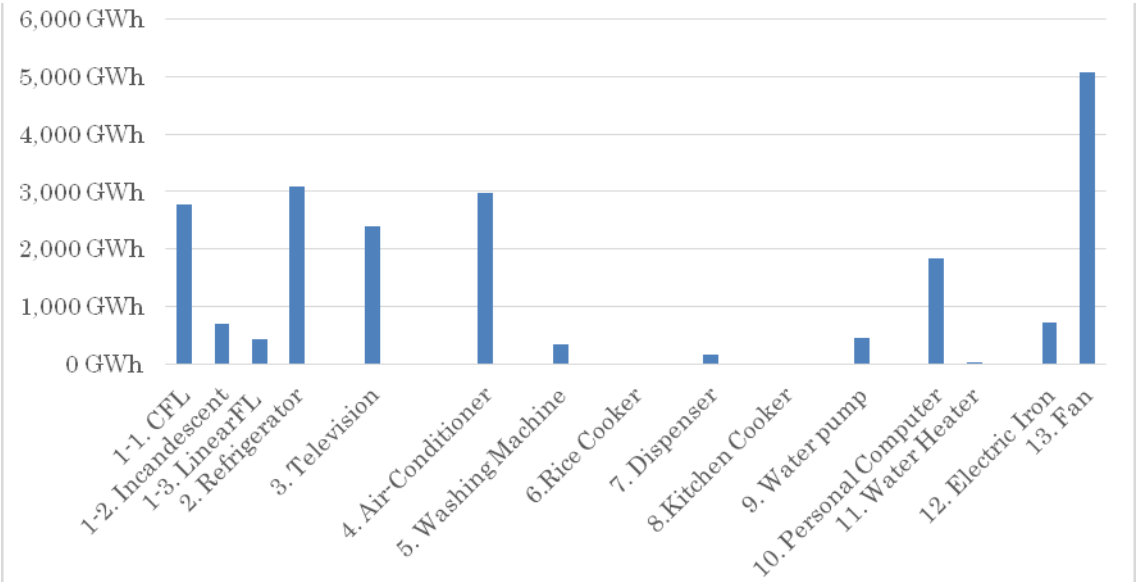
Source: Prepared by the JICA Survey Team

Figure 2.6-10 Electricity Consumption of Fans

12) Comparison of Electric Consumption

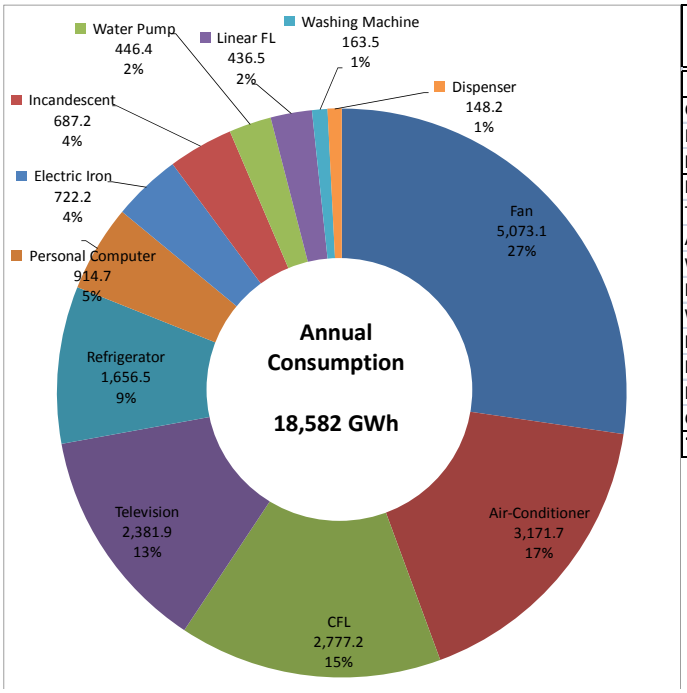
Figure 2.6-11 shows the estimated annual consumption of 15 home electrical appliances in Karachi, Lahore, and Islamabad by typical average households in Pakistan under the survey. Meanwhile, Figure 2.6-12 shows the electricity consumption share in the three major cities.

Energy consumption of 'fan' is the highest at approximately 5,000 GWh/year among the 13 subject appliances. 'Refrigerator' ranks second at over 3,000 GWh/year. 'Air conditioner' is third at approximately 3,000 GWh/year while 'CFL' is fourth at approximately 2,800 GWh/year. 'Personal computer (Desktop)' has approximately 1,800 GWh/year. 'Electric iron' has potential also at 700 MWh/year, which is almost the same level as 'incandescent'. The rest do not seem to be potential appliances for Pakistan ES&L.



Source: Prepared by the JICA Survey Team

Figure 2.6-11 Electricity Consumption (GWh/Year) in Karachi, Lahore, and Islamabad



Annual Consumption in Islamabad/Karachi/Lahore		
Appliances	**GWh/year**	**%**
CFL	2,777.2	14.9%
Incandescent	687.2	3.7%
LinearFL	436.5	2.3%
Refrigerator	1,656.5	8.9%
Television	2,381.9	12.8%
Air-Conditioner	3,171.7	17.1%
Washing Machine	163.5	0.9%
Dispenser	148.2	0.8%
Water Pump	446.4	2.4%
Personal Computer	914.7	4.9%
Electric Iron	722.2	3.9%
Fan	5,073.1	27.3%
Others	2.7	0.0%
Total 3 Cities	**18,581.8**	**100.0%**

Source: Prepared by the JICA Survey Team

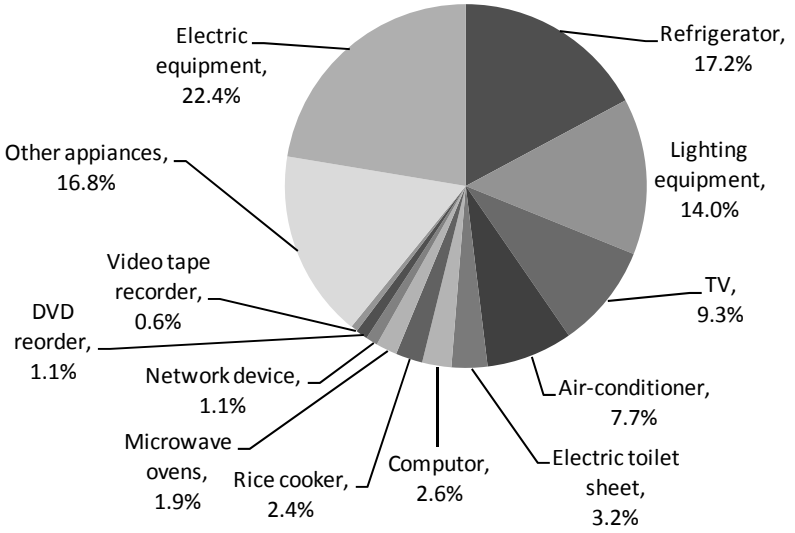
Figure 2.6-12 Electricity Consumption (GWh/Year) and Share (%) of Karachi, Lahore and Islamabad

2.6.4 Electric Consumption in Other Countries

As reference of electric consumption in other countries, Figures 3.1-5 to 3.1-7 show the electricity consumption rate in the household sector in Japan, India, and Indonesia (Jakarta District).

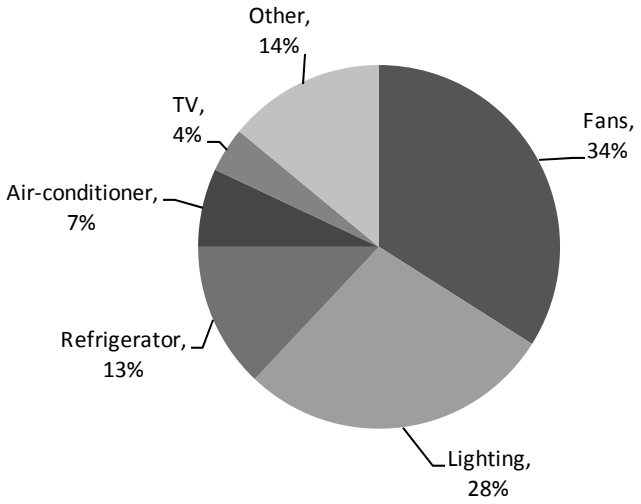
In each country, refrigerators, lighting, televisions, and air conditioners account for more than 50% of electricity consumption in the household sector. India has higher electricity consumption for fans as compared with other countries.

As Pakistan is similar to India in terms of climate condition and lifestyle, ceiling fans, lighting equipment, refrigerators, air conditioners, and televisions are expected to be the most commonly used energy intensive appliances in every household.



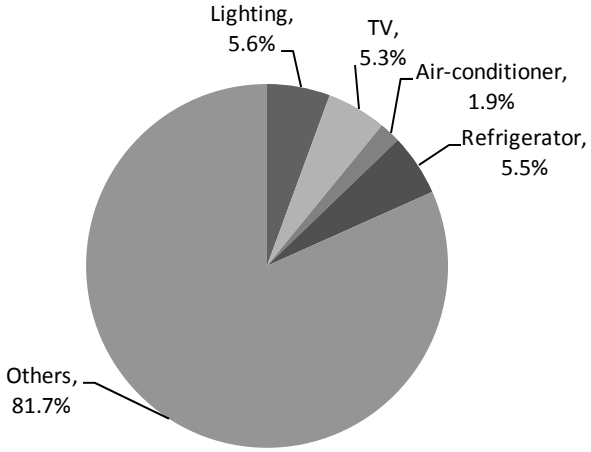
Source: METI, Japan

Figure 2.6-13 Power Consumption of Appliances in Japan (For Reference)



Source: BEE, India

Figure 2.6-14 Power Consumption of Appliances in India (For Reference)



Source: Final Report of Study for Promoting Practical Demand Side Management Program in Indonesia, 2012, JICA

Figure 2.6-15 Power Consumption of Appliances in Jawa-Bali Area in Indonesia (For Reference)

2.6.5 Energy Saving Potential from Japanese Experience

Energy saving potential data are applied from the results of the improvement of energy efficiency of appliances and equipment by the Top Runner Program in Japan.

Energy efficiency improvement results in the Top Runner Program are shown in Table 2.6-3.

Table 2.6-2 Energy Efficiency Improvement Results in Top Runner Program in Japan

No.	Product Category	Energy Efficiency Improvement (Result)	Details (Annual Energy Consumption or Index)
1	TVs (TV set using LCD and Plasma)	29.6% (FY 2004 - FY 2008)	Annual power consumption (179.7 kWh to 126.5 kWh), Improvement ratio: 30%
2	DVD recorder	40.9% (FY 2004 - FY 2008)	Annual power consumption (66 kWh to 39 kWh)
3	Air conditioners (Room air conditioners)	67.8% (FY 1997 - 2004 freezing year)	COP (3.01 to 5.05)
4	Electric refrigerators	55.2% (FY 1998 - FY 2004)	Annual power consumption (647.3 kWh to 290.3 kWh) , Improvement ratio: 50%
5	Electric freezers	29.6% (FY 1998 - FY 2004)	Annual power consumption (524.8 kWh to 369.7 kWh)
6	Gasoline passenger vehicles	22.8% (FY 1995 - FY 2005)	Fuel consumption (12.3 km/L to 15.1 km/L)
7	Diesel freight vehicles	21.7% (FY 1995 - FY 2005)	Fuel consumption (13.8 km/L to 16.8 km/L)
8	Vending machines	37.3% (FY 2000 - FY 2005)	Annual power consumption (2.617 kWh to 1.642 kWh)
9	Fluorescent light equipment	35.7% (FY 1997 - FY 2005)	Lumen / Watt (63.1 lm/W to 85.6 lm/W) Improvement ratio: 25%
10	Copying machines	72.5% (FY 1997 - FY 2006)	Power consumption (155 Wh to 42 Wh)
11	Computers	99.1% (FY 1997 - FY 2005)	Watt/Mega computing (0.17 to 0.0015)
12	Magnetic disk units	98.2% (FY 1997- FY 2005)	Watt/Gigabite (1.4 to 0.00255)
13	Electric toilet seats	14.6% (FY 2000 - FY 2006)	Annual power consumption (281 kWh to 240 kWh)
14	Microwave oven	10.5% (FY 2004 - FY 2008)	Annual power consumption (77.2 kWh to 69.1 kWh), Improvement ratio: 10%

Source: Top Runner Program, METI, Japan

2.7 Research on Specification of Electrical Appliances

2.7.1 Objective of Research

The objective of the research is to collect the basic data regarding electrical appliances in Pakistan in order to decide the criteria of MEPS.

Research criteria and objectives are as follows:

- Line-up of products, number of sales, share in market, general specification;
- Price, purchase (cash, loan, credit card);
- Strategy of innovation and selling; and
- Import/domestic.

2.7.2 Methodology

Market survey for retail shop and interview survey with manufacturers will be carried out. The purposes of the survey are as follows:

a) To grasp outline of appliances and manufacturers.

b) To study energy efficiency and coefficient of performance (COP) of appliances in the market.

1) Target Appliances

Target appliances are shown in Table 2.7-1. Target appliances are selected from the target of BRESL and existing similar survey in another country. Energy consumption ratio of appliances in other countries is shown in Figures 3.1-4 to 3.1-6 of Section 3.1.2. Energy consumption ratio of appliances in the households in Pakistan will be indicated as a result of the research of EE&C consciousness and energy demand.

Table 2.7-1 Target Appliances for Research on Specification of Electrical Appliances

Appliance	Characteristics of Energy Demand
Air conditioner	Rated electrical capacity of air conditioner is high (0.5 – 3 kW) Daily operation time is long (6-12 hours). Thus, total electrical consumption is high. It is estimated that domestic products account for almost 50%.
Refrigerator	Rated electrical capacity of refrigerator is low (100 – 200 W) Daily operation time is long (all day). Thus, total electrical consumption is high. It is estimated that domestic products account for almost 70 to 80%.
Televisions (TV)	Rated electrical capacity of TV is average (50 – 400 W) Daily operation time is long (6-12 hours). Thus, total electrical consumption is average. 32-inch liquid crystal display (LCD) televisions consume lower electric power at a rate of 75% than 32-inch CRT television. It is estimated that domestic products account for almost 40 to 50%.
Washing machine	Rated electrical capacity of washing machine is average (300 – 500 W) Daily operation time is short (more than 1 hour). Thus, total electric consumption is high. It is estimated that domestic products account for almost 70 to 80% .
Microwave oven	Rated electrical capacity of microwave oven is high (1 – 1.5 kW). Daily operation time is short (0.1 - 1 hour). Total electric consumption is not much, but promotion of efficient type contributes to decreasing peak demand. It is estimated that domestic products account for almost 80 to 90% .
Fans	Rated electrical capacity of fan is low (50 – 150 W). Daily operation time is long (8-12 hours). Thus, total electric consumption is high. But fans will die out with the promotion of air conditioners. It is estimated that domestic products account for almost 100%.
Water heater	Rated electrical capacity of water heater is high (1 – 4 kW). Daily operation time is short. Total electric consumption is not much, but promotion of efficient type contributes to lowering peak demand.
Tubular fluorescent lamp	Rated electrical capacity of tubular fluorescent lamp is low (10 – 40 W). Daily operation time is long especially in office buildings. Total electric consumption is average. It is estimated no domestic products account in Pakistan.

Source: Prepared by the JICA Survey Team

2) Target Area

Target areas for research are shown in Table 2.7-2.

Table 2.7-2 Target Areas for Research on Specification of Electrical Appliances

Survey	Target Area
Retail shop survey	Islamabad City (Blue Area) Lahore City Karachi City
Manufacturers interview	Head office of manufacturers and importers

Source: Prepared by the JICA Survey Team

3) Sample Group

Sample group is shown in Table 2.7-3.

Table 2.7-3 Sample Group for Research on Specification of Electrical Appliances

Survey	Sample Size and Summary
Retail shop survey	21 retail shops: 2 large retail shops (1,000 m^2 or more) each in the 3 cities 5 small retail shops (less than 1,000 m^2) each in the 3 cities
Manufacturer interview	9 manufacturers: Dawlance, PEL, Super Asia, Waves, Kenwood, Haier, DWP, Metro, Karim Buksh,

Source: Prepared by the JICA Survey Team

4) Survey Schedule

From 18th June to 8th August and 29th October 2014

The JICA Survey Team carried out the survey with the help of a local assistant.

2.7.3 Result

1) Air Conditioners (ACs)

The number of air conditioners by model is shown in Table 2.7-4. Most of the air conditioners are non-inverter type. Market share of ACs is: 30% for Haier (Origin in China), 15% for Dawlance (Domestic), 10% for PEL (Domestic), and 40% to 50% for imported.

COP of ACs is not shown in the body and catalogue. The COP is calculated by capacity (kW) divided by input power (kW). COP of ACs is lower than 3.05 as shown in Figure 2.7-1, while criteria of MEPS drafted by ENERCON suggest a COP of 3.2 for capacity of 12,000 Btu and 3.1 for 18,000 Btu. All the models of ACs did not pass the criteria of MEPS drafted by ENERCON as shown in Figure 2.7-1.

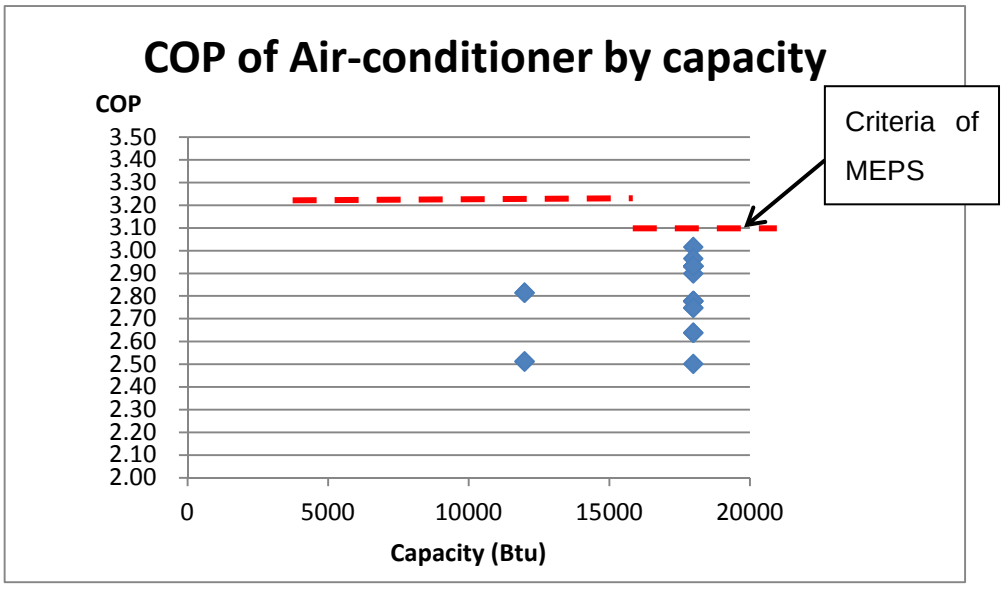
Domestic manufacturers should develop highly efficient air conditioner technology within a few years because foreign manufacturers already have highly efficient air conditioner

technology.

Table 2.7-4 Number of Air Conditioner Models in Retail Shops

Manufacturer		18,000 Btu (5.3 kWh)		12,000 Btu (3.5 kWh)	
Name	Origin	Non-inverter	Inverter	Non-inverter	Inverter
Acson	Import (Malaysia)	2	-	-	-
Dawlance	Domestic	2	1	1	1
Gree	Import (China)	2	-	1	-
General	Import (Japan)	-	1	-	-
Haier	Domestic (China)	2	-	1	-
Kenwood	Import (Italy)	2	-	-	-
LG	Import (Korea)	2	-	-	-
Mitsubishi	Import (Japan)	-	2	-	-
Orient	Domestic	2	-	1	-
PEL	Domestic	1	-	-	-
Samsung	Import (Korea)	1	-	-	-
Singar Input power (kW)	Import (USA)	1 1.75 to 2	-	1 1.25 to 1.4	-

Source: Prepared by the JICA Survey Team



Source: Prepared by the JICA Survey Team

Sample: 20 models

Figure 2.7-1 COP of Air Conditioners in Retail Shops

2) Refrigerator

The number of refrigerators by manufacturer and inner volume is shown in Table 2.7-5. Main products have inner volume of 300 to 500 L. Market share of refrigerators is 50% for Dawlance, 30% for Haier, and 27% for PEL according to manufacturer comments.

Most of the refrigerators with large volume and of the inverter control type are imported. Refrigerators of the inverter control type contribute to energy saving, and so the penetration is to be promoted by the government.

Retail price of refrigerators of 400 L of normal type is PKR 50,000. On the other hand, the price of the inverter control type is PKR 70,000. Incentives for the consumers are necessary for the promotion of refrigerators of the inverter control type.

Table 2.7-5 Manufacturers and Models of Refrigerators in Retail Shops

Manufacturer		Inner Volume of Refrigerator (L)					
		200 to 299	300 to 399		400 to499		500 to 700
		Normal	Normal	Inverter	Normal	Inverter	
Dawlance	Domestic	3	4	-	3	-	-
Electrolux	Import (Sweden)	-	-	-	1	-	-
Haier	Domestic (China)	2	7	2	4	-	-
Kenwood	Import (Italy)	-	-	-	2	-	-
LG	Import (Korea)	-	-	-	-	1	1 inv
Mitsubishi	Import (Japan)	-	1	-	-	-	-
Orient	Domestic	1	1	-	-	-	1
Panasonic	Import (Japan)	-	-	-	-	1	-
PEL	Domestic	3	3	-	2	-	-
Samsung	Import (Korea)	-	1	-	1	-	-
Singar	Import (USA)	1	1	-	1	-	-
Waves	Domestic	-	-	-	2	-	-
Retail price (PKR)		-	-	-	50,000	70,000	-

Source: Prepared by the JICA Survey Team

3) Televisions (TVs)

The number of TVs by manufacturers and LCD display size is shown in Table 2.7-6. Most products have 32-inch display. All the TVs are imported from China, Korea, and Japan. Two and three sets of cathode ray tube (CRT) are displayed in some shops.

Table 2.7-6 Manufacturers and Models of TVs in Retail Shops

Manufacturer		Display Size		
		24 inch	32 inch	42 inch
Changhong	Imported (China)		1	
Ecostar	Domestic		7	
Haier	Imported (China)		2	
LG	Imported (Korea)		3	
Orient	Domestic		4	
Panasonic	Imported (Japan)		1	
Samsung	Imported (Korea)		4	
Singer	Imported (USA)	1		1
Sony	Imported (Japan)		4	
TCL	Imported (China)		2	
Son	Domestic		1	
Chug	Imported (China)		1	

Source: Prepared by the JICA Survey Team

4) Ceiling Fans

The number of ceiling fans by manufacturer and blade diameter is shown in Table 2.7-7.

All the ceiling fans are manufactured in Pakistan. Blade diameter (mm) and motor output (W) are shown in the label on the motor, but air flow volume (m^3/min), service factor (m^3/min/W) and standard number are not indicated. According to the study report of GIZ in 2010, actual motor input power is 90 W to 100 W for the 1200 mm and 1400 mm type. Therefore, it is necessary to develop highly efficient motor and inverter control for ceiling fans.

Table 2.7-7 Manufacturers and Models of Ceiling Fans in Retail Shops

Manufacturer		Blade Diameter (mm)		
		900 mm	1200 mm	1400 mm
GFC Fan	Domestic	2	1	-
Taimur Fan	Domestic	1	1	1
Younas Fan	Domestic	-	1	1
Royal Fan	Domestic	-	-	4
Super Asia Fan	Domestic	-	-	1
Pak Fan	Domestic	1	1	2
Spresic fan	Domestic		1	1
Pak bage	Domestic		1	1
Wahid	Domestic		1	1
TCL	Domestic		1	1
Sony	Domestic		1	1
Chug	Domestic		1	1
Rated motor output			65 W	75 W

Source: Prepared by the JICA Survey Team

5) Microwave Ovens

The number of microwave ovens by manufacturers and inner volume is shown in Table 2.7-8. Most products have inner volume of 20 to 25 L.

Most of the products are manufactured in Pakistan. The estimated annual production is about 300,000 sets and the estimated number of ovens in use is 1,000,000 sets.

Table 2.7-8 Number of Microwave Ovens by Manufacturer and Model in Retail Shops

Manufacturer		Inner Volume of Oven	
		20 to 29 L	30 L or more
Arorua	Domestic	1	-
Bosss	Domestic	1	-
Dawlance	Domestic	9	-
Haier	Domestic (China)	10	5
Homage	Domestic	6	-
Izone	Domestic	1	-
Kenwood	Import (Italy)	2	1
LG	Import (Korea)	4	1
Orient	Domestic	4	-
Panasonic	Import (Japan)	1	-
Samsung	Import (Korea)	-	1
Sharp	Import (Japan)	4	-
Singer	Import (USA)	1	-
Toyo	Domestic	1	-
PEL	Domestic	-	-
Input power (W)		700 W to 1200 W	900 W to 1300 W

Source: Prepared by the JICA Survey Team

6) Washing Machine

The number of washing machines by manufacturer and size of washing tub is shown in Table 2.7-9. Main products are 2-tub type with size of 8 kg. Highly efficient automatic washing machines with 1 tub are being introduced.

Haier has 22% market share of washing machines.

Most of the products are manufactured in Pakistan.

Table 2.7-9 Number of Washing Machines by Manufacturer and Model in Retail Shops

Manufacturer		Size of Washing Tub / Type of Machine						
		5 kg or less	6 to 8 kg			9 kg or more		
		2-tub	Manual	Auto	2-tub	Manual	Auto	2-tub
Asia	Domestic	-	-	1	-	-	-	-
Boss	Domestic	-	-	-	1	-	1	-
Dawlance	Domestic	2	-	1	3	-	-	1
Electrolux	Import (Sweden)	-	-	-	-	-	-	1
Haier	Domestic (China)	-	-	2	4	-	2	2
Kenwood	Import (Italy)	-	-	-	-	-	-	2
LG	Import (Korea)	-	-	1	-	-	-	-
Singer	Import (USA)	-	-	-	2	1	-	-
Sonex	Import (India)	-	-	-	2	-	-	-
Super Asia	Domestic	1	-	-	1	-	-	-
Toyo	Domestic	-	-	1	1	1	-	-
Input power (W)								

Source: Prepared by the JICA Survey Team

7) Water Heater

Water heaters for shower room and kitchen are sold by only one retail shop because water heaters are sold only in the winter season. In the retail shop survey in October 2014, many water heaters of the natural gas combustion type and combination type of gas and electricity are displayed in the shops. Most of the water heaters displayed in the shops are gas combustion type.

The number of water heater by manufacturer and size of water tank is shown in Table 2.7-10.

Table 2.7-10 Number of Water Heaters by Manufacturer and Model in Retail Shops

Manufacturer		Size of Water Tank of Water Heaters	
		30 gallon	35 gallon
Singer	Imported (USA)	1	3

Source: Prepared by the JICA Survey Team

8) Tubular Fluorescent Lamp

The number of tubular fluorescent lamp by manufacturer and size is shown in Table 2.7-11. Main products are T8 type lamps which are changeable to T10 due to same socket. T5 type lamps which are highly efficient are not yet widespread. All the tubular fluorescent lamps are imported from Thailand, Malaysia, Indonesia, China, Japan, the Netherlands, and Germany.

Table 2.7-11 Number of Tubular Fluorescent Lamps by Manufacturer in 5 Retail Shops in Islamabad

Manufacturer		Tubular Fluorescent Lamp (40 W Type)		
		T10 (32.5 mm)	T8 (25 mm)	T5 (15.5 mm)
Toshiba	Import (Japan, Thailand)			1
Philips	Import (Netherlands, Malaysia)	1	1	1
OSRAM	Import (German, Indonesia)		1	
Unique	Import (China)		1	
Price	PKR	100	95	150
Efficiency of Japanese product (Lm/W)		83	86	100

Source: Prepared by the JICA Survey Team

9) Motors and Water Pump

The number of motor and mono pump by manufacturer and motor size is shown in Table 2.7-12. Main products are 1 hp and 1.5 hp pumps. Mono pumps are used to lift water to head tanks on the roof for shower water with high pressure. All the mono pumps of 0.5 hp to 1.5 hp are manufactured in Pakistan. Large-sized water pumps of more than 1.5 hp are imported from China, Italy, and other countries for well water. A mono pump is the unified product of a water pump and a motor.

Table 2.7-12 Number of Water Pumps by Manufacturer in 5 Retail Shops in Islamabad

Manufacturer		Motor and Mono Pump		
		0.5 HP	1 HP	1.5 HP
Master	Domestic	1	1	1
Gold	Domestic	1	1	1
Abser	Domestic	1	1	1
Diamond	Domestic	1	1	1
Sardar	Domestic	1	1	1
Golden	Domestic	1	1	1
M. Star	Domestic	1	1	1

Source: Prepared by the JICA Survey Team

2.8 Research of available payment method on retail shops

2.8.1 Objective of Research

In order to grasp basic information for consideration of financial incentive to consumers, JST carried out the brief research to clarify available payment method on retail shops in Pakistan.

2.8.2 Methodology

JST carried out interview survey to four retail shops and one commercial bank in Islamabad.

Samples and items for research of available payment method on retail shops are shown in Table 2.8-1.

Table 2.8-1 Samples and Items for Research of available payment method on retail shops

	Retail shops	Commercial bank
Numbers of Respondents	4	1
Items	1. Loan, Lease and/or installments scheme 2. Consumers to utilize loan scheme 3. If rebate programme will be established, will consumer utilize it or not?	1. Loan, Lease and/or installments scheme

Source: Prepared by the JICA Survey Team

2.8.3 Results

1) Retail shops

Available payment method on retail shops is shown in Table 2.8-2. Only one shop is available to instalment payment in four shops. But, according to manager of available shop to instalment payment, Barrier on implementation of rebate program is that will be requested big invest to most of the retailers. Further if leasing/loan facility is established in Pakistan, it will be very much advantageous for the consumers.

Table 2.8-2 Available payment method on retail shops

	Shop1	Shop2	Shop3	Shop4
Available scheme	Nil	Nil	Nil	Installments (NOT available to Loan or Lease)
Available appliance	Nil	Nil	Nil	This shop offers leasing facility to the consumers on various products without any down payment. This facility is particularly is available for the government employees. Regular government employees can get the electrical home appliances on monthly installment basis. Though this facility is also available for the people otherthan government employees, but if any government employees applies, he/she can easily get such facility.
Summary of scheme	Nil	Nil	Nil	Interest: 2 % per month Cap amount: Varies from product to product Repayment period: Varies from product to product
Utilization factor	Nil	Nil	Nil	People are using this facility in order to fulfill their necessities.
Opinion to introduction of rebate program	Nil	Nil	Nil	This facility is more particularly for the low paid government employees who cannot get appliances by paying cash. Though others also avail this facility
Barrier on implementation of rebate program	Nil	Nil	Nil	Barriers are the finance for the retail shops because if such practice is started most of the retailers need big invest in this sector such a huge amount to provide leasing/loan facility to the consumers.
Suggestion to justifiable implementation of rebate program	Nil	Nil	Nil	If leasing/loan facility is established in Pakistan, it will be very much advantageous for the consumers because it will not only be leasing but also be penetrating the energy efficient products in the homes of most of the people. Due to illiteracy, people are not aware of such high energy efficient products. Thus, it is recommended to initiate such campaigns to educate the people
Repayment tenure	Nil	Nil	Nil	Repayment tenure is the 1 year and 1.5 years. Depending upon the consumer choice to make repayment.

Source: Prepared by the JICA Survey Team

2) Commercial Bank

Moslem Commercial Bank (MCB) Bank Limited ,one of the banks JST visited, provides the consumers credit card facilities, which provides them options to purchase certain items mostly home appliances over the period of 6 months on zero interest rates on their credit cards. However, there is no such facility or mechanism which provides financial incentives to the

manufactures or the vendors to provide financing options to the consumers. According to representative of the bank, the consumers will be more than happy to provide some sort of financing options if they have guarantors.

CHAPTER 3
ENERGY STANDARD & LABELING (ES&L)

Chapter 3 Energy Standards and Labelling (ES&L)

3.1 Policy for Preparation of ES&L Framework

3.1.1 Role and Position of ES&L Framework in Pakistan

1) National Power Policy 2013

In Pakistan, electricity demand is increasing rapidly due to economic development. Unfortunately, the electric power company is unable to fulfil the growth in electricity demand effectively. Financial and technical issues, and electricity shortage have lowered the gross national product (GNP). The Ministry of Water and Power (MOWP) announced the National Power Policy in July 2013. In this policy, five supply-side targets are named, as shown in Table 3.1-1. Demand-side measures are implemented by the Energy Efficiency and Conservation Bills (EE&C Bill) and Building Energy Code, as shown in Table 3.1-2.

Table 3.1-1 Key Points of the National Power Policy 2013

Target	Details
1 . Supply-demand gap	Reduce the current supply-demand gap of 4,500-5,000 MW to null by 2017.
2. Affordability (reduce the cost to a price level affordable for consumers)	Reduce the current power tariff of 12 cents/kWh to 10 cents/kWh or less by 2017.
3. Efficiency (improved efficiency)	Reduce the current transmission and distribution loss of 23-25% to 16% or less by 2017.
4. Financial viability and collection (improved collection rate)	Increase the current collection rate of not higher than 85% to 95% by 2017.
5. Governance	Increase speed and shorten the period of decision-making process in ministries, relevant institutions, and regulatory agencies.

Source: Final Report of Data Collection Survey on Energy Sector Reform in Pakistan, March 2014, JICA

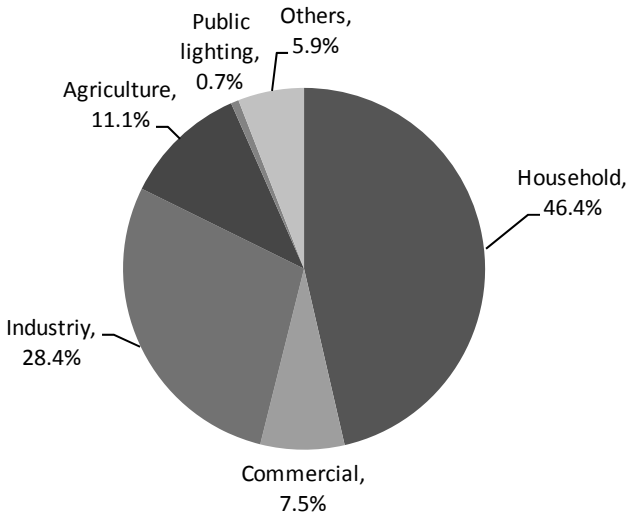
Table 3.1-2 Key Items of Demand-side Measures

Subjects	Details
1.Energy Efficiency and Conservation Bills (EE&C Bill)	Establishment and power of the Pakistan Energy Efficiency and Conservation Board (PEECB) and the National Energy Conservation Centre (ENERCON) are specified.
2. Building Energy Code	The Building Energy Code has been enacted by the Ministry of Science and Technology (MOST) in March 2013. Buildings having installed equipment capacity of more than 100 kW or contract demand of more than 125 kVA are designated to design structure and equipment.

Source: Final Report of Data Collection Survey on Energy sector Reform in Pakistan, March 2014, JICA

The electricity consumption rates by sector in Pakistan are shown in Figure 3.1-1. The electricity consumption rate of the household sector is 46.4%. The Government of Pakistan is planning to introduce highly efficient home appliances through an energy labelling program and to reduce lower efficient home appliances through a minimum energy performance

standards (MEPS) program, as measures to reduce electricity consumption of the household sector.



Source: Pakistan Energy Yearbook 2012, Ministry of Petroleum and Natural Resources

Figure 3.1-1 Electricity Consumption Rates by Sector in 2012

2) EE&C Bill 2104

The EE&C Bill has already been approved by the Council of Common Interests (at the meeting of all Provincial Chief Ministers held on 29th May 2014) and is under deliberation by the Parliament for final approval.

After Prime Minister approval, the bill sent to Ministry of Law and Justice for vetting. The same forwarded to the Cabinet for discussion and approval which was returned it with remarks to get fresh approval from Ministry of Law and Justice. The bill was forwarded to the Cabinet for its approval but Cabinet meeting did not take place. Finally, Bill was directly forwarded to the Prime Minister on 13th January 2015 for his approval under section 16 (2) of the Rules of Business, 1973. The file was sent back to MoWP by Additional Secretary PM Office on 29th January 2015 with remarks to get suggestions of other Ministries (Planning and Development, Petroleum etc) and then get it vetted from Ministry of Law and send it to P.M for his final approval by justifying why its importance for urgent approval. The suggestions of other Ministries have already been taken but it was somehow not noticed in detail by the official who dealt with the file in PM Office.

The Pakistan Energy Efficiency and Conservation Board (PEECB) is not yet present and it will be constituted after approval of the EE&C Bill 2014. It is not necessary to enact the EE&C Bill, which is limited to implementation on voluntary basis, but it is necessary to enact the

EE&C Bill in advance in order for it to be implemented by mandatory basis and in order to utilize other functions on legal basis such as the functions of PEECB.

In case a session of the Parliament is adjourned due to political turmoil or any other cogent reason, the National Energy Conservation Centre (ENERCON) can call the EE&C Bill back and can move to the Honourable President of Pakistan for issuance of an ordinance, which will later be ratified by the Parliament in the upcoming session of the National Assembly. According to the 1973 Constitution of the Islamic Republic of Pakistan, when any ministry moves a bill to the Prime Minister for its onward submission to the President of Pakistan for his approval to issue an ordinance, the President has to agree with the advice of the Prime Minister within 15 days. If the President raises any question/query and sends the bill back to the Prime Minister, it will take further 15 days to approve it. Even if the President does not approve/agree with the advice of the Prime Minister regarding the bill, it would be deemed to be signed by the President.

3) BRESL

The Government of Pakistan has participated in the Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labelling (BRESL) project of the United Nations Development Programme (UNDP) from 2010 and has prepared the draft MEPS and draft labelling standard for home appliances. The BRESL project examines the harmonization of standards of MEPS and the energy labelling of six countries (China, Thailand, Vietnam, Indonesia, Bangladesh and Pakistan) over a period of five years, from 2010 through 2015, with the support of UNDP. The six appliances targeted in the BRESL project are as follows:

a) Air-conditioning (AC) electric fans
b) Compact fluorescent lamps (CFL)
c) Magnetic and electric ballasts for tubular fluorescent lamps
d) Electric motors
e) Air conditioners
f) Refrigerators

The ES&L framework established in the BRESL project is voluntary basis, and will be mandatory after three to five years. As is the case with India, it is not necessary to enact the EE&C Bill by voluntary basis. Label will be granted to applicants whose appliances comply with the MEPS.

As many countries selected, BRESL and ENERCON decided to take the voluntary basis instead of the mandatory basis. The procedure for approving ES&L by BRESL is shown in Figure 3.1-2 as voluntary basis.

As one of the important roles of the Project Stakeholder Coordinator Committee (PSCC), interviews of stakeholders (e.g., manufacturers and importers) with intention and willingness to successfully achieve their goals are to be conducted. The BRESL Team insists on allowing voluntary management at the beginning stage, knowing serious resistance from industrial sectors in Pakistan against a mandatory rule.

Before submitting the application to the Pakistan Standards and Quality Control Authority (PSQCA), ENERCON, and BRESL are preparing and drafting the necessary documents for approval of related organizations.

In the approval procedure, the Project Steering Committee (PSC) shall finalize and approve the draft. Members and power of the Project Steering Committee are shown in Table 3.1-3. PSC consists of the secretary/representative of relevant ministries. ENERCON and PSQCA function to decide on the overall policy. However, PSC was dissolved on 31st December 2014, even though the expiration of the first phase of BRESL is scheduled at the same time.

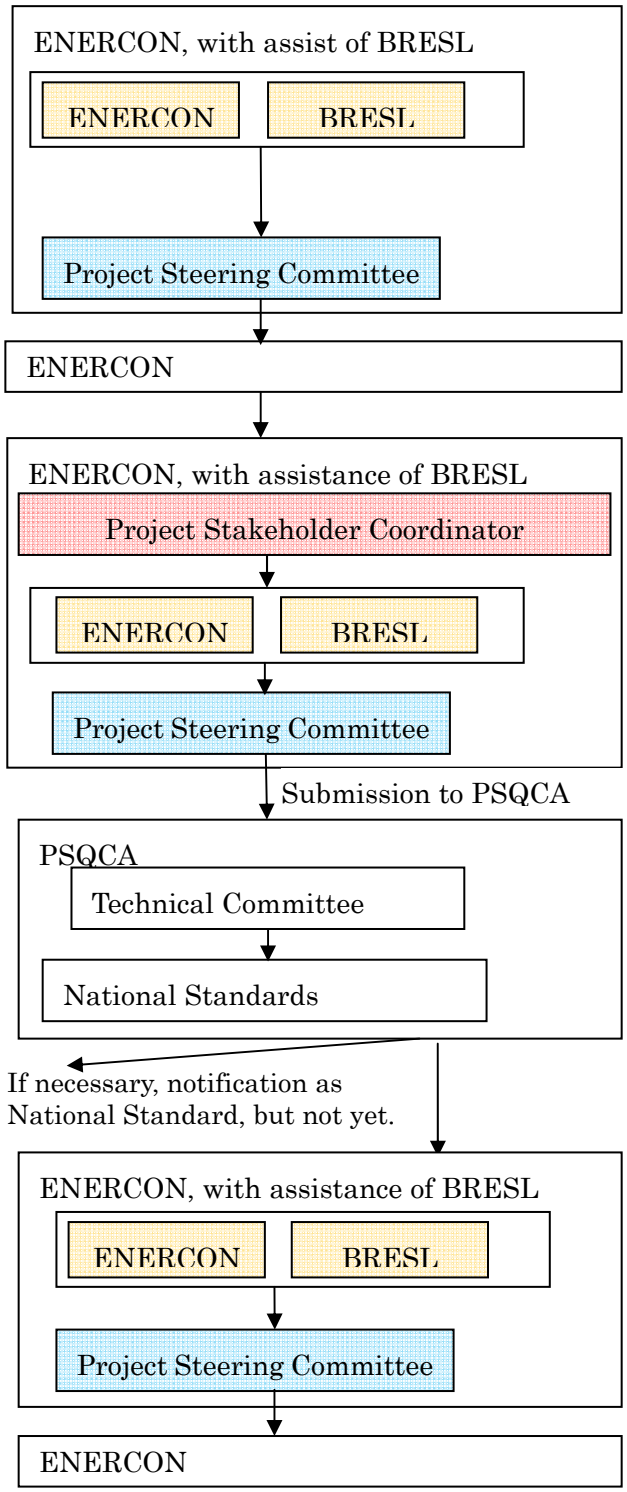
PSQCA will approve the draft through the evaluation of the Technical Committee so that the draft would qualify as the National Standard.

The policy for the ES&L framework that was established by BRESL is described in 'Labelling Policy / Procedure for Grant and Monitoring of Energy Labels In Pakistan' (hereinafter referred to as "Labelling Policy"). Summary of the Labelling Policy is shown in Table 3.1-4. This material has been already issued as a common policy against target appliances of ES&L.

The MEPS for each appliance is prepared as the Pakistan Standard (hereinafter referred to as "PS: MEPS for specific appliance"). For example in the case of electric fans, the 'Pakistan Standard: Minimum Energy Performance Standard (MEPS) for AC Electric Fans' is provided.

Based on the 'PS: MEPS for specific appliance', the guideline for ES&L for specific appliance is prepared.

The time frame of approval and issuance of BRESL is shown in Table 3.1-6. Five appliances except refrigerator have already processed up to approval of the Pakistan Standard, one appliance (fans) has been approved as guideline, and two appliances will be approved as guideline by November 2014. Interview with stakeholders conducted by PSCC will take a longer time in case there are many manufacturers. Discussion and approval of PSCC took one year in the case of fans. This is because there are more than 150 manufacturers of fans in Pakistan. However, MEPS of ballasts is not very useful because there is no manufacturer of ballasts in Pakistan.



(1) Prep. and Appr. of Draft Policy for ES&L

a) Preparation of Draft Guideline regarding policy for ES&L, e.g., scope, voluntary/mandatory, responsibility, basic procedure

b) Approval of Draft Guideline regarding Policy for ES&L

(2) Issuance of Draft Policy for ES&L

(3) Prepare Draft MEPS

c) Interview of stakeholder

d) Preparation of Draft MEPS

e) Internal approval of Draft MEPS

(4) Official approval of MEPS

f) If necessary, amendment of Draft MEPS

g) Approval of MEPS

(5) Prep. and Appr. of Draft Guideline for ES&L

h) Preparation of Draft Guideline for ES&L

i) Approval of Guideline for ES&L

(6) Issuance of Guideline for ES&L

Prep.: Preparation, Appr.: Approval,

Source: Prepared by the JICA Survey Team as excerpted from interview with UNDP / BRESL

Figure 3.1-2 Procedure for Approval of ES&L for BRESL Case (Voluntary Basis)

Table 3.1-3 Members and Powers of PSC

Members of PSC	1. Secretary, Ministry of Water and Power, Chairman 2. Secretary / Representative, Economics Affairs Division 3. Secretary / Representative, Ministry of Industries and Production 4. Secretary / Representative, Ministry of Science and Technology 5. Secretary / Representative, Ministry of Commerce 6. Secretary / Representative, Ministry of Climate Change 7. MD ENERCON / NPD BRESL Project 8. CEO, Engineering Development Board 9. Assistant Country Director, Environment and Climate Change, UNDP 10. Chairman, Pakistan Council of Scientific and Industrial Research 11. Director General, Pakistan Standards and Quality Control Authority
Powers of PSC	1. To steer the project and provide overall policy support for successful project implementation and follow-up actions, ensuring stakeholder linkages at all levels, and 2. To approve the annual work plans and annual budget of the BRESL project.

Source: Selected by the JICA Survey Team as per summary from Gazette, No.A.II-13(2)-ENERCON, 22nd September 2011

Table 3.1-4 Summary of Labelling Policy

Purpose / Policy (Paragraph 1)	To establish and provide guidelines to the manufacturers and importers of household appliances / products in Pakistan for participating in the energy labelling scheme on voluntary basis and to get permission / licence to use / affix 'Pakistan Energy Efficiency Label' on their appliances / products marketed in Pakistan.
Scope (Paragraph 2)	a) Ceiling fans, b) Compact fluorescent lamps (CFL), c) Magnetic and electronic ballasts for tube fluorescence lamp, d) Electric motors, e) Air conditioners, and f) Refrigerators
Voluntary / Mandatory (Paragraphs 3 and 4)	Voluntary in the first phase. Mandatory in the second phase. The second phase is planned to be launched in three to five years, depending on the local, regional, and international market conditions.
Responsibility (Paragraph 5)	ENERCON is national focal agency to implement energy labelling scheme for household electrical appliances / products in Pakistan.
Criteria for Grant of 'Pakistan Energy Label' (Paragraph 8)	The criteria for grant of 'Pakistan Energy Label' will be that the product meets the requirements of energy efficiency performance standards as laid down in the relevant MEPS for the specific product, and as approved by the National Standards Committee (NSC) of Pakistan Standards and Quality Control Agency (PSQCA).
Levels of Violation (Paragraph 15)	Violation level A: The test result samples indicate non-conformance to the specified MEPS, i.e., the tested samples are less energy efficient than specified in the MEPS. Violation level B: Label placed / affixed unqualified / unauthorized product. Violation level C: Design of label is not according to the approved pattern, or the label is misguiding to the customers. Violation level D: Label not affixed properly or not affixed at appropriate place on product / packaging.
Penalties for Violation (Para.16)	i) Suspension of labelling licence ii) Withdraw of labelling licence A fine up to Rs.250,000 (maximum), but not less than Rs.50,000, will be levied according to the level of violation, as given in Paragraph 15 above.

Note: Underline added

Source: Selected by the JICA Survey Team as per summary

Table 3.1-5 Time Frame of Approval and Issuance of BRESL

(1)	Preparation and Approval of Draft Policy for ES&L						
a)	Preparation of Draft Guideline regarding Policy for ES&L	One year					
b)	Approval of Draft Guideline regarding Policy for ES&L (PSC)	Six months					
(2)	Issuance of Draft Policy for ES&L	Six months					
		Fans	Motors	CFLs	Ballasts	AC	Refrigerator
(3)	Preparation of Draft MEPS						
c)	Interview of stakeholder (Project Stakeholder Coordination Committee)	One year	Six months	One month	NA	Three months	NA
d)	Preparation of Draft MEPS	Six months	Three months	Three months	Two months	Three months	-
e)	Internal approval of Draft MEPS (PSC)	Six months	One month	Three month	One month	One month	-
(4)	Approval of Draft MEPS	-	-	-	-	-	-
f)	Technical Committee	Six months	Three months	Six months	Three months	Three months	-
g)	National Standards Committee	4-6 months	4-6 months	4-6 months	4-6 months	4-6 months	-
(5)	Preparation and Approval of Draft Guideline for ES&L		-	-	-	-	-
h)	Preparation of Draft Guideline for ES&L	Three months	Three months	Under Prep	NA	NA	-
i)	Approval of Draft Guideline for ES&L	Six months	Three months	NA	NA	NA	-
(6)	Issuance of Draft Guideline for ES&L	Six months	Under Process	NA	NA	NA	-

Source: Prepared by the JICA Survey Team according to the interview with UNDP / BRESL

4) Policy Matrix

The Japan International Cooperation Agency (JICA), the Asian Development Bank (ADB), and he World Bank (WB) formulated a cooperative loan programme entitled “Proposed Programmatic Approach and Policy-Based Loan for Subprogram 1 Islamic Republic of Pakistan: Sustainable Energy Sector Reform Program” (hereinafter referred to as “Program Loan”). Summary of the Program Loan is given in Table 3.1-6.

Table 3.1-6 Summary of the Program Loan

Background	The Program Loan aims to support the 2013 National Power Policy of the Government of Pakistan to make the energy sector affordable, reliable, sustainable, and secure in order to support the country's economic growth. 1. The government approved the power policy with the goal of alleviating the chronic energy crisis that has crippled the industries and caused social unrest. The government agreed with the International Monetary Fund (IMF), under the extended fund facility (EFF), to reduce the energy sector's burden on the annual state budget and its negative impact on economic growth. 2. The government has met the requirements for the first and second IMF reviews. 3. The program is fully coordinated with the EFF. Based on the findings and lessons from previous interventions, the government needs support to realize and sustain the reforms set out in the power policy.
Duration	Five years (from 2013 to 2017)
Disbursement condition	The program consists of five annual subprograms that support the government's reform initiatives as outlined in the power policy, and specifically cover medium- to long-term issues in three areas: (i) managing tariff and subsidies with revised and updated policies and guidelines to create a self-sustaining tariff regime, (ii) improving energy sector performance and the market environment to encourage participation by private entities, and (iii) increasing accountability and transparency through public disclosure on the progress of the reforms and the performance of sector participants. 1. Subprogram 1: All ten policy conditions for subprogram 1 were met by 31st March 2014. 2. Subprogram 2: Subprogram 2 has ten indicative policy conditions that cover all three reform areas and are to be completed by January 2015. 3. Subprograms 3 to 5 Subprograms 3 to 5 are intended to continue to build on the reforms begun under subprograms 1 and 2, with indicative policy actions in each of the three reform areas to be carried out by January 2016, 2017, and 2018.
Policy matrix	The policy matrix lists actions to be taken prior to board consideration for subprogram 1, and proposed policy actions for subsequent subprograms.

Source: Proposed Programmatic Approach and Policy-Based Loan for Subprogram 1 Islamic Republic of Pakistan: Sustainable Energy Sector Reform Program, April 2014, ADB

According to the policy matrix of the Program loan, the Government of Pakistan must be completed by the deadline on 31st December 2014.

Policy Matrix

MOWP issues regulation(s) on (i) MEPS for at least three energy-intensive consuming appliances or technologies and (ii) appliance labelling.

3.1.2 ES&L Framework in Other Countries and Its Feasibility in Pakistan

The MEPS program of electrical appliances was introduced during the oil crisis in the 1970s and 1980s in the United States (by the National Appliance Energy Conservation Act in 1987), as well as in Europe and many other countries.

Japan adopted an average standard value method by measuring the equipment and appliances prescribed in Clause 2, Article 78 of the Energy Conservation Acts and adopted the highest standard value method, namely the "Top Runner Program" in 1998. In the Top Runner Program, manufacturers and importers do not affix the labels on the product but submit an annual report on manufacturing and import. Japan's Ministry of Economy, Trade and Industry (METI) manages the Top Runner Program and energy labelling program including removal of appliances of lower efficiency.

In India, the Energy Conservation Act was introduced in 2001, and the Bureau of Energy Efficiency (BEE) was established as the energy saving promoting body. The Energy Labelling Program was started in 2006. As a mandatory program in 2010, it was implemented for four types of appliances, namely, refrigerators, air conditioners, tube fluorescent lamps, and transformers. The value of MEPS is to define the lowest rank of energy label. The appliances without energy labels will be withdrawn from the retail shops and markets overall.

Feasibility of the MEPS and the Top Runner Program in Pakistan is shown in Table 3.1-7. Because adoption of the Top Runner Program is so risky in Pakistan in view of protection of consumers because the Top Runner Program requires higher innovation than MEPS.

Table 3.1-7 Feasibility of MEPS and the Top Runner Program in Pakistan

	MEPS	Top Runner Program
Specification	Criteria are set within factor of appliances of high energy efficiency at present.	Criteria are set beyond factor of appliances of high energy efficiency at present (with consideration of future prospects and their performance and technical development).
Advantage	Methodology of criteria is relatively easy. Manufacturer burden is relatively small.	Energy efficiency effect is relatively high.
Disadvantage	Energy efficiency effect is relatively low.	Manufacturer burden is large. Methodology of criteria is relatively difficult (future prospect).
Evaluation	Recommended	

Source: Prepared by the JICA Survey Team

As mentioned in Chapter 2, the BRESL program of UNDP covers six countries: Pakistan, China, Bangladesh, Vietnam, Indonesia, and Thailand. The MEPS and labelling program is already implemented in Indonesia, Vietnam, Thailand, and China. MEPS values are different in the six countries, but MEPS framework is almost the same.

The EE&C Bill was submitted to the Parliament. The regulations on MEPS and energy labelling will be arranged after enactment of the EE&C Bill. Then, Pakistan will start the MEPS and energy labelling program. ENERCON of MOWP will examine the standards of

MEPS and energy labelling of six appliances with support from the BRESL project of UNDP. The priority of ENERCON is to establish standards of MEPS in 2014 for three appliances, namely, fans, CFL, and motors.

The number of appliances and indicated method for labelling programs in other countries are shown in Table 3.1-8. Two indicated methods (i.e., endorsement label and star-rating label) exist, but very few countries adopt the endorsement label. In case of adopting the star-rating label, the number of evaluation steps is set at five or more in almost all countries.

The target appliances for MEPS and energy labelling in Pakistan, India, and Japan are shown in Table 3.1-9.

The comparison of framework of MEPS and energy labelling in Pakistan, India, and Japan are shown in Table 3.1-10.

Table 3.1-8 Number of Appliances and Indicated Method for Labelling Program in Other Countries

No.	Country	Indicated Method		Number of Appliances
		Endorsement Label	Star-rating Llabel	
1	Indonesia	-	X (4 steps)	9
2	Vietnam	X	X (5 steps)	9
3	Malaysia	-	X (5 steps)	8
4	Thailand	-	X (5 steps)	14
5	Philippine	X	- (under preparation)	4
6	India	-	X (5 steps)	14
7	China	-	X (3 or 5 steps)	26
8	Hong Kong	-	X (5 steps)	5
9	Taiwan	-	X (5 steps)	6
10	Saudi Arabia	-	X (6 steps)	3
11	UAE	-	X (5 steps)	1
12	Turkish	-	X (7 steps)	6
13	Egypt	-	X (5 steps)	5
14	Nigeria	-	-	-
15	South Africa	-	X (7 steps)	4
16	Mexico	X	-	18
17	Brasil	-	X (5 steps)	3
18	Russia	-	X (9 steps)	17

Source: Prepared by the JICA Survey Team based on the survey report of energy efficiency activities in other countries regarding home electrical appliances, December 2013, JEMA

Table 3.1-9 Appliances and Equipment of MEPS and Energy Labelling Program in Pakistan and Other Countries

No.	Country	Pakistan	India	Japan	
	Appliances and Equipment	MEPS and Energy Labelling	MEPS and Energy Labelling	Top Runner	Energy Labelling
1	Air conditioners	X (Plan)	X (Mandatory)	X	X
2	Television receivers (TVs)		X	X	X
3	Electric refrigerator	X (Plan)	X (Mandatory)	X	X
4	Electric rice cookers			X	X
5	Microwave ovens			X	X
6	Washing machines		X		
7	Compact fluorescent lamp (CFL)	X (Plan)		X	X
8	Tube fluorescent lamp (TFL)		X (Mandatory)	X	X
9	Ballast	X (Plan)	X		
10	Electric toilet seats			X	X
11	DVD recorders			X	X
12	VCRs			X	
13	Space heaters		X (Plan, Kerosene)	X	X
14	Heat pumps		X (Future)		
15	Gas cooking appliances			X	X
16	Gas water heaters			X	X
17	Oil water heaters			X	X
18	Electric water heater			X	
19	Computers		X	X	X
20	Printer			X	
21	Magnetic disk units			X	X
22	Transformers		X (Mandatory)	X	X
23	Motors for well pumps	X (Plan)	X		
24	Fans (including ceiling fan)	X (Plan)			
25	Ceiling fans		X		
26	Industrial fans and blowers		X (Plan)		
27	Compressors		X (Plan)		
28	Commercial freezers		X (Plan)		
29	Boilers		X (Plan)		
30	Copying machines		X	X	
31	Uninterrupted power supply		X (Plan)		
32	Vending machines			X	
33	Passenger vehicles		X (Plan)	X	
34	Freight vehicles		X (Plan)	X	
35	Routers			X	
36	Switching units			X	

Symbol: X: implemented voluntarily, X (Mandatory): implemented mandatorily, X (Plan): under planning

Source: Top runner program, METI, Japan; Progress in and Issues on S&L Policy in Republic of India, Mr. Girish Sethi, TERI; ENERCON website

Table 3.1-10 Framework of MEPS and Energy Labelling Program in Pakistan and Other Countries

No.	Items	Pakistan	India	Japan
1	EE&C Acts	Under deliberation	Enacted	Enacted
2	Regulation on MEPS	None	Notification on Energy Labelling Program by BEE	Cabinet Order and Ministry Audience on Top Runner Program
3	Regulation on Energy Labelling	None	Notification on Energy Labelling Program by BEE	Ministry Audience on Energy Labelling Program by METI
4	Key Nodal Agency	ENERCON, MoWP covers: -Set MEPS and affixing label; - Impose fine to manufacture or import of appliances not to meet standards; and -Ensure display of label on appliances.	BEE, MoP covers: -Set MEPS and affixing label; -Withdraw of appliances not to meet standards from markets; and -Ensure display of label on appliances.	ANRE, METI covers: -Set Top Runner Standards and Star Rating Label Standards; -Guide to improve average performance value to manufacture, sale, or import of appliances; and -Receiving annual report of production or imported amounts of objective appliances.
5	Standards	Under drafting PSQCA covers: - Formulation and implementation of national standards; - Production certification; and - Quality system certification.	BIS covers: - Formulation and implementation of national standards; - Production certification; and - Quality system certification.	Japanese Industrial Standards (JIS) covers: - Label design; - Display position; - Star-rating calculation method; and - Testing method.
6	Energy Label	Star-rating label with three stages	Star-rating label with five stages and endorsement label	Star-rating label with five stages and endorsement label
7	Performance Testing Laboratories	Laboratories accredited by the National Accreditation Council	Laboratories accredited by the National Accreditation Board of Laboratories	Manufacturers and certificated organizations conforming to JIS and IEC standards
8	Monitoring and Inspection	Field monitoring a half year by ENERCON	Field monitoring by BEE	Monitoring energy saving effects by annual report of manufacturers and importers
9	Penalties for Violations	Impose fine of Rs.50,000/- to Rs.250,000/-	Withdraw the stock of appliances from the market	Recommend to improve energy efficiency of appliances

Source: Labelling policy/procedure for grant and monitoring of energy labels in Pakistan, ENERCON; Energy efficiency standards and labelling in India, TERI/BEE; Energy Conservation Acts, Cabinet Order and Ministry Audiences, METI, Japan

3.1.3 ES&L Framework in Pakistan

1) Basic Policy

The procedure and policy for ES&L mentioned above (Section 3.1.1) is authorized by PSC after discussion and review by related stakeholders since the year of set up of the BRESL project, and it is respected by all stakeholders. The JICA Survey Team will assist the Government of Pakistan to promote ES&L regarding the three energy-intensive consuming appliances.

2) Procedure

For the effective implementation of the JICA Survey Team project on ES&L, the JICA Survey Team considers the established frameworks of ENERCON and BRESL as the best and reasonable solution.

Preparation and approval process of the JICA Survey Team is shown in Figure 3.1-3.

3) Decision on Voluntary / Mandatory

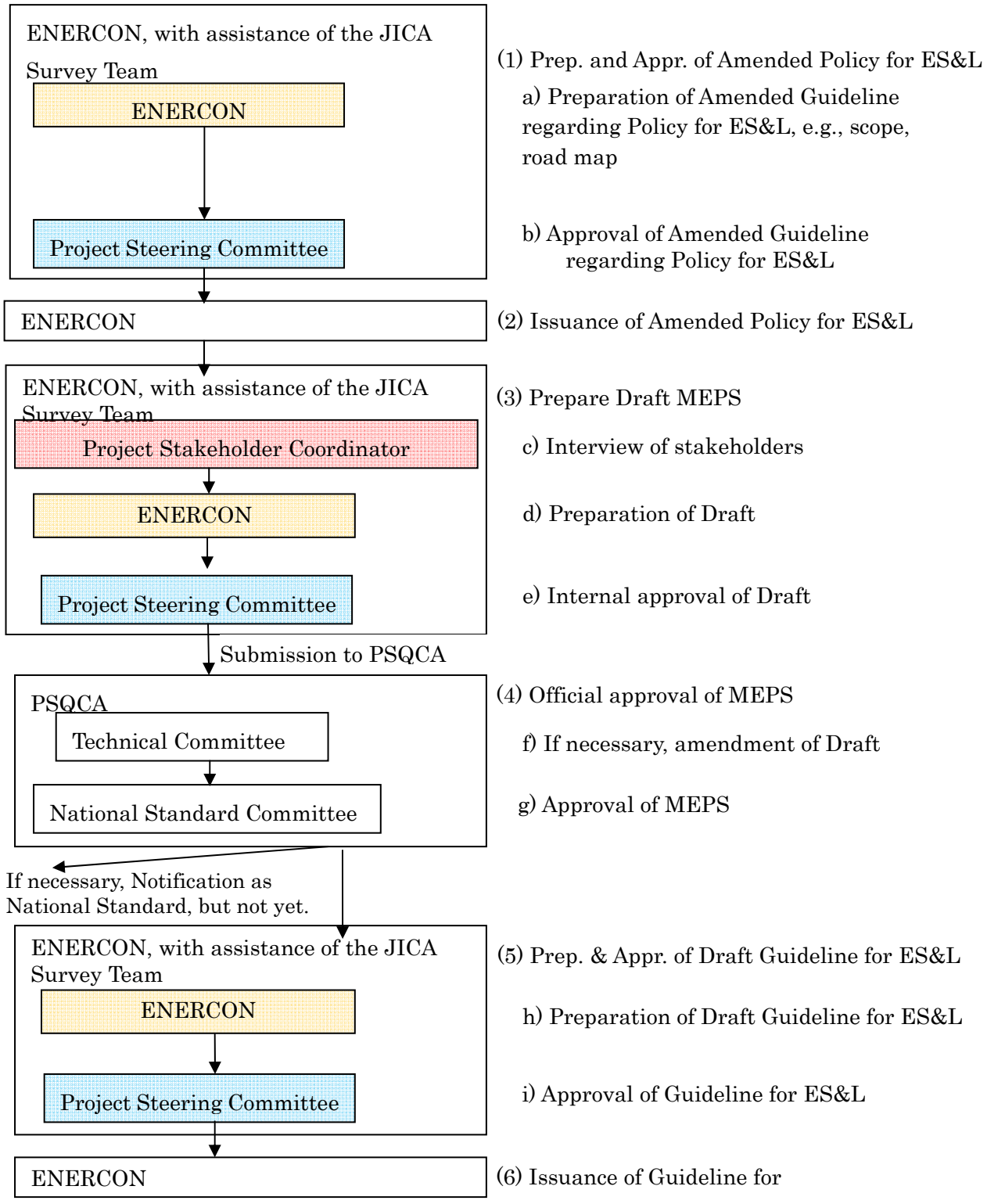
As mentioned above (Section 3.1.1), due to the decision by the Project Steering Committee, voluntary basis is selected at the beginning stage for a few years, which is general and common procedure among countries including China and India. Otherwise, mandatory basis may cause rejection from industry sectors as experienced with the fan industry in Pakistan discussing on the number of star marks. That is the reason for the BRESL project for adopting voluntary basis in Pakistan. As BRESL is afraid, “mandatory” basis should not be taken at the initial stage.

4) Decision for Unification / Non-unification

In the current BRESL scheme regarding ES&L in Pakistan, MEPS and labelling is treated unified framework.

5) Required Documents to be Prepared

Required documents to be prepared are shown in Table 3.1-11.



Source: Prepared by the JICA Survey Team referring to amendment of Figure 3.1-2

Figure 3.1-3 Preparation and Approval Process of the JICA Survey Team

Table 3.1-11 Required Documents to be Prepared

Phase	New/ Amend	Legal Framework	Name of Document	Preparation	Approval	Issuance
Voluntary	Amend (by notification letter)	Guideline authorized by Fed. Gov.	Labelling Policy / Procedure for Grant and Monitoring of Energy Labelling in Pakistan	ENERCON	Project Steering Committee	ENERCON
	New	National Standard based on PSQCA Act	Pakistan Standard: Minimum Energy Performance Standard (MEPS) for Name of Appliances	ENERCON	PSQCA	ENERCON
	New	Guideline authorized by Fed. Gov.	Minimum Energy Performance Standard (MES) for Name of Appliances	ENERCON	Project Steering Committee	ENERCON
Mandatory	New	Ordinance	Statutory Order regarding specifying of Name of Appliances due to clauses (b) and (d) of Section 9 of the Energy Efficiency and Conservation Act, 2014	ENERCON*1	PEECB*3	MOWP
	New	Ordinance	Statutory Order regarding Norms of Name of Appliances due to clauses (a) of Section 9 of the Energy Efficiency and Conservation Act, 2014	ENERCON*1	PEECB*3	MOWP
	New	Ordinance	ENERCON (Name of Appliances) Regulations due to clause (d) of Section 9 of the Energy Efficiency and Conservation Act, 2014	ENERCON*2	PEECB*3	MOWP

Legal Framework
1.Parliament Act/Ordinance
2.President Ordinance
3. Prime Minister Order
4. Cabinet Order
5.Minister order/direction/instruction
6.Department enforcement/implementer
*1: clause (v) of Sec. 6
*2: clause (iv) of Sec. 6
*3: clause (e) of Sec. 4

Source: Prepared by the JICA Survey Team

3.1.4 Draft MEPS Against Three Appliances (Fans, CFLs, and Motors)

ENERCON is currently preparing the MEPS standard values for fans, CFLs, and motors, out of the six items of the BRESL project. Of these the draft standards of MEPS for fans have been prepared.

Currently, ENERCON is in the process of preparing the draft MEPS for CFLs and motors with support from UNDP. It is scheduled to finish by December 2014. The copy of the final MEPS for fans has already been provided by ENERCON.

3.1.5 Methodology for Selecting Target Appliances for Additional MEPS

The target appliances for additional MEPS and energy labelling program are selected from energy intensive appliances and appliances which are most commonly used in the household sector.

Due to lack of data related to the electricity consumption rate in the household sector in Pakistan, a survey is being carried out to determine electricity consumption of the housing as well as retail shop sectors. This survey is being implemented through interviews of manufacturers and the housing sector during the first and the second phase of the survey in order to grasp the electricity consumption rate of both sectors.

The following are the criteria for determining the energy intensive appliances for ES&L:

① To exclude the appliances studied and selected by BRESL in 2014;
② Additional three appliances with higher ranking in terms of energy intensity; and
③ Additional three appliances with large energy saving potential.

The additional home appliance candidates are shown in Table 3.1-12.

Table 3.1-12 Additional Home Appliance Candidates for ES&L

No.	Candidate Appliances and Equipment	Energy Consumption	Energy Saving Potential*
1	Refrigerator	1,400 GWh	50%
2	TV receiver	1,900 GWh	30%
3	Tubular fluorescent lamp	300 GWh	25%
4	Microwave oven	80 GWh	10%
5	Washing machine	100 GWh	

(*) Data of energy saving ratio in Top Runner Program, Japan

Source: Prepared by the JICA Survey Team

3.2 Selection of Target Electrical Appliances for Additional MEPS

3.2.1 Selection of Target Electrical Appliances for Additional MEPS and Schedule

According to the criteria reviewed in Section 3.1.5, the following are selected as the additional potential appliances for Pakistan ES&L:

① Television receivers
② Tubular fluorescent lamps
③ Microwave ovens.

Fans, air conditioners, and CFLs are already selected and studied by BRESL. Refrigerators are further selected as target appliances of the BRESL project in the second phase.

3.2.2 Procedure for Appliances Not Reaching the Required EE&C Efficiency Rate

In ENERCON draft paper a fine of Rs.50,000 to Rs.250,000 is imposed on the person who commits a second violation. According to Article 17 of the EE&C Bill 2013, ENERCON has the power to remove appliances with lower efficiency which are manufactured, imported, or sold.

Levels of violation are as follows:

1) Violation Level A: The test results of samples indicate non-conformance to the specified MEPS.
2) Violation Level B: Label placed/affixed on an unqualified / unauthorized product.

3) Violation Level C: Design of label is not according to the approved pattern.

4) Violation Level D: Label is not affixed properly or not affixed at an appropriate place on products/ packaging.

3.2.3 Indication Method

(In the ENERCON draft MEPS, the label only has three stages of star-ratings, but introduction of the endorsement label is necessary for indicating energy saving products. Fans, air conditioners, and refrigerators are suitable for affixing star-rating labels. Products such as normal motors and high efficient motors for which specification and efficiency are specified in international standards, ISO, are suitable for affixing an endorsement label).

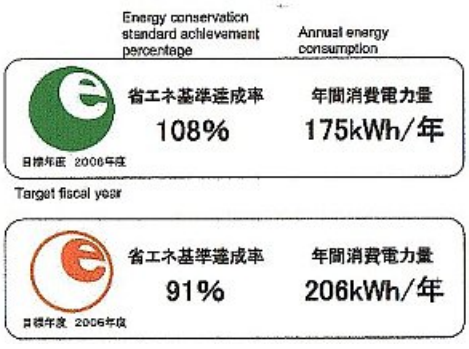
The star-rating label drafted by ENERCON is shown in Figure 3.2-1. For comparison, a star-rating label and endorsement label used in Japan are shown in Figures 3.2-2 and 3.2-3, respectively.

Source: Webpage of ENERCON

Figure 3.2-1 Star-rating Label of ENERCON

Source: Webpage of METI

Figure 3.2-2 Star-rating Label from Japan



Source: Webpage of METI

Figure 3.2-3 Endorsement Label from Japan

3.2.4 Penalty

Penalty in the event that an appliance does not comply with ES&L is summarized in Table 3.2-1.

Table 3.2-1 Penalty in the Event that Appliance Does Not Comply With ES&L

Phase	Penalty
Voluntary	Fine penalty and suspension/withdrawal of licence, based on Sec. 16 of 'Label Policy'
Mandatory	Prohibition of manufacture or sale or purchase or import of equipment or appliance specified under the EE&C Act.

Source: Prepared by the JICA Survey Team

3.2.5 Allocation of Administrative Responsibilities

For the implementation of MEPS, ENERCON takes the central role and shares responsibility with concerned organizations. The plan of ENERCON is shown in Table 3.2-2.

Table 3.2-2 Labelling Responsibilities by Organization and by Task as Planned by ENERCON

Player / Tasks	ENERCON	PSQCA	PCSIR	Manufacturer, Importer	Others
Quality standards		X			
Safety standards		X			
Testing protocol and standards		X			
Criteria of MEPS and star-rating	X				
Committee of MEPS and labelling	X (Chairman)	X (Member)	X (Member)	X (Member)	MOIP (Member)
Testing of EE performance		X	X	X	Accredited laboratory
Accreditation of testing laboratory					PNAC
Manufacturing or import of appliances				X	
Registration of appliances	X (Register)			X (Application)	
Evaluation committee for application	X (Head)				MoWP, MoST, MoIP,
Publication of registered appliances	X				
Printing of label				X	
Affixing of label				X	
Field monitoring of label	X	X (Collaboration)			
Imposing of fine	X				
Withdrawing of products not conforming to MEPS from market	X (by EE&C Bills)				
Energy saving effects of implementation of MEPS	X				
Research and development of EE&C equipment	X				MoIP
Purchasing of appliances with label					Consumer, Governmental organization,

Source: Labelling policy/ procedure for grant and monitoring of energy labels in Pakistan, ENERCON; and gathered data of the JICA Survey Team

3.3 Review of Draft MEPS for Fans

Review of the ENERCON Draft MEPS for fans is discussed below.

3.3.1 Scope

The scope of MEPS for fans is from table electric fans with blade of 200 mm in diameter to ceiling fans with blade of 1,800 mm in diameter. Small table fans (200 to 600 mm) are recommended to be out of the scope of MEPS because of their small electricity consumption.

Production data of ceiling fans in Pakistan is shown in Table 3.3-1. More than 70% of annual production of fans has a blade of 900 mm or larger in diameter. The unknown category may include fans with blade of 900 mm or larger in diameter.

Table 3.3-1 Production Data of Ceiling Fans in Pakistan

Diameter of Fan	36'' (=900 mm)	48'' (=1,200 mm)	56'' (=1,400 mm)	64'' (=1,600 mm)	Un known	Total
Number of type	20	163	247	1	252	684
Percentage of type	2.9%	23.8%	36.1%	0.1%	36.8%	100%
Number of annual products	2,041,000				743,000	2,784,000
Percentage of annual products	73.3%				26.7%	100%

Sources: Prepared by the JICA Survey Team based on Data Collection and Estimation of Appliance Population (November 2010, BRESL)

3.3.2 Regulation Values

Energy performance values are specified in MEPS for fans by ENERCON as shown in Figure 3.3-2. These MEPS values are too high for domestic manufacturers to continue manufacturing of ceiling fans.

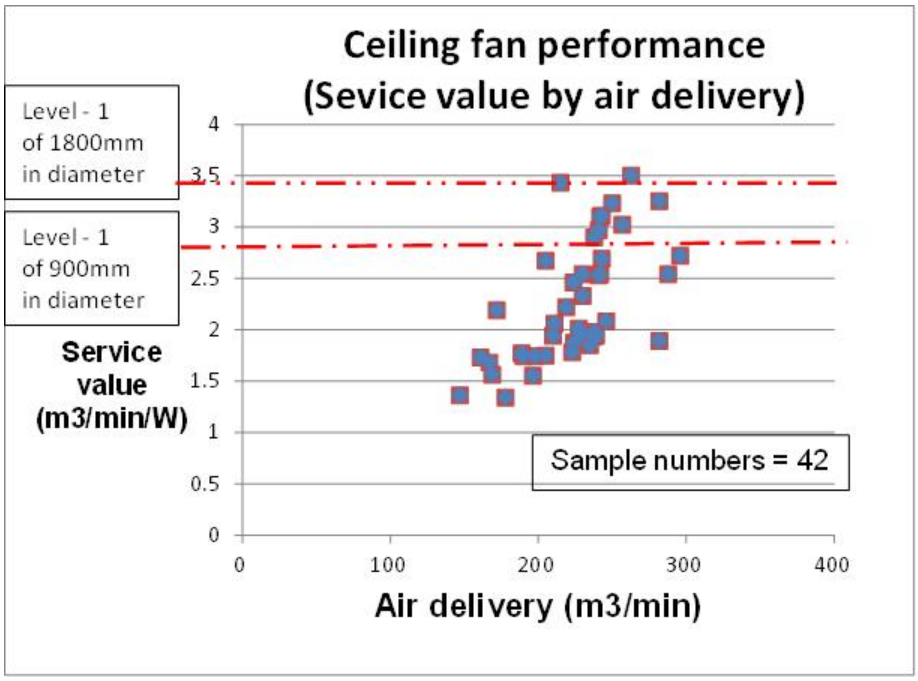
Test data of energy performance value of 42 sets of ceiling fans from studies carried out by GTZ in 2010 is shown in Figure 3.3-1. When MEPS for fans of 900 mm sweep is 2.75, 80% of fans do not pass the criteria of MEPS; when MEPS of fans of 1,800 mm sweep is 3.47, only two sets of fans pass the criteria of MEPS.

Technology development for improvement of energy efficiency level of fans is recommended to be supported by ENERCON for manufacturers to pass most of their products of fans to the criteria of MEPS during the voluntary period of the MEPS program.

Table 3.3-2 Energy Performance Values for AC Electric Fans

Product Type	Sweep (mm)	Energy Performance / Service Value (m^3/(min W))		
		Energy Efficiency Level / Star		
		1	2	3
		Level-1 1 star	Level-2 2 star	Level-3 3 star
Ceiling fans (capacitor type)	900	2.75	2.87	2.95
	1,050	2.79	2.93	3.10
	1,200	2.93	3.08	3.22
	1,400	3.15	3.32	3.45
	1,500	3.33	3.52	3.68
	1,800	3.47	3.67	3.81

Source: Minimum Energy Performance Standards (MEPS) for Fans, EES01/2013, ENERCON



Source: Final report of development of energy efficiency standards and labelling program, July 2010, GTZ

Figure 3.3-1 Ceiling Fan Performance on Service Factor by Air Delivery

3.3.3 Equipment and Standards for Measurement

There are three sets of testing facilities for performing tests on fans in Pakistan, but there is only one accredited testing facility in the center of the Pakistan Council of Scientific and Industrial Research (PCSIR) in Lahore. It takes five days to conduct an energy performance test, and so testing of fans is to be enforced.

3.4 Review of Draft MEPS for CFLs

Review of the ENERCON Draft MEPS for CFLs is discussed below.

3.4.1 Scope

The scope of MEPS for CFLs is with nominal power rating from 3 to 60 W. Small CFLs (up to 4 W) are recommended to be out of the scope of MEPS because of their small electricity consumption, because CFLs of 3 W and 4 W consume low energy and also performance specifications of CFL of 3 W and 4 W are not specified in IEC 60901, 2007 that is single-capped fluorescent lamps – performance specifications 8 W CFL, equivalent 40 W incandescent light bulb, or over is used generally.

The lowest class of label grade of CFLs in BRESL countries is shown in Table 3.4-1. The lowest class of energy label grade is defined 5 W or over in almost all BRESL countries, CFLs of 3 W and 4 W have low relevance for energy label.

Table 3.4-1 Lowest Class of Energy Label Grade of CFLs in BRESL Countries

Countries	Lowest Class of Energy Label Grade in Capacity
Pakistan	5 W to 8 W
Bangladesh	NOT classified in capacity
Indonesia	5 W to 9 W
Thailand	5 W to 8 W
Viet Nam	5 W to 8 W
China	5 W to 8 W

Sources: Prepared by the JICA Survey Team based on the presentation document for lites.asia - Seventh Regional Meeting 22nd-23rd April 2103

3.4.2 Regulation Values

Regulation value of the MEPS program in Pakistan is drafted based on that of China. The energy efficiency values of Pakistan are about 10% lower than that of the Top Runner Program in Japan as shown in Table 3.4-1. The energy efficiency values of Pakistan are recommended to be lifted by about 10% to promote energy saving in households in the future.

Table 3.4-2 Comparison of Energy Efficiency Values (lm/W) in Pakistan and Japan

Rated Wattage	Color Temperature	Pakistan: MEPS Program	Japan: Top Runner Program
		EE value (lm/W)	EE value (lm/W)
10 W	5,000 to 6,500 K	50	55.0
	2,700 to 4,000 K	52	60.6
15 W	5,000 to 6,500 K	54	60.8
	2,700 to 4,000 K	57	67.5
25 W	5,000 to 6,500 K	58	69.5
	2,700 to 4,000 K	61	69.1

Sources: MEPS for CFL EES-02/2013, Pakistan. Top-runner Program/ 2010, METI, Japan

3.4.3 Equipment and Standards for Measurement

Three facilities for measurement of performance of CFL are installed in Pakistan according to the feasibility study report of BRESL in 2013, but these three facilities are not accredited by any accreditation body.

3.5 Review of Draft MEPS for Motors

Review of the ENERCON Draft MEPS for Motors is discussed below.

3.5.1 Scope

The scope of MEPS for motors is with nominal power rating from 0.5 to 7.5 HP. Larger motors (up to 75 HP = 55 kW) of low tension are recommended to be covered by the MEPS because they are used in industrial and commercial sectors in general.

3.5.2 Regulation Values

The specifications of induction motors are prepared in accordance with the energy efficiency rating of IEC 60034-30-1. The minimum energy efficiency values of motors in Pakistan are indicated in Table 3.5-1 of the MEPS for AC induction motors EES 04/7-2011, which correspond to the values of IEC 60034-30-1.

However, the energy efficiency star labels for motors are not indicated in the MEPS for AC induction motors, EES 04/7-2011. High efficiency type motors of IE2 are recommended to be set as the motors of minimum energy efficiency value because standard efficiency type motors of IE1 are not energy efficient.

Since the IEC standards for AC motors is prepared, most countries have not implemented energy efficiency labelling programs for AC motors because high efficiency type motors are manufactured according to the IEC standards of IE2 and IE3. Especially high efficiency type motors have to be mounted to equipment and machines exported to the USA according to USA regulations, therefore high efficiency type motors are considered as MEPS in many countries.

India implements MEPS and energy efficiency labelling program for AC motors, in which high efficiency type motors of IE2 are level 1 under the star-rating value, as shown in Table 3.5-1. IE2(+) is the intermediate value between IE2 and IE3 in Table 3.5-2.

Recommended star-rating values of four pole high efficiency motors are shown in Table 3.5-3.

Induction motors of small capacity are being manufactured, but motors of large capacity for industrial use are not being manufactured in Pakistan. Manufacturers of motors for industrial

use have to be developed with governmental support to promote electricity saving in factories and export of equipment to the USA, Japan, etc.

The USA, Canada, and other countries ban both manufacturing and importing of induction motors and equipment with induction motors rated below IE2 level. Therefore, in the 1990s, Japan had difficulties to export induction motors because of the lack of regulatory framework to promote manufacturing of high efficiency induction motors.

Pakistan should be aware of such historical facts. One of the best solutions for enhancement and promotion of induction motors is for the Government of Pakistan to provide support and subsidy. Manufacturers of motors in Pakistan require both technical transfer and financial support in installing new manufacturing facilities and conducting efficient operation and maintenance to produce and export improved induction motors. As mentioned above, Japan is one of the best countries to understand the details and the necessity for introduction of institutional implementation of high efficiency induction motors. As an example, Pakistan should consider technical transfer from Japan, which had accumulated experience to clear such difficulties in the 1990s.

Table 3.5-1 Star-rating of AC Motors of the Labelling Program in India

Star Rating	Motor Efficiency Class
1 Star	≧IE2 & < IE2(+)
2 Star	≧IE2(+) & < IE3
3 Star	>=IE3 & < IE3(+)
4 Star	>=IE3(+)& < IE3(++)
5 Star	≧ IE3(++)

Sources: Schedule-6 energy efficient three phase squirrel cage induction motors, 2013, India

Table 3.5-2 Value of Performance Characteristics of Four Pole Energy Efficient Motors in India

Rated Output	Nominal Efficiency %				
	Star I	Star 2	Star 3	Star 4	Star 5
	IE2	IE2(+)	IE3	IE3(+)	IE3(++)
KW	Percent	Percent	Percent	Percent	Percent
0.37	70.1	71.6	73.0	74.5	76.0
0.55	75.1	76.6	78.0	79.5	81.0
0.75	79.6	81.1	82.5	84.1	85.6
1.1	81.4	82.8	84.1	85.8	87.4
1.5	82.8	84.1	85.3	86.7	88.1
2.2	84.3	85.5	86.7	88.2	89.7
3.7	86.3	87.4	88.4	89.6	90.7
5.5	87.7	88.7	89.6	90.9	92.1
7.5	88.7	89.6	90.4	91.5	92.6
11.0	89.8	90.6	91.4	92.5	93.6
15.0	90.6	91.4	92.1	93.1	94.0
18.5	91.2	91.9	92.6	93.5	94.3
22.0	91.6	92.3	93.0	93.9	94.7
30.0	92.3	93.0	93.6	94.3	95.0
37.0	92.7	93.3	93.9	94.6	95.3
45.0	93.1	93.7	94.2	94.9	95.6
55.0	93.5	94.1	94.6	95.2	95.8

Sources: Schedule-6 energy efficient three phase squirrel cage induction motors, 2013, India

Table 3.5-3 Recommended Star-rating of Four Pole Energy Efficient Motors in Pakistan

Rated Output		Nominal Efficiency %		
		Star I	Star 2	Star 3
		IE2	IE2(+)	IE3
HP	KW	Percent	Percent	Percent
0.5	0.37	70.1	71.6	73.0
	0.55	75.1	76.6	78.0
1	0.75	79.6	81.1	82.5
	1.1	81.4	82.8	84.1
2	1.5	82.8	84.1	85.3
3	2.2	84.3	85.5	86.7
5	3.7	86.3	87.4	88.4
7.5	5.5	87.7	88.7	89.6

Source: Prepared by the JICA Survey Team

3.5.3 Equipment and Standards for Measurement

A testing machine for measurement of performance of AC motors, which have capacity of less than 2 kW and without torque meter, is installed in PCSIR's laboratory in Lahore. PCSIR has a plan of introducing a measurement machine for motors with torque meter at the Lahore Laboratory.

3.6 Television Receiver as Additional MEPS

3.6.1 Scope

This standard specifies the energy efficiency levels, minimum allowable values of energy efficiency, high energy performance values/evaluating values of energy conservation test methods, and inspection rules of television receivers (TVs). This standard shall apply to the following types and sizes of TVs commonly used in Pakistan, with supply voltage of 230 V, 50 Hz, or range of 220-240 V, 50 Hz:

- Liquid crystal display (LCD) TVs, plasma TVs, and light emitting diodes (LED) TVs.

3.6.2 Terms and Definitions

The following terms and definitions apply to this standard.

1) Television receivers

A commercially available electronic product designed primarily for the display/direct viewing and reception of audio visual signals from terrestrial, cable, satellite, Internet Protocol TV (IPTV), or other transmission of analog and/or digital signals, consisting of a tuner/receiver and a display encased in a single housing. The product usually relies upon a Cathode Ray Tube (CRT), Liquid Crystal Display (LCD) with Cold Cathode Fluorescent Lamp (CCFL) backlight, and Light Emitting Diode (LED) backlight and Plasma Display. TV is an acronym of television.

2) Power Modes

The consumption of power in the modes mentioned below follows the definition of clauses as mentioned in IEC 62301–Household electrical appliances measurement of standby power.

Table 3.6-1 Power Mode of Television receivers

Power Modes	Definition
Standby power mode	As per clause 3.6 of IEC 62301
Active Mode	As per clause 3.8 of IEC 62301

Source: Summaried by JST based on IEC 62301

3) Energy consuming efficiency

Energy consuming efficiency for evaluating the performance of TVs is annual power consumption calculated from the test in Section 3.6.5.

4) Minimum Values of annual power consumption

Minimum Values of annual power consumption pertaining to energy efficiency rating shall not be less than Star-1 as mentioned in this standard in section 3.6.4, under the specific test conditions.

3.6.3 Regulation Values

The following documentary standard, through reference in this text, constitute the provision of this standard. The latest edition of the normative document is applicable to this standard:

- IEC 60107-1: Method of measurement on receivers for television broadcast transmissions – Part 1: General conditions – Measurement at radio and video frequencies)
- IEC 60107-2: Method of measurement on receivers for television broadcast transmissions – Part 2: Audio channels – General methods and methods for monophonic channels
- IEC 60107-3: Method of measurement on receivers for television broadcast transmissions – Part 3: Electrical measurements on multichannel sound television receivers using subcarrier systems
- IEC 62301: Household electrical appliances – Measurement of standby power
- IEC 62087: Method of measurement for power consumption of audio, video and related equipment
- JIS C 6101-1: Method of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies
- JIS C 6101-2: Method of measurement on receivers for television broadcast transmissions – Part 2: Audio channels – General methods for monophonic channels
- JIS C 6101-3: Recommended method of measurement on receivers for television broadcast transmissions – Part 3: Electrical measurements on multichannel sound television receivers using subcarrier system)
- Indian labelling standard: Schedule No. 11 Color Televisions
- PS (Pakistan Standards): To be examined

The methods for measuring energy efficiency performance are as follows:

1) Determination of energy consumption efficiency

Efficiency of energy consumption expressed in kWh/year is calculated by the following formula:

$$E = \frac{(Po - PA/4) \times t1 + Ps \times t2}{1{,}000}$$

Source: Final report of committee on standards for judgment of TV's performance, METI, Japan

In this formula, E, Po, Ps, PA, t1, and t2 are as follows:

E: Annual energy consumption [kWh/year]

Po: Operational power [W]

Ps: Power on standby [W]

PA: Reduction in power consumption due to energy-saving function [W]

t1: Annual operating standard time [hours] 2,920 (365 days x 8 hours) *1

t2: Annual standby condition standard time [hours] 5,840 (365 days x 16 hours) *2

Note: *1 Annual operating standard time is time on mode, which is average 6 hours according to interview survey by the JICA Survey Team in Islamabad, Lahore and Karachi in June 2014.

*2 Annual standby condition standard time is 18 hours/day in Japan and 12 hours/day in India, therefore the standby time is 12 hours/day in Pakistan.

3.6.4 Labelling Criteria

Television receivers' energy-efficiency level criteria are described below.

The star-rating criteria of television receivers in Japan and in India are shown in Table 3.6-1.and Table 3.6-2, respectively. The time on mode is 4.5 hours/day in Japan and 6 hours/day in India, and so annual energy consumption in India is more than that of Japan. The time on mode in Pakistan is 6 hours, same as in India, according to research on EE&C consciousness and energy demand by the JICA Survey Team in 2014. The recommended star-rating criteria for LCD TVs in Pakistan are shown in Table 3.6-3.

The criteria of MEPS and star-rating of TVs are recommended according to the following conditions:

a) The time on mode is 6 hours.

b) The model of criteria is that of India to be enacted in 2016.

c) Criteria of Star 1 and Star 3 are that of Star 1 and Star 5, respectively, of India's star-rating.

Table 3.6-2 Star-rating Criteria of Television Receivers in Japan

Type	Display Size	Equation	Star-rating (kWh/year)			
			Star 1	Star 2	Star 3	Star 4
Normal	24 inch	2.0S+6	54	45	38	33
	32 inch	6.6S-141	70	58	49	43
	42 inch	6.6S-141	136	113	95	83
FHD	24 inch	2.0S+21	69	57	48	42
	32 inch	6.6S-126	85	70	60	52
	42 inch	6.6S-126	151	125	106	92

Source: Prepared by the JICA Survey Team

Table 3.6-3 Star-rating Criteria of LCD TVs in India (Enacted on 1st January 2016)

Type	Display Size	Display Area A ($inch^2$)	Star-rating Criteria (kWh/year)				
			Star I	Star 2	Star 3	Star 4	Star 5
LCD (Normal)	Equation		0.386 A +3.5	0.350 A +3.50	0.315 A +3.50	0.280 A +3.50	0.245 A +3.50
	24 inch	250	100	91	82	74	65
	32 inch	437.6	172	157	141	126	111
	42 inch	753.8	294	268	241	215	188
LCD (LED backlighting)	Equation		0.193 A +2.63	0.193 A +2.63	0.193 A +2.63	0.193 A +2.63	0.193 A +2.63
	24 inch	250	51	46	42	38	33
	32 inch	437.6	87	79	72	64	56
	42 inch	753.8	148	135	121	108	95

Source: BEE, India

Table 3.6-4 Recommended Star-rating of Television Receivers in Pakistan

Type	Screen Size	Screen Area A ($inch^2$)	Star-rating Criteria (kWh/year)		
			Star I	Star 2	Star 3
LCD (Normal)	Equation		0.386 A+3.5	0.315 A+3.50	0.245 A+3.50
	24 inch	250	100	82	65
	32 inch	437.6	172	141	111
	42 inch	753.8	294	241	188

Source: Prepared by the JICA Survey Team

S = Screen length (inch)

A= Screen area ($inch^2$)

FHD = Full high definition

Operating condition: TV watching time = 4.5 hours/day in Japan

(Pakistan and India = 6 hours/year)

3.6.5 Equipment and Standards for Measurement

1) Measurement method of power consumption

Power consumption of TVs is implemented according to Clause 4.2, IEC 60107.

Measuring conditions are as follows:

a) Power supply voltage and frequency: rated

b) Video test signal: three vertical bars signal

c) Audio test signal(s): 1 kHz sine-wave signal(s)

d) Signal input: radiofrequency and/or baseband

e) Modulation of sound channel(s): 100 %

f) Input signal level: standard input signal level

g) Test channel for r.f. input: typical channel

h) Loading of terminals: loudspeaker terminals and baseband output terminals are terminated in accordance with standard audio output signal levels.
Loading of any ancillary circuit is included but any peripheral equipment that is powered from the receiver is excluded.

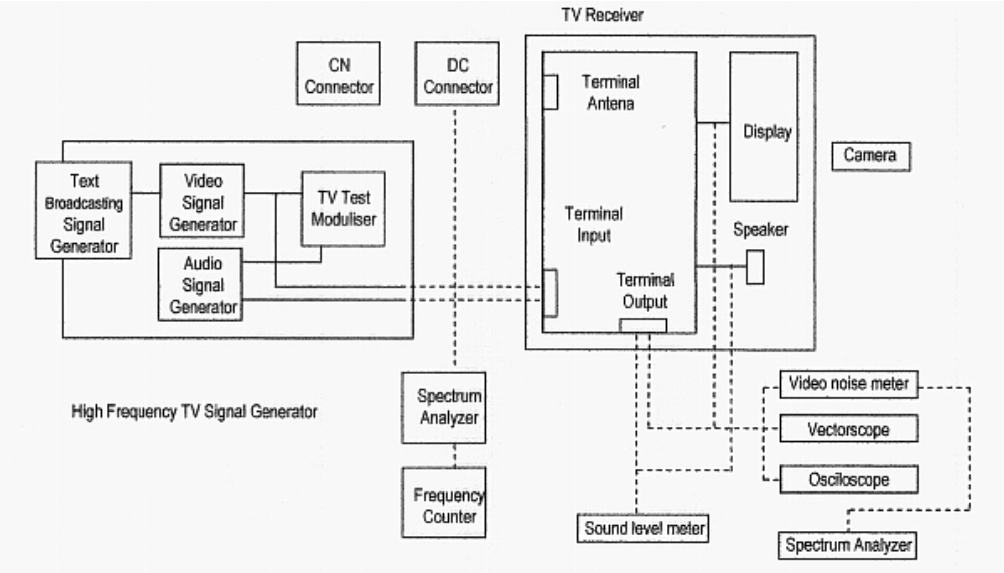
Measurement procedure is shown below:

a) Set the receiver under test to the standard settings and then adjust the contrast and brightness controls to obtain the luminance specified as standard video output level. The volume control of all the audio channels shall be set to obtain 50 mW at a 1 kHz single tone signal.

b) Measure power consumption of the receiver with an electro-dynamic wattmeter or any other wattmeter of sufficient accuracy.

2) Measurement equipment and conditions

A schematic diagram of used equipment for measurement of TV performance is shown in Figure 3.6-1.



Source: Fig. 38, IEC 60107-1

Figure 3.6-1 Schematic Diagram of Equipment for Measurement of TV Performance

The measurement devices are as follows:

a) Spectrum analyzer

b) Frequency counter

c) Video noise meters

d) Vector scope

e) Oscilloscope

f) Lux meter

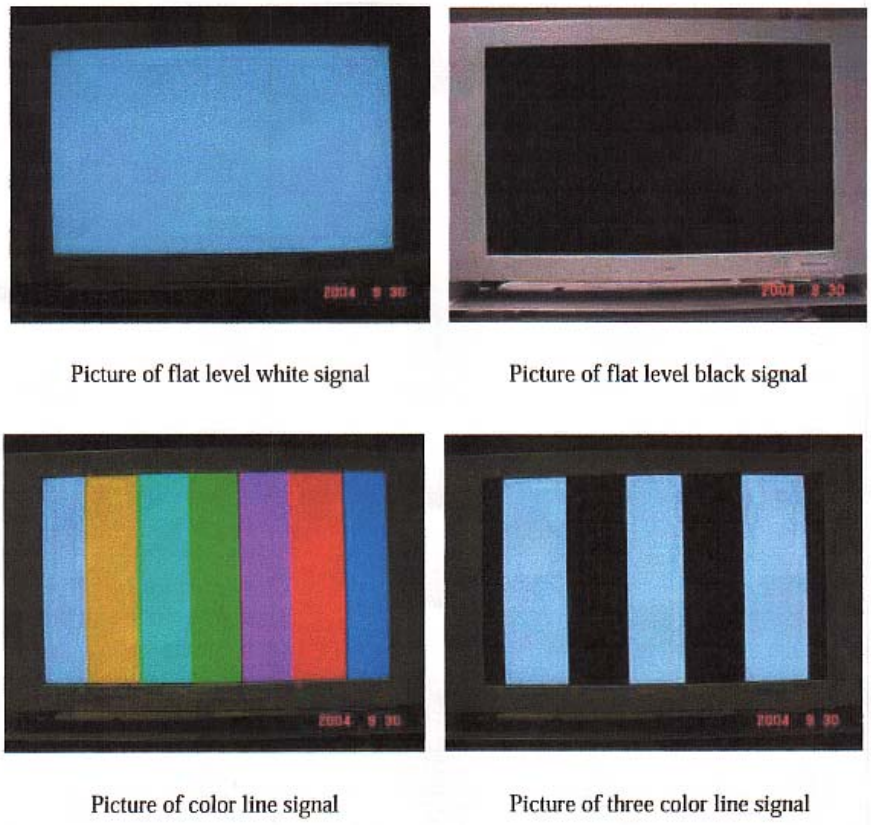
g) Sound level meter

The measurement conditions are as follows:

- Voltage and frequency action: in accordance with the standard AC voltage 220 V + 10%, 50 Hz.
- Temperature: 20-35 °C
- Humidity: 45-75% RH

The power consumption measurements conducted using the input signal are as follows:

Video input signal: flat level white signal, flat level black signal, colour line signal, and three colour signal line (refer to JIS C6101-1). The TV conditions of different input signals are shown in Figure 3.6-2.



Source: Final report of study of promotion of DSM Program in Indonesia, JICA

Figure 3.6-2 TV Conditions of Various Input Signals

3.7 Tubular Fluorescent Lamp (TFL) as Additional MEPS

3.7.1 Scope

This standard specifies the energy efficiency levels, minimum allowable values of energy efficiency, high energy performance values/ evaluating values of energy conservation test methods, and inspection rules of TFLs. This standard shall apply to the following types and sizes of TFLs commonly used in Pakistan, such as with supply voltage of 230 V, 50 Hz or range of 220-240 V, 50 Hz:

- T12 type, T8 type, and T5 type TFLs
- 4-ft TFL with wattage up to 40 W

3.7.2 Terms and Definitions

The following terms and definitions apply to this standard:

1) Tubular fluorescent lamp

Tubular fluorescent lamp is the name of double-capped fluorescent lamp. This lamp is a fluorescent lamp having two separate caps and mostly tubular form and linear shape. TFL is an acronym of tubular fluorescent lamp.

2) Initial luminous Efficacy

The initial luminous efficacy for evaluating the performance of the TFLs is the ratio of measured initial luminous flux and the measured input power of the TFL. The unit is lumens per watt (lm/W).

3) Minimum Values of Initial luminous efficacy

Minimum Values of Initial luminous efficacy pertaining to energy efficiency rating shall not be less than criteria of MEPS as mentioned in this standard in Section 3.7.4, under the specific test conditions.

3.7.3 Regulation Values

The following documentary standards, through reference in this text, constitute the provision of this standard. The latest edition of the normative document is applicable to this standard:

- IEC 60081: Double-capped fluorescent lamps – Performance specifications
- IEC 61195: Double-capped fluorescent lamps – Safety specifications
- JIS C 7617-1: Double-capped fluorescent lamps – Part 1, Safety specifications
- JIS C 7617-2: Double-capped fluorescent lamps – Part 2, Performance specifications
- IS 2418: 1977 Tubular fluorescent lamps for general lighting service
- PS (Pakistan Standards): To be examined

The methods for measuring energy efficiency performance are as follows:

1) Determination of energy consumption efficiency; and
2) Efficiency of energy consumption expressed in lm/W is calculated by the following formula:

$$E = \frac{\text{Total luminous flux (lm)}}{\text{Power consumption (W)}}$$

Source: Final report of committee on standards for judgment of fluorescent lamps performance, METI, Japan

In this formula, E, total luminous flux, and power consumption are represented as follows:

E: Energy consumption efficiency [lm/W]

Total luminous flux: Total luminous flux of fluorescent lamp [lm]

Power consumption: Power consumption of lighting fixture [W]

3.7.4 Labelling Criteria

TFLs' energy-efficiency level criteria are described below.

The star-rating criteria in Japan and India are shown in Tables 3.7-1 and 3.7-2, respectively.

All TFLs in Pakistan are imported from Thailand, Malaysia, or China. Therefore, the international standards and criteria of MEPS are recommended to be introduced for TFL in Pakistan. The energy consumption efficiency of a T8 type TFL is 86 lm/W and a T5 type TFL is 100 lm/W, as shown in Table 2.6-1. Recommended star-rating criteria of TFL in Pakistan is shown in Table 3.7-3.

The criteria of MEPS and star-rating of TFLs are recommended according to the following conditions:

1) Criteria of MEPS are 86 lm/W, which is the energy efficiency of a T8 type TFL.
2) Criteria of star-rating are 86 lm/W for Star 1 and 97.2 lm/W for Star 2, which are the energy efficiency of a T8 type TFL and a T5 type TFL, respectively.

Table 3.7-1 Star-rating Criteria of 40 W Type TFL in Japan

STAR RATING		Star 1	Star 2	Star 3	Star 4	Star 5
	Criteria of MEPS	Less than 100%	100% or over, less than 113%	113% or over, less than 127%	127% or over, less than 140%	140% or over
Lumens per watt at 100 hours of use	91.6	<91.6	>=91.6 & <103.5	>=103.5 & <116.3	>=116.3 & <128.2	>=128.2

Source: METI, Japan

Table 3.7-2 Star-rating Criteria in India

STAR RATING	Star 1	Star 2	Star 3	Star 4	Star 5
Lumens per watt at 100 hours of use	<61	>=61 & <67	>=67 & <86	>=86 & <92	>=92
Lumens per watt at 2000 hours of use	<52	>=52 & <57	>=57 & <77	>=77 & <83	>=83
Lumens per watt at 3500 hours of use	<49	>=49 & <54	>=54 & <73	>=73 & <78	>=78

Source: Prepared by the JICA Survey Team

Table 3.7-3 Recommended Star-rating Criteria of TFL of 40W Type in Pakistan

STAR RATING		Star 1	Star 2	Star 3
	Criteria of MEPS	100% or over, less than 113%	113% or over, less than 127%	127% or over
Lumens per watt at 100 hours of use	86	>=86 & <97.2	>=97.2 & <109.2	>=109.2

Source: Prepared by the JICA Survey Team

3.7.5 Performance Testing Protocol for Tubular Fluorescent Lamps:

1) General Requirement of Tests

The test for performance evaluation of TFLs shall be carried out according to the general requirements as specified in the standard IEC 60081.

2) Marking on the Lamp

Lamp shall be clearly and durably marked with at least the following mandatory markings:

a) Mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of the responsible vendor).

b) Rated voltage or voltage range (marked "V" or "volts").

c) Rated wattage (marked "W" or "Watts").

d) Rated frequency (marked in "Hz").

3) Marking on the Lamp Packing

In addition to the mandatory marking on the lamp, the following data shall be provided on the lamp packing:

a) Country of Origin

b) Rated Luminous Flux

c) Luminous Efficacy (lm/W)

d) Correlated Color Temperature (CCT)

e) Rated Life

f) A written Warrantee in at least one applicable local language

g) A local address for customer contacts and complaints

4) Lamp Wattage

Input Power shall not deviate by more than ± 15% of rated power when measured at test voltage of 230V, 50Hz.

5) Initial Luminous Flux

The initial luminous flux measured after the ageing time shall not be less than 90% of the rated luminous flux when measured at test voltage of 230 V, 50 Hz.

6) Lumen Maintenance

After 2000 h of operation, including the ageing period, the luminous flux shall not be less than 85% of the initial luminous flux.

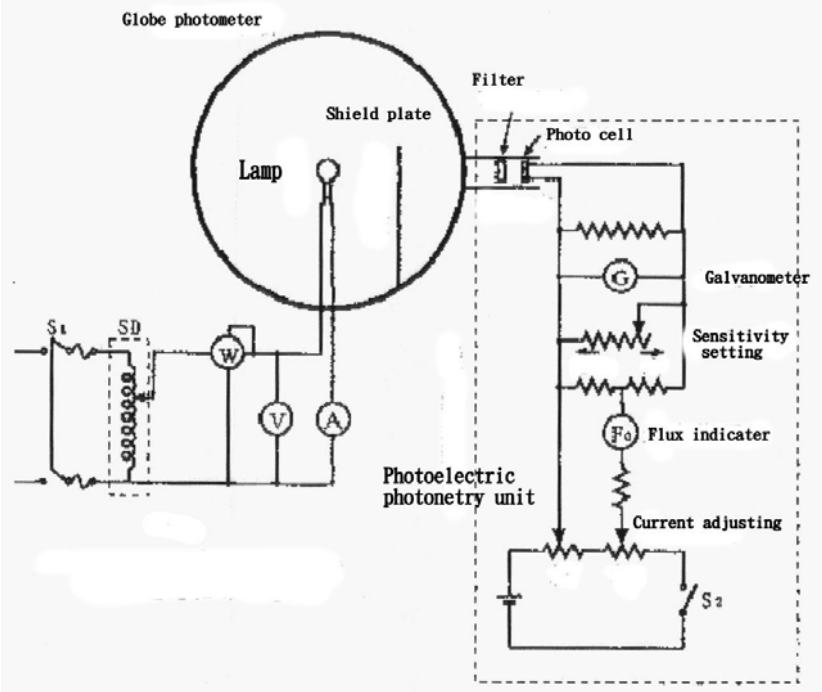
7) Life Time

A TFL shall have a minimum rated life time of 8,000 hours. The manufacturer / supplier will produce a test report showing the compliance of rated life time of a particular rating, make/ model of TFL.

3.7.6 Equipment and Standards for Measurement

A diagram of equipment for measurement of performance of TFLs is shown in Figure 3.7-1.

- Globe photometer



Source: Website of CollegeLife-Café

Figure 3.7-1 Diagram of Globe Photometer

3.7.7 Samples for Inspection and Testing:

1) Quality Acceptance Test for Market Delivery

The manufacturers / suppliers of tubular fluorescent lamps shall carry out quality level acceptance test for minimum energy efficiency values and those rejected in the test shall not be allowed in the market. The lamps used for the acceptance test shall be selected among the lot of same type of lamps produced daily. The test shall be carried out according to the requirement of standard IEC 60081 in conjunction with those as specified in the Table 3.7-4 below.

Table 3.7-4 Quality Acceptance Level and Sampling

Test Item	Technical Requirement	Sampling Scheme	Sample Size	AQL % (Acceptance Quality Level)
Initial Lumen Efficacy	As described in section 4.2	One time	8 TFLs	75%

Source: Prepared by JICA Survey Team based on Pakistan MEPS for self-Ballastd Fluorescent Lamps

2) Routine Test

a) The manufacturers / suppliers shall carryout routine test on the minimum values of energy efficiency, at least twice (half yearly basis) in a year on its TFLs. The routine test shall also be carried out if one of the following conditions prevails;
   (i) Identifying product's trial production and settings
   (ii) The performance may be altered due to change in the design, technology or material of the product.
   (iii) Reinstating the production of the product after a halt of more than 1year.
   (iv) Requirement of routine test is proposed by standard regulatory body/organization.

b) The routine test shall be carried out according to the requirements as specified in Table 3.7.5 below;

Table3.7-5 Routine Test & Reject able Quality Level (RQL)

Test Item	Section	Sample Size (TFLs)	RQL%
Initial Lumen Efficacy	4.2	8	25
Lamp Wattage	6.4	16	25
Initial Luminous Flux	6.5	16	25
Lumen Maintenance	6.6	16	25
Life Time	6.7	20	25

Source: Prepared by JICA Survey Team based on Pakistan MEPS for self-Ballastd Fluorescent Lamps

3.8 Microwave Oven as Additional MEPS

3.8.1 Scope

This standard specifies the energy efficiency levels, minimum allowable values of energy efficiency, high energy performance values/ evaluating values of energy conservation test methods, and inspection rules of microwave ovens. This standard shall apply to the following types and sizes of microwave ovens commonly used in Pakistan, such as with supply voltage of 230 V, 50 Hz, or range of 220-240 V, 50 Hz:

- Microwave ovens which heat food with high frequency wave level of 2,450 Hz.
- Output of high frequency wave is 2 kW or less.
- Combined type microwave ovens with gas and other heat sources are out of the scope.
- Microwave ovens with inner height of 135 mm or less are out of the scope.

3.8.2 Terms and Definitions

The following terms and definitions apply to this standard:

1) Microwave oven

Appliance using electromagnetic energy in the Industry-Science-Medical (ISM) frequency band of 2 450 MHz, for heating food and beverages in its cavity.

2) Energy consuming efficiency

Energy consuming efficiency for evaluating the performance of microwave ovens is annual power consumption calculated from the test of Section 3.8.3.

3) Minimum Values of annual power consumption

Minimum Values of annual power consumption pertaining to energy efficiency rating shall not be less than criteria of MEPS as mentioned in this standard in Section 3.8.4, under the specific test conditions.

3.8.3 Regulation Values

The following documentary standard, through reference in this text, constitute the provision of this standard. The latest edition of the normative document is applicable to this standard:

- IEC 60705: Methods for measuring the performance of microwave cooking appliances for household and similar purposes

- IEC 60335-1: Safety of household and similar electrical appliances. Part 1: General requirements
- IEC 60335-2-6: Safety of household and similar electrical appliances. Part 2：Particular requirements for cooking ranges, cooking tables, ovens and similar appliances for household use
- IEC 60335-2-25: Safety of household and similar electrical appliances. Part 2：Particular requirements for microwave ovens
- JIS C 9250: Microwave ovens
- Top-runner program Electrical appliances quality labelling regulation, Consumer Affairs Agency, Japan
- PS (Pakistan Standards): To be examined

The methods for measuring energy efficiency performance are as follows:

1) Determination of energy consumption efficiency

Measurement of power consumption required to heat model load from 4oC to 70oC and power consumption expressed in kWh / year is calculated by the following formula:

$$E = \frac{[(580.8 \times AV285 + 66 \times AV245 + 571.1 \times AV125 + 205 \times AV185) + 31 \times B + 6400 \times C]}{1000}$$

Source: Final report of committee on standards for judgment of microwave ovens performance, METI, Japan

In this formula, E, AV285, AV245, AV125, AV185, B and C are represented as follows:

E: Annual energy consumption [kWh/year]

AV285: Power consumption per 1 time required to heat model load of 285 g [Wh/time] to heat frozen food

AV245: Power consumption per 1 time required to heat model load of 245 g [Wh/time] to frost raw food

AV125: Power consumption per 1 time required to heat model load of 125 g [Wh/time] to heat frozen food and frost raw food

AV185: Power consumption per 1 time required to heat model load of 185 g [Wh/time] to heat beverage

B: Power consumption of oven part per 1 time to use oven function [Wh/time]

C: Standby power consumption per hour [Wh/hour]

2) Model load is water and model load mass is specified as shown in Table 3.8-1.

Table 3.8-1 Specifications of model load mass and test container

Model load mass M [g]	Specifications of test container
285	A crystallizing dish of outer diameter of 150mm and height of 75mm specified in JIS R 3503
245	
125	A crystallizing dish of outer diameter of 90mm and height of 45mm specified in JIS R 3503
185	A tall beaker of outer diameter of 66mm and height of 135mm specified in JIS R 3503

Source: Measurement method of energy consumption efficiency of microwave oven, METI,Japan

3) Temperature in the range is 23 ± 2 ºC before the start of test.
4) Mass of model load and container is measured.
5) Temperature of model load and container is 10 ± 1 ºC before the start of test
6) Model load is heated to 70 ± 2 ºC with the function of microwave oven
7) Output of microwave oven is set at maximum output.
8) After heating, temperature of model load is measured, and mass of model load and container is measured. Power consumption required to heat load is measured.

3.8.4 Labelling Criteria

Microwave ovens' energy-efficiency level criteria are described below.

The criteria of microwave ovens under the Top Runner Program of Japan are shown in Table 3.8-2. There is only a low correlation between inner volume and annual power consumption of microwave ovens in Japan, as shown in Figure 3.8-1. The recommended star-rating criteria of microwave ovens in Pakistan are shown in Table 3.8-3.

The criteria of MEPS and star-rating of microwave ovens are recommended according to the following conditions:

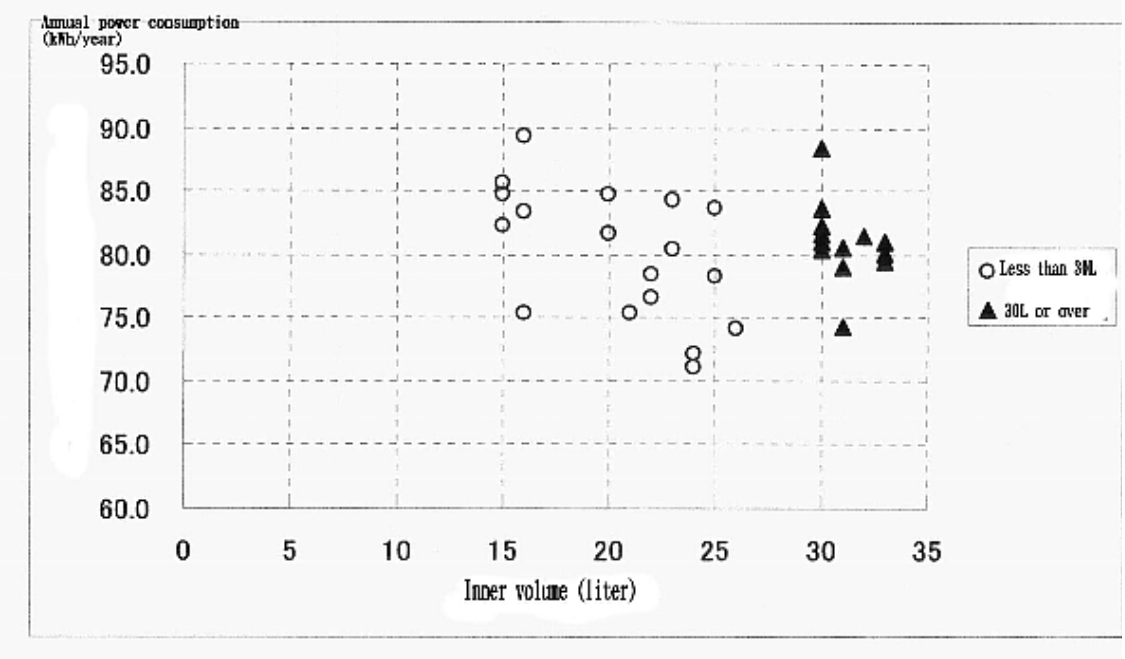
1) Criteria of MEPS are 80 kWh/year, which is the average value of annual power consumption in Japan, as shown in Figure 3.8-1. The reason why Japanese data are applied is that there are no recorded data on electricity consumption of microwave ovens in Pakistan.

The criteria of star-rating are energy consumption saving ratio of 100% to 105% of MEPS value for Star 1, 105% to 110% for Star 2, and 110% or over for Star 3. The reason why the energy consumption saving ratio is 110% for Star 3 is that the annual energy consumption of microwave ovens is improved by10% from 2004 to 2008 under the Top Runner Program of Japan.

Table 3.8-2 Criteria of Microwave Ovens under the Top Runner Program in Japan

No.	Function	Heating Method	Inner Volume	Criteria (kWh/year)
1	Microwave heating only			60.7
2	Microwave + oven function	By heater without cover	Less than 30 L	74.1
3			30 L or more	79.0
4		By heater with cover	Less than 30 L	71.1
5			30 L or more	80.4

Source: METI, Japan



Source: METI, Japan

Figure 3.8-1 Relationship of Inner Volume and Annual Power Consumption in Japan

Table 3.8-3 Recommended Star-rating Criteria of Microwave Ovens in Pakistan

STAR RATING		Star 1	Star 2	Star 3
	Criteria of MEPS (kwh/year)	100% or over, Less than 105%	105% or over, Less than 110%	110% or over
Microwave oven (Heating only)	80	>=80 & <76	>=76 & <72	>=72

Source: Prepared by the JICA Survey Team

3.8.5 Equipment and Standards for Measurement

The used equipment for measurement of performance of microwave ovens is shown below:.

- Circumstance temperature: 21 to 25 °C
- Power voltage and frequency: 220 V +- 1 V, and 50 Hz; -0.1 Hz
- Balance with minimum scale of 0.1 g

- Watt meter
- Thermometer: glass thermometer
- Thermocouple of type-K, class-1
- Model loads of 285 g, 245 g, 125 g, and 185 g

3.9 Road Map for Phase Out of Appliances or Technologies that Do Not Comply with the Three MEPS Reviewed

3.9.1 Items of the Road Map

1) Legal Framework

Relevant legal framework includes the enactment of the EE&C Act, establishment of PEECB, and establishment of ENERCON.

If the EE&C Act will still remain unapproved, the implementation of ES&L will become very difficult because decision makers on ES&L will be absent since the PSC will no longer exist after 31st December 2014. Further, the current ENERCON does not have sufficient human resources to process ES&L applications. Therefore, a Presidential Ordinance should be arranged before 31st December 2014 to avoid vacancy of the framework for the implementation of ES&L.

In order to kick off the implementation of ES&L at the beginning of 2015, applications should be completed by the end of 2014, but actually not yet in beginning of 2015. It is important to attack this issue continuously.

2) Policy

'*Labelling Policy/Guidelines for Grant and Monitoring of Energy Labels in Pakistan*', vide Document No. ES&L/P-01/2012, has been prepared as the Policy of ES&L, with assistance from BRESL. However, it is desirable to amend this document, as mentioned in Section 3.11.

Also, the guideline for three additional ES&L, the same as the *'Minimum Energy Performance Standards (MEPS) for fans'*, should be prepared with assistance from the JICA Survey Team, and be approved and issued. This might take almost one year.

In order to promote ES&L on voluntary basis, the announcement of ES&L should be carried out continuously.

Prior to moving to mandatory basis, review of the entire policy shall be made. It may include increasing the steps of labelling criteria and reviewing of criteria of ES&L.

3) Incentives

Especially on voluntary basis, an effective incentive program is an important measure for smooth promotion of EE&C appliances.

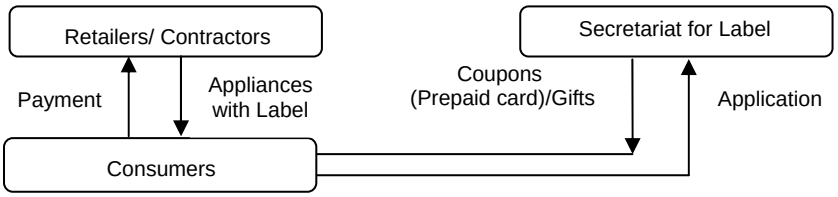
The JICA Survey Team suggests energy label debate program, low interest fund and governmental purchasing program.

Some countries adopt energy label rebate programs, such as the Eco Point Program of Japan.

Example of energy label debate program is shown in Table 3.9-1.

Examples of governmental purchasing programs for ES&L appliances are shown in Table 3.9-2.

Table 3.9-1 Example of energy label debate program

Country	Summary of program
Japan (Eco point)	Period: 2009 to 2011 Implementation: In order to promote the countermeasures against the global warming, economic revitalization, and penetration of terrestrial digital media broadcasting compliant TV, this program was implemented in Japan from 2009 to 2011. “Electric appliance’s eco points”, which can be exchanged with various products and services when the “Green Electrical Appliances” were purchased, were provided. “Green Electric Appliances” means terrestrial digital media broadcasting compliant TV, AC, and refrigerator with four stars or above of EE label established by the government. The purchasers of green electric appliances mail to Secretariat for Ecolabel, application forms, warranty certificates issued by manufacturers (copy), receipts (original), and copies of vouchers to prove electric appliance’s recycling (in case of applying eco-points for recycling). Eco-points are issued after evaluation of Secretariat. The amounts of Eco-points are determined depending on the capacity of appliances and the amounts are added, if the appliances to be disposed are recycled in case of replacement. The applicants can exchange these eco-points with various gifts/coupons. (see figure) Effect: 4,866 GWh/year 
New Mexico, USA	Period: 2 months within 2010 Implementation: The program was implemented to reimburse part of the costs for electric appliances with Energy Star, which shows high efficiency of appliances. Applicants send original receipts and/or invoices, which describe the purchased date, price, and model of the appliances together with the application forms downloaded from the web sites, to The State of New Mexico’s Energy Conservation and Management Division. After evaluation, the checks are sent to applicants, if there are no problems. The program allows only one replaced appliances per one postal address. In addition, the rebates are distributed on the first-come-first-serve basis and the program is completed, when the initial funding is exhausted. In order to ensure the fair opportunity, the purchase by the landlord was considered ineligible. The eligible appliances are washing machines, refrigerators and gas furnaces and they were selected considering the energy saving impact and the rebate’s potential impact based on the price difference between highly-efficient appliances and the other ones. Effect: 623 GWh/year

Source: Prepared by the JICA Survey Team

Table 3.9-2 Examples of Governmental Purchasing Program for ES&L Appliances

Country	Summary of Program
Japan	Voluntary basis program is provided. Japan subsequently introduced the first dedicated Asian green purchasing legislation in 2000 with the Law on Promoting Green Purchasing. The law requires the central government to develop a green procurement policy and implementation plan and to set up a competent authority to publish guidelines and product criteria. Since 2001, the government has designated over 250 green procurement products in 19 product categories. Eco Mark criteria and labeled products are widely adopted in the governmental green purchasing program. Through implementing this law since 2007, all central government ministries, 47 prefectural governments, 12 designated cities, and 68% of 700 local governments and cities have been practicing green purchasing. Collectively, more than 95% of products purchased in the designated product categories, e.g., home electrical appliances, office equipment, papers, and stationaries, can be considered green.
Korea	In the Republic of Korea, the government also passed the Green Purchasing Law in 2004. The law requires the Ministry of the Environment to issue purchasing guidelines on eco-products annually and ensure that public agencies announce purchasing plans and practices as well as report their results annually. When conducting green purchasing, government agencies must preferentially purchase green products in the designated product categories. The Eco-Label Mark and Good Recycle Mark are used as the criteria for identifying green products. The Green Purchasing Law came into effect in 2005 and has resulted in a tremendous increase in the amount of governmental green purchase spending by the Korean public sector. The total amount of green purchasing including green supply chain management in 2007 was US$18.7 billion; the amount spent on Eco-Labeled Mark and Good Recycle Mark products was US$17.4 billion in the same year.
China	Two programs, voluntary basis and mandatory basis, are implemented, as follows: (Voluntary basis) On 17th December 2004, the Circular on Implementation of Government Procurement of Energy-saving Product was issued jointly by the Ministry of Finance (MOF) and the National Development and Reform Committee (NDRC). Certified EE products will be purchased in priority. (Mandatory basis) The Circular on Establishing A Mandatory Government Procurement Scheme of Energy-saving Products was issued by the General Office of the State Council on 30th July 2007. Several types of EE products are purchased mandatorily (air conditioner, water heater, TV, double-capped and self-ballasted fluorescent lamp, computer, printer and monitor, toilet and water tap) (Effectiveness) In 2010, government procurement in China reached over CNY 8.4 trillion in total. According to statistics, in 2010, procurement of products of energy-saving and environment protection reached CNY 7,215 billion, which account for 77.6% of all purchased products.

Source: Prepared by the JICA Survey Team

4) Awareness

ENERCON has started an awareness campaign to promote ES&L, with assistance from BRESL, and the World Wide Fund (WWF). But it is desirable to enforce awareness campaign in order to accelerate penetration of ES&L application.

Two forms of awareness have been implemented: BRESL supports awareness campaign through electric / print media, and WWF supports the Energy Assessment of Green School programme. Energy Assessment of Green School is a programme that consists of a one-hour lecture and training in elementary schools, while ENERCON implements the same activities using their own funds, and utilizing know-how obtained through experience.

Some countries adopt the EE&C Award, which is aimed at promotion of EE&C including ES&L. An example of EE&C Award for ES&L appliance is shown in Table 3.9-2. Due to granting of prizes to excellent EE&C appliances by manufacturers, it helps to motivate

manufacturers that have already obtained a higher rank label, and technology innovation is expected. In addition to the EE&C Award for ES&L appliance, other various EE&C awards for industries, buildings, and energy auditors are recommended.

A survey on consumer awareness is important to verify effectiveness of implemented awareness countermeasures. In order to develop implemented awareness countermeasures, there should be a degree of recognition of countermeasures, and degree of awareness of development. The issues that are clarified through the survey shall be amended to the next countermeasures.

Seminar for EE&L (for retailer) should include a lecture on ES&L covering objectives and its merits to consumers.

Table 3.9-3 Example of EE&C Award for ES&L Appliance

Country	Summary of Program
India	The award scheme is open to the following appliances: refrigerator, air conditioner, tubular fluorescent lamp, distribution transformer, electric storage water heater, ceiling fan, agricultural pump-set, based on the current market data available, and the scope is limited to the type of equipment as described in the BEE schedule of labelling. It is proposed that maximum of three awards, i.e., 1st Prize, 2nd Prize, and Certificate of Merit, would be given for air conditioner, refrigerator, and TFL. For the other four equipment, maximum of two awards are proposed to be given in the form of 1st Prize and 2nd Prize for recognizing the effort of manufacturers to promote star labelling.

Source: Prepared by the JICA Survey Team based on information from the BEE webpage

5) Facilities

Preparation of facilities shall be carried out in two steps.

In the first step, facilities planning/estimation for improvement of cost, and overall planning will be provided by considering and estimating the number of laboratories needed to process applications, current resources (governmental laboratory, domestic private laboratory, and foreign laboratory), responsibility allocation for preparation of facilities, and installation/expansion cost of governmental laboratory.

In the second step, according to the facilities planning, preparation and accreditation of governmental laboratory, accreditation of domestic private laboratory and accreditation of foreign laboratory will be carried out.

6) Monitoring and Verification

Monitoring and verification are important for success and development of ES&L.

Some countries carry out public relations with cooperative manufacturers and types of appliances aiming at manufacturer’s incentives and information sharing with consumers.

Survey of number of products / sales of appliances is to clarify number and specification of appliances that are in circulation in domestic market.

Verification / evaluation of effectiveness of ES&L is evaluation through estimation of reduction of energy consumption.

7) Implementation for Three Appliances

The items and schedule of implementation for the three appliances are almost the same.

At first, it is desirable to carry out training for testing prior to the start of implementation of ES&L. However, in order to kick off the implementation of ES&L as soon as possible, both are planned to start at the same time. After training for testing, according to the facilities planning, preparation of the test equipment will be carried out until moved to mandatory basis.

As described in labelling policy, ES&L will be started on voluntary basis. It is specified to move to mandatory basis in three to five years later. But it is desirable to move to mandatory basis as soon as possible.

8) Effectiveness

Effectiveness in current estimation of reduction of energy consumption can be determined in case of introduction of ES&L under voluntary basis and introduction of incentive.

Detailed conditions for estimation are described in Section 3.10.

3.9.2 Target Indicator

A target indicator show numerical target that is set on an item, when appropriate.

1) Legal Framework

Target indicators cannot be set on legal framework.

2) Policy

Target indicators are set for amendment and preparation of document.

3) Incentives

The target indicator of the energy label rebate program is set at 1,000,000 TVs, as shown in Table 3.9-3.

The target indicator of the low interest fund and governmental purchasing program is set at 50 buildings respectively.

4) Awareness

The target indicator of Energy Assessment of Green School is set at 40 schools.

The target indicator of seminar for EE&L (for retailer) is set at 15 cities, namely, Islamabad, Karachi, Lahore, Quetta, Hyderabad, Faisalabad, Sialkot, Gujrat, Gujranwala, Shikhupura, Pakpatan, Sahiwal, Norowal, D.G. Khan, and Bhakkar.

5) Facilities

The target indicator regarding facilities will be set after preparation of the facilities plan.

6) Monitoring and Verification

The target indicator of survey on the number of products/sales of appliance is set to cover 90% or more of appliances in the market.

The target indicator of cooperative types of appliances is set to grow at 10% annually.

7) Implementation for Three Appliances

The target indicators on the number of laboratories are set at eight laboratories for fans, four laboratories for motors, and three laboratories for CFLs. They are set considering that manufacturers will receive result of applications within three months under mandatory basis.

8) Effectiveness

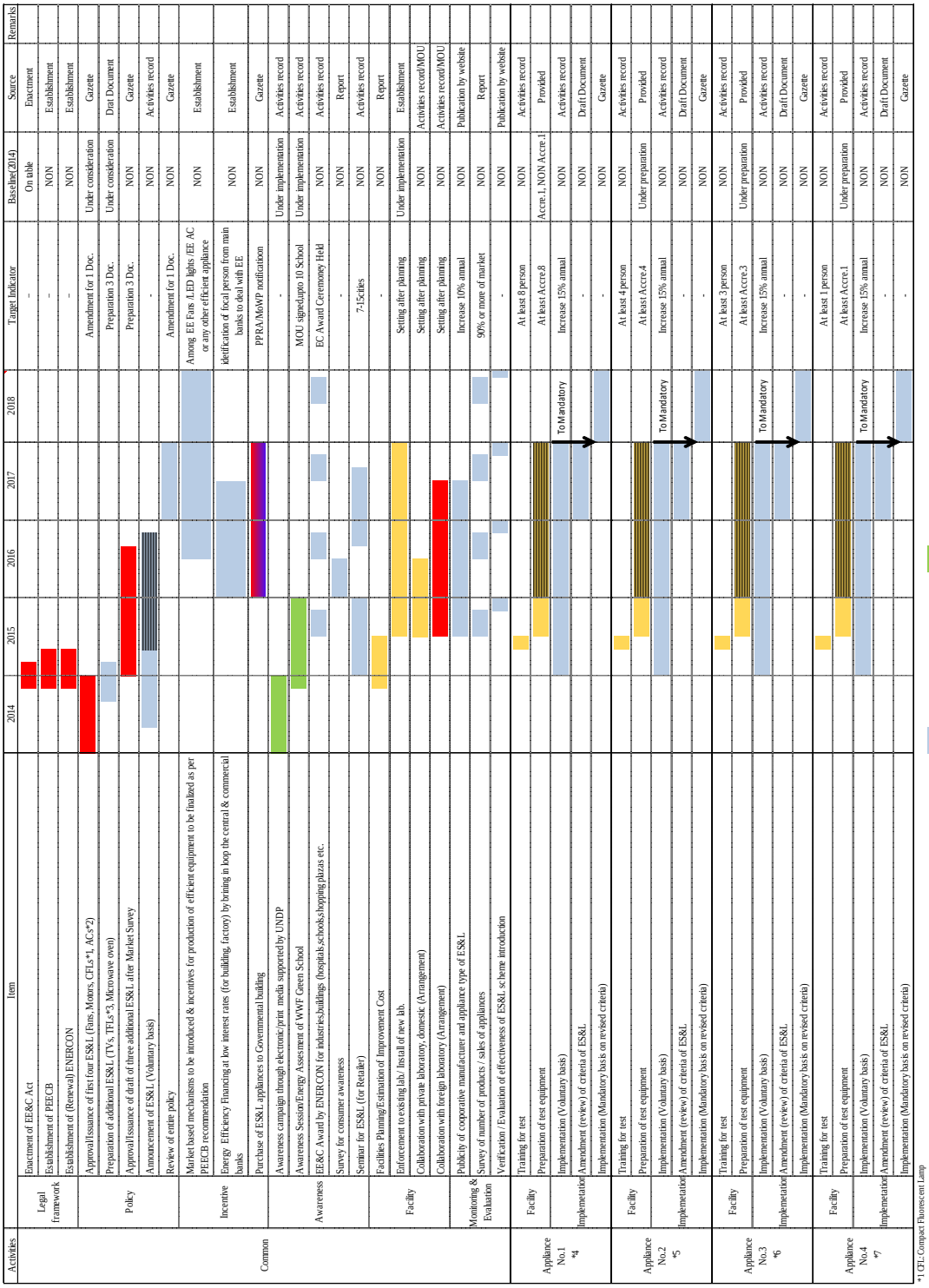
Target indicator is not set on effectiveness.

3.9.3 Baseline (2014) and Source

Baseline (2014) and source show the current conditions at the survey and future conditions at the end of 2018, respectively.

3.9.4 Road Map

The draft of the road map for the phase out of appliances or technologies that do not comply with the three additional MEPS is shown in Figure 3.9-1.



Source: prepared by JICA Survey Team

Figure 3.9-1 Draft Road Map for the Phase Out of Appliances or Technologies that Do Not Comply with the Three Additional MEPS

3.10 Estimation of EE&C Effect for the Entire Country due to Introduction of ES&L

3.10.1 Estimation of Introduction of ES&L for BRESL's Three Appliances

1) Preconditions

Preconditions of estimation of energy efficiency potential for BRESL's Three Appliances are shown in Table 3.10-1.

The ES&L framework prepared in 2014 will start under voluntary basis from 2015. After several years, the target appliances move in principle under mandatory basis.

Table 3.10-1 Preconditions of Estimation of Energy Efficiency Potential for BRESL's Three Appliances

Item	Precondition
Standard year	FY 2014
Start year of MEPS	FY 2015
Move to mandatory basis	3 years later
Target appliance	Fans, CFLs, Motors
Number of appliances	(Penetration level) multiples (Number of households)
1-a) Penetration level of appliance in household	BRESL data
1-b) Rate of MEPS appliance in market	(Standard year basis) Fans 10% CFLs 6.5% Motors 1.5%
1-c) Number of households	Power System Statistics 2012-2013 P72 (NTDC 38th Edition)
Operation hours of appliance	India's experience
Rate of increase of appliance in compliance with MEPS in voluntary basis	Set to 3 cases; 10%,15%,20% increase annually
Energy consumption per hour	BRESL data

Source: Prepared by the JICA Survey Team

2) Formula

The formula for estimation of energy efficiency potential is as follows:

(Number of appliance) x (Operation hours of appliance) x (Energy consumption per hour)

3) Estimation

Estimation of reduction of power consumption due to introduction of ES&L for BRESL's Three Appliances is shown in Figure 3.10-1. Under set of Rate of increase of appliance in compliance with MEPS is 15%, approximately 70 GWh reduction is expected at end of 2015, 660 GWh reduction is expected at end of 2017.

Estimation of reduction of electric demand due to introduction of ES&L for BRESL's Three Appliances is shown in Figure 3.10-2. Under set of Rate of increase of appliance in compliance with MEPS is 15%, approximately 150 MW reduction is expected at end of 2017.

Fans

		Unit	Fomulea	Source	1st year			2nd year			3rd year		
A :	Rated input power MEPS before	W	set value	BRESL report	102			102			102		
B :	Rated input power MEPS before	W	set value	BRESL report	80			80			80		
C :	daily operation hour	hours/day	set value	India experience	12			12			12		
D :	annual operation days	days/year	set value	India experience	300			300			300		
E :	Number of Appliances in one Household	unit/household	set value	BRESL report	3.334			3.334			3.334		
F :	Number of Penetration household of appliance	housholds	set value	Contract with PEPCO	18,713,537			18,713,537			18,713,537		
G :	number of appliance in Pakistan	units	=ExF	Estimation value	62,390,932			62,390,932			62,390,932		
H :	life year of appliance	years	set value	assumption value by JST	15			15			15		
I :	implementation years from start	years	set value	assumption value by JST	1			2			3		
J :	pnestration lebel of MEPS	%	set value	assumption value by JST	10%	15%	20%	20%	30%	40%	30%	45%	60%
K :	number of MEPS appliance	units	=GxIxJ/H	Estimation value	415,940	623,909	831,879	1,663,758	2,495,637	3,327,516	3,743,456	5,615,184	7,486,912
	Effectiveness	GWh/year	=(A-B)xCxDxK	Estimation value	32.94	49.41	65.88	131.77	197.65	263.54	296.48	444.72	592.96
					0.03%	0.05%	0.06%	0.13%	0.19%	0.25%	0.28%	0.43%	0.57%

Motors

		Unit	Fomulea	Source	1st year			2nd year			3rd year		
A :	Rated input power MEPS before	W	set value	BRESL report	1400			1400			1400		
B :	Rated input power MEPS before	W	set value	BRESL report	1344			1344			1344		
C :	daily operation hour	hours/day	set value	India experience	8			8			8		
D :	annual operation days	days/year	set value	India experience	300			300			300		
E :	Number of Appliances in one Household	unit/household	set value	BRESL report	0.863			0.863			0.863		
F :	Number of Penetration household of appliance	housholds	set value	Contract with PEPCO	18,713,537			18,713,537			18,713,537		
G :	number of appliance in Pakistan	units	=ExF	Estimation value	16,149,782			16,149,782			16,149,782		
H :	life year of appliance	years	set value	assumption value by JST	15			15			15		
I :	implementation years from start	years	set value	assumption value by JST	1			2			3		
J :	pnestration lebel of MEPS	%	set value	assumption value by JST	10%	15%	20%	20%	30%	40%	30%	45%	60%
K :	number of MEPS appliance	units	=GxIxJ/H	Estimation value	107,665	161,498	215,330	430,661	645,991	861,322	968,987	1,453,480	1,937,974
	Effectiveness	GWh/year	=(A-B)xCxDxK	Estimation value	14.47	21.71	28.94	57.88	86.82	115.76	130.23	195.35	260.46
					0.01%	0.02%	0.03%	0.06%	0.08%	0.11%	0.13%	0.19%	0.25%

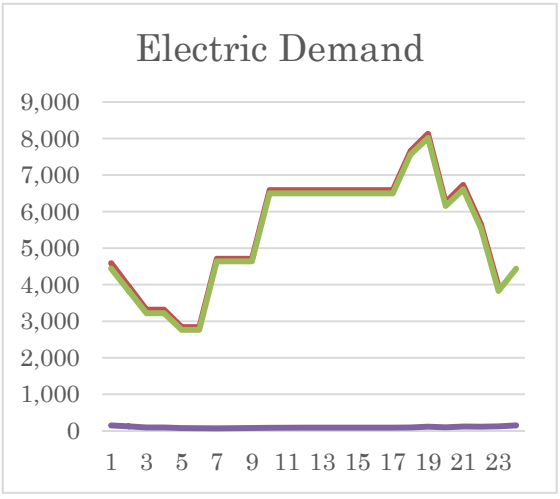
CFLs

		Unit	Fomulea	Source	1st year			2nd year			3rd year		
A :	Rated input power MEPS before	W	set value	BRESL report	25			25			25		
B :	Rated input power MEPS before	W	set value	BRESL report	23.75			23.75			23.75		
C :	daily operation hour	hours/day	set value	India experience	4			4			4		
D :	annual operation days	days/year	set value	India experience	300			300			300		
E :	Number of Appliances in one Household	unit/household	set value	BRESL report	4.562			4.562			4.562		
F :	Number of Penetration household of appliance	housholds	set value	Contract with PEPCO	18,713,537			18,713,537			18,713,537		
G :	number of appliance in Pakistan	units	=ExF	Estimation value	85,371,156			85,371,156			85,371,156		
H :	life year of appliance	years	set value	assumption value by JST	8			8			8		
I :	implementation years from start	years	set value	assumption value by JST	1			2			3		
J :	pnestration lebel of MEPS	%	set value	assumption value by JST	10%	15%	20%	20%	30%	40%	30%	45%	60%
K :	number of MEPS appliance	units	=GxIxJ/H	Estimation value	1,067,139	1,600,709	2,134,279	4,268,558	6,402,837	8,537,116	9,604,255	14,406,383	19,208,510
	Effectiveness	GWh/year	=(A-B)xCxDxK	Estimation value	1.60	2.40	3.20	6.40	9.60	12.81	14.41	21.61	28.81
					0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.03%

Source: JICA Survey Team

Figure 3.10-1 Estimation of Reduction of Power Consumption due to Introduction of ES&L for BRESL's Three Appliances

hour	Pre- implementation of ES&L					Post- implementation of ES&L					differencial
	per household				whole pakistan	per household				whole pakistan	
	Fan	Motor	CFL	Total		Fan	Motor	CFL	Total		
	W	W	W	W	MW	W	W	W	W	MW	MW
1	340	151	0	490	4,586	266	144	0	411	4,438	148
2	272	151	0	422	3,951	213	144	0	358	3,830	121
3	204	151	0	354	3,315	160	144	0	304	3,222	94
4	204	151	0	354	3,315	160	144	0	304	3,222	94
5	153	151	0	303	2,838	120	144	0	264	2,765	73
6	153	151	0	303	2,838	120	144	0	264	2,765	73
7	102	401	0	503	4,709	80	385	0	465	4,637	71
8	102	401	0	503	4,709	80	385	0	465	4,637	71
9	102	401	0	503	4,709	80	385	0	465	4,637	71
10	102	602	0	704	6,586	80	578	0	658	6,500	86
11	102	602	0	704	6,586	80	578	0	658	6,500	86
12	102	602	0	704	6,586	80	578	0	658	6,500	86
13	102	602	0	704	6,586	80	578	0	658	6,500	86
14	102	602	0	704	6,586	80	578	0	658	6,500	86
15	102	602	0	704	6,586	80	578	0	658	6,500	86
16	102	602	0	704	6,586	80	578	0	658	6,500	86
17	102	602	0	704	6,586	80	578	0	658	6,500	86
18	102	602	114	818	7,653	80	578	111	768	7,560	93
19	153	602	114	869	8,130	120	578	111	808	8,016	113
20	153	401	114	668	6,252	120	385	111	616	6,154	98
21	204	401	114	719	6,729	160	385	111	656	6,610	119
22	204	401	0	605	5,662	160	385	0	545	5,550	112
23	272	151	0	422	3,951	213	144	0	358	3,830	121
24	340	151	0	490	4,586	266	144	0	411	4,438	148



Source: JICA Survey Team

Figure 3.10-2 Estimation of Reduction of Electric Demand due to Introduction of ES&L for BRESL's Three Appliances (in at end of 2017)

3.10.2 Estimation of Introduction of ES&L for additional Three Appliances

1) Preconditions

Preconditions of estimation of energy efficiency potential for additional Three Appliances are shown in Table 3.10-2.

The ES&L document prepared in 2015 will start under voluntary basis from 2016. After several years, the target appliances move in principle under mandatory basis.

Table 3.10-2 Preconditions of Estimation of Energy Efficiency Potential for BRESL's Three Appliances

Item	Precondition
Standard year	FY 2015
Start year of MEPS	FY 2016
Move to mandatory basis	3 years later
Target appliance	Fans, CFLs, Motors
Number of appliances	(Penetration level) multiples (Number of households)
1-a) Penetration level of appliance in household	BRESL data
1-b) Rate of MEPS appliance in market	(Standard year basis) TV 100% TFLs 10% Microwave Oven 20%
1-c) Number of households	Power System Statistics 2012-2013 P72 (NTDC 38th Edition)
Operation hours of appliance	India's experience
Rate of increase of appliance in compliance with MEPS in voluntary basis	Set to 3 cases; 10%,15%,20% increase annually
Energy consumption per hour	BRESL data

Source: Prepared by the JICA Survey Team

2) Formula

The formula for estimation of energy efficiency potential is as follows:

(Number of appliance) x (Operation hours of appliance) x (Energy consumption per hour)

3) Estimation

Estimation of reduction of power consumption due to introduction of ES&L for additional Three Appliances is shown in Figure 3.10-3. Under set of Rate of increase of appliance in compliance with MEPS is 15%, approximately 40 GWh reduction is expected at end of 2016, 260 GWh reduction is expected at end of 2018.

Estimation of reduction of electric demand due to introduction of ES&L for additional Three Appliances is shown in Figure 3.10-4. Under set of Rate of increase of appliance in compliance with MEPS is 15%, approximately 120 MW reduction is expected at end of 2018.

Fans

		Unit	Fomulea	Source	1st year			2nd year			3rd year		
A :	Rated input power MEPS before	W	set value	BRESL report	102			102			102		
B :	Rated input power MEPS before	W	set value	BRESL report	80			80			80		
C :	daily operation hour	hours/day	set value	India experience	12			12			12		
D :	annual operation days	days/year	set value	India experience	300			300			300		
E :	Number of Appliances in one Household	unit/household	set value	BRESL report	3.334			3.334			3.334		
F :	Number of Penetration household of appliance	housholds	set value	Contract with PEPCO	18,713,537			18,713,537			18,713,537		
G :	number of appliance in Pakistan	units	=ExF	Estimation value	62,390,932			62,390,932			62,390,932		
H :	life year of appliance	years	set value	assumption value by JST	15			15			15		
I :	implementation years from start	years	set value	assumption value by JST	1			2			3		
J :	pnestration lebel of MEPS	%	set value	assumption value by JST	10%	15%	20%	20%	30%	40%	30%	45%	60%
K :	number of MEPS appliance	units	=GxIxJ/H	Estimation value	415,940	623,909	831,879	1,663,758	2,495,637	3,327,516	3,743,456	5,615,184	7,486,912
	Effectiveness	GWh/year	=(A-B)xCxDxK	Estimation value	32.94	49.41	65.88	131.77	197.65	263.54	296.48	444.72	592.96
					0.03%	0.05%	0.06%	0.13%	0.19%	0.25%	0.28%	0.43%	0.57%

Motors

		Unit	Fomulea	Source	1st year			2nd year			3rd year		
A :	Rated input power MEPS before	W	set value	BRESL report	1400			1400			1400		
B :	Rated input power MEPS before	W	set value	BRESL report	1344			1344			1344		
C :	daily operation hour	hours/day	set value	India experience	8			8			8		
D :	annual operation days	days/year	set value	India experience	300			300			300		
E :	Number of Appliances in one Household	unit/household	set value	BRESL report	0.863			0.863			0.863		
F :	Number of Penetration household of appliance	housholds	set value	Contract with PEPCO	18,713,537			18,713,537			18,713,537		
G :	number of appliance in Pakistan	units	=ExF	Estimation value	16,149,782			16,149,782			16,149,782		
H :	life year of appliance	years	set value	assumption value by JST	15			15			15		
I :	implementation years from start	years	set value	assumption value by JST	1			2			3		
J :	pnestration lebel of MEPS	%	set value	assumption value by JST	10%	15%	20%	20%	30%	40%	30%	45%	60%
K :	number of MEPS appliance	units	=GxIxJ/H	Estimation value	107,665	161,498	215,330	430,661	645,991	861,322	968,987	1,453,480	1,937,974
	Effectiveness	GWh/year	=(A-B)xCxDxK	Estimation value	14.47	21.71	28.94	57.88	86.82	115.76	130.23	195.35	260.46
					0.01%	0.02%	0.03%	0.06%	0.08%	0.11%	0.13%	0.19%	0.25%

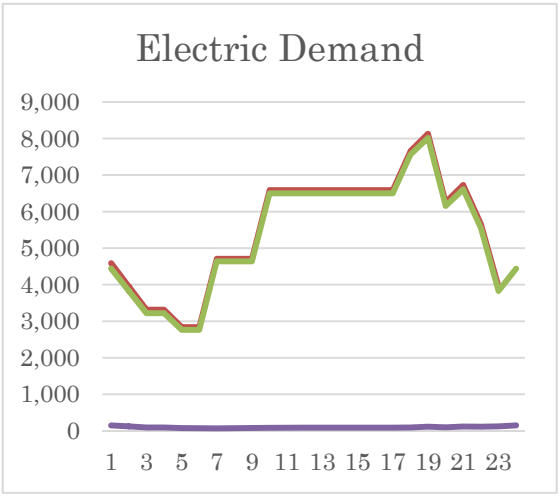
CFLs

		Unit	Fomulea	Source	1st year			2nd year			3rd year		
A :	Rated input power MEPS before	W	set value	BRESL report	25			25			25		
B :	Rated input power MEPS before	W	set value	BRESL report	23.75			23.75			23.75		
C :	daily operation hour	hours/day	set value	India experience	4			4			4		
D :	annual operation days	days/year	set value	India experience	300			300			300		
E :	Number of Appliances in one Household	unit/household	set value	BRESL report	4.562			4.562			4.562		
F :	Number of Penetration household of appliance	housholds	set value	Contract with PEPCO	18,713,537			18,713,537			18,713,537		
G :	number of appliance in Pakistan	units	=ExF	Estimation value	85,371,156			85,371,156			85,371,156		
H :	life year of appliance	years	set value	assumption value by JST	8			8			8		
I :	implementation years from start	years	set value	assumption value by JST	1			2			3		
J :	pnestration lebel of MEPS	%	set value	assumption value by JST	10%	15%	20%	20%	30%	40%	30%	45%	60%
K :	number of MEPS appliance	units	=GxIxJ/H	Estimation value	1,067,139	1,600,709	2,134,279	4,268,558	6,402,837	8,537,116	9,604,255	14,406,383	19,208,510
	Effectiveness	GWh/year	=(A-B)xCxDxK	Estimation value	1.60	2.40	3.20	6.40	9.60	12.81	14.41	21.61	28.81
					0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.02%	0.03%

Source: JICA Survey Team

Figure 3.10-3 Estimation of Reduction of Power Consumption due to Introduction of ES&L for additional Three Appliances

hour	Pre- implementation of ES&L					Post- implementation of ES&L					differencial
	per household				whole pakistan	per household				whole pakistan	
	Fan	Motor	CFL	Total		Fan	Motor	CFL	Total		
	W	W	W	W	MW	W	W	W	W	MW	MW
1	340	151	0	490	4,586	266	144	0	411	4,438	148
2	272	151	0	422	3,951	213	144	0	358	3,830	121
3	204	151	0	354	3,315	160	144	0	304	3,222	94
4	204	151	0	354	3,315	160	144	0	304	3,222	94
5	153	151	0	303	2,838	120	144	0	264	2,765	73
6	153	151	0	303	2,838	120	144	0	264	2,765	73
7	102	401	0	503	4,709	80	385	0	465	4,637	71
8	102	401	0	503	4,709	80	385	0	465	4,637	71
9	102	401	0	503	4,709	80	385	0	465	4,637	71
10	102	602	0	704	6,586	80	578	0	658	6,500	86
11	102	602	0	704	6,586	80	578	0	658	6,500	86
12	102	602	0	704	6,586	80	578	0	658	6,500	86
13	102	602	0	704	6,586	80	578	0	658	6,500	86
14	102	602	0	704	6,586	80	578	0	658	6,500	86
15	102	602	0	704	6,586	80	578	0	658	6,500	86
16	102	602	0	704	6,586	80	578	0	658	6,500	86
17	102	602	0	704	6,586	80	578	0	658	6,500	86
18	102	602	114	818	7,653	80	578	111	768	7,560	93
19	153	602	114	869	8,130	120	578	111	808	8,016	113
20	153	401	114	668	6,252	120	385	111	616	6,154	98
21	204	401	114	719	6,729	160	385	111	656	6,610	119
22	204	401	0	605	5,662	160	385	0	545	5,550	112
23	272	151	0	422	3,951	213	144	0	358	3,830	121
24	340	151	0	490	4,586	266	144	0	411	4,438	148



Source: JICA Survey Team

Figure 3.10-4 Estimation of Reduction of Electric Demand due to Introduction of ES&L for additional Three Appliances (in at end of 2018)

3.11 Development of MEPS Framework

The recommendations for the ES&L framework in the draft final report are described below.

3.11.1 Enactment of the EE&C Act

The PSC under the BRESL project has been operating as a decision maker regarding ES&L, only until 31st December 2014. In spite of ENERCON implementing the ES&L scheme continuously, there has been no organization as decision maker since the said date. Since PEECB, as specified in the EE&C Act, has no power to decide on the EE&C policy including ES&L, it is strongly desirable that the EE&C Act will be enacted as soon as possible in order to avoid the lack of an organization that can approve the framework for the implementation of ES&L.

3.11.2 Amendment of 'Labelling Policy'

Some words are proposed to be amended/added in the '*Labelling Policy/Procedure for Grant & Monitoring of Energy Labels in Pakistan*', vide Document No. ES&L/P-01/2012 ('Labelling Policy'), in order to manifest or show compliance with the 'policy matrix" of the "Proposed Programmatic Approach and Policy-Based Loan for Subprogram Islamic Republic of Pakistan: Sustainable Energy Sector Reform Program" (policy matrix), and improve the ES&L framework of Pakistan.

1) Amendment for Compliance with the Policy Matrix

Although the policy matrix requests the establishment of both MEPS and labelling scheme, the current Labelling Policy does not show that it is established as requested.

Some words are proposed to be amended in order to manifest or show compliance with the policy matrix, as described in Table 3.11-1 below.

Table 3.11-1 Proposed Amendments in the Policy Matrix

Existing Words	Proposed Changes (Note: Underline indicates new words.)	Referred Page, Paragraph, Section, or Clause
Labelling Policy/Guidelines for Grant & Monitoring of Energy Labels in Pakistan	MEPS and Labeling (Energy Efficiency Standards and Labeling: ES&L) Policy/Guidelines for ~~Grant & Monitoring~~ Implementation of ~~Energy Labels~~ ES&L scheme in Pakistan	Title page
Procedure for Grant & Monitoring of Energy Labels in Pakistan	Procedure for ~~Grant & Monitoring~~ Implementation of ~~Energy Labels~~ ES&L scheme in Pakistan	Page No.1 (Title page)
Procedure for Grant & Monitoring of Energy Labels in Pakistan	Procedure for ~~Grant & Monitoring~~ Implementation of ~~Energy Labels~~ ES&L scheme in Pakistan	Page No.4 (Heading)
Energy Label scheme	~~energy label~~ ES&L scheme	Section 1, Line 3
Energy Label scheme	~~energy label~~ ES&L scheme	Section 3, Line 3
Energy Labelling Section	~~Energy Labeling~~ ES&L scheme Section	Section 7.5, Line 2
Criteria for Grant of "Pakistan Energy Label"	MEPS and Criteria for Grant of "Pakistan Energy Label"	Section 8, Heading
Energy Labelling Section	~~Energy Labeling~~ ES&L scheme Section	Section 9.2, Line 1

Source: Prepared by the JICA Survey Team

2) Introduction of Periodic Review System

Several years after introduction of the ES&L framework, the energy efficiency of target appliances will be developed due to business efforts of manufacturers and technological innovation. Therefore, it is necessary to revise the MEPS criteria and labelling criteria in order to prevent losing the effectiveness of the ES&L framework.

In the latest version of the 'Labelling policy' and 'Minimum Energy Performance Standard (MEPS) for fan', the revision of the MEPS criteria and labelling criteria is not defined. It seems that this issue was missed.

It is recommended that the policy for periodic revision of the MEPS criteria and labelling criteria is to be defined in the 'Labelling policy', and the period for revision of the MEPS criteria and labelling criteria is to be defined in the 'Minimum Energy Performance Standard (MEPS) for appliance'

Therefore, the JICA Survey Team proposes introduction of periodic review of the MEPS criteria in order to continue effectiveness of the ES&L framework. For reference, an example of the description is shown in Table 3.11-2 below, as Section 8.3 (new section) and Section 8.4 (new section).

Table 3.11-2 Example of Description for Introduction of Periodic Review System

8.3 The criteria for grant of "Pakistan Energy Label" shall be reviewed periodically by ENERCON. Detail interval of review shall be specified under separate guidelines*. 8.4 The criteria for MEPS shall be reviewed periodically, due to request from ENERCON, by PSQCA. Detail interval of review shall be specified under separate guidelines*. * 'separate guideline' means the guideline for implementation of ES&L, e.g., Minimum Energy Performance Standard (MEPS) and Labelling for AC Electric Fans

Source: Prepared by the JICA Survey Team

3) Introduction of Reference on Amount of Appliance

In Japan, METI lets manufacturers and importers submit an annual report on the domestic delivery volume and imported volume by-product, monitors the progress of the Top Runner Program, and estimates the energy saving effects. In Pakistan, ENERCON undertakes the measures for implementation of MEPS and energy labelling program by monitoring retail stores, manufacturers, and importers in the whole country every six months. The collection of data for estimating the energy saving effects of MEPS is not specified in the policy paper. It is recommended that manufacturers and importers submit an annual report to ENERCON on the domestic delivery volume and imported volume by-product.

The JICA Survey Team proposes introduction of reference on the amount of appliances regarding ES&L. For that purpose, sentences are proposed to be added. For reference, an example of the description is shown in Table 3.11-3 below, as Section 14.5 (new section).

Table 3.11-3 Example of Description for Introduction of Reference on Amount of Appliances

14.5 ENERCON has responsibility to collect the information, annual amount of products and/or imports regarding ES&L, through questionnaire or the other methodologies from manufacturers and/or importers, related associations.

Source: Prepared by the JICA Survey Team

4) Introduction of Verification System in the EE&C Bill, 2014.

The JICA Survey Team proposes introduction of verification regarding ES&L. For that purpose, sentences are proposed to be added. For reference, an example of the description is shown in Table 3.11-4 below, as Section 14.6 (new section).

Table 3.11-4 Example of Description for Introduction of Verification System

14.6 ENERCON shall verify and effectiveness of introduction of ES&L framework, and shall carry out publicity regarding that.

Source: Prepared by the JICA Survey Team

5) Announcement Regarding Regulation After Moving to Mandatory Basis

The JICA Survey Team proposes to newly announce that manufacturers and importers will be prohibited to manufacture, sell, purchase, or import any equipment or appliance that does not comply with the MEPS, after moving to mandatory basis. For reference, an example of the description is shown in Table 3.11-5 below, as Section 16.7 (new section).

Table 3.11-5 Example of Description for Announcement Regarding Regulation After Moving to Mandatory Basis

16.7 Federal Government may prohibit manufacture or sale or purchase or import of equipment or appliance specified under EE&C Act, after move to mandatory basis, unless such equipment or appliance conforms to energy consumption standards.

Source: Prepared by the JICA Survey Team

6) Addition of Some Appliances Subject to ES&L

The current 'Labelling policy' covers just six appliances, excluding the candidate appliances for the additional three MEPS.

Therefore, the JICA Survey Team proposes to add some appliances subject to ES&L that will be prepared in the future. For reference, an example of the description is shown in Table 3.11-6 below, as Paragraph 2.

Table 3.11-6 Example of Description for Addition of Some Appliances Subject to ES&L

2. The procedure will apply ~~initially~~ to the following listed household electrical appliances/products manufactured locally or imported into Pakistan: a. AC Electric Fans b. Compact Fluorescent Lamps (CFLs) c. Magnetic & Electric Ballasts for Tubular Fluorescent Lamps d. Electric Motors e. Air Conditioners f. Refrigerators g. Television h. Electric Iron i. Microwave Oven j. Washing Machine k. Tubular Fluorescent Lamps

Note: Underline indicates new words

Source: Prepared by the JICA Survey Team

7) Amendment for Submission and Processing of Application

Checking for document completeness is done under Paragraph 7.5 yet rejection of application due to incomplete application may happen after evaluation by the Evaluation Committee under Paragraph 7.6, for reasons itemized under Paragraph 7.7. Rejection of applications should be made after going through Paragraph 7.5, and only complete applications should proceed on to the evaluation phase as mentioned in Paragraph 7.6. Bullet numbers 1, 2, 3, and 5 under Paragraph 7.7 can be checked upon submission of application under Paragraph 7.5.

The JICA Survey Team proposes to improve the procedure of submission and processing of applications. For reference, an example of the description is shown in Table 3.11-7 below, as Paragraphs 7.5 to 7.9 (amendment).

Table 3.11-7 Example of Description for Improvement of Procedure of Submission and Processing of Applications

7.5	The received application shall be checked for completeness of documents and ~~entered into register/log record~~ will be registered / logged by authorized person of the "Energy Labelling Section" of ENERCON. Application is incomplete if, among others, the (i) application form is not properly filled up, signed and stamped, (ii) EE tests results are not enclosed, (iii) Enclosed EE tests results are not issued by accredited laboratories, (iv) Prescribed registration fees are unpaid. Incomplete applications will be returned to the applicants within two (2) days after submission; complete applications will be forwarded to the Evaluation Committee. Acknowledgement of receipt of complete applications shall be communicated by ENERCON to the applicants within seven (7) days after submission.
7.6	~~The~~ Complete applications then shall be reviewed by the Evaluation Committee (Para. 9 below) against the defined criteria for grant of "Pakistan Energy Label". The committee will finalize its recommendations as to the acceptance or rejection of the application within two (2) weeks from the date the case is referred to the committee. MD ENERCON will be the competent authority to approve/reject grant of "Pakistan Energy Label" to the applicant. The applications may be rejected, if, among others, the results shown in the enclosed EE test reports do not meet the qualification threshold of the products as specified in the relevant MEPS (Minimum Energy Performance Standards)
~~7.7~~	~~The following may entail rejection of application:~~ ~~■ Incomplete application submitted by the applicant~~ ~~■ EE Test Report not enclosed with the application~~ ~~■ Enclosed EE Test Report has been issued by an accredited laboratory~~ ~~■ The result in the report do not meet the qualification threshold of the product as specified in the relevant MEPS (Minimum Energy Performance Standards)~~ ~~■ Not accompanied with prescribed registration fee~~
~~7.8~~ 7.7	*Omitted*
~~7.9~~ 7.8	*Omitted*

Note: Underline indicates new words.

Source: Prepared by the JICA Survey Team

8) Public Relations with Participants for ES&L

The JICA Survey Team proposes to publicize manufacturers' names and appliance types after the grant of labels, to promote manufacturers and importers to apply for grant of the 'Pakistan Energy Label'.

Some countries carry out publicity of manufacturers' names and appliance types. For example, the Ministry of Industry and Trade of Vietnam publishes the name of unit products registered to be labelled, as shown in Figure 3.11-1 below.

For reference, an example of the description is shown in Table 3.11-8 below, as Section 7.9 (new section).

Name of unit Products registered to be labeled

No	Name of unit	Products registered to be labeled	Date of signing Decision / Decision number	Type of label	Tel	Address
1	Rang Dong Light Source & Vacuum Flask J.S.C	1. T8 fluorescent bulb (60cm and 120cm long) 2. Electromagnetic ballast for fluorescent lamp	2134/QD-BCN dated Jun 22nd, 2007	Confirmative label	(04) 8584165; (04) 8584310	87-89 Ha Dinh Str., Thanh Xuan Dist., Hanoi City
2	Hung Phong Manufacturing & Trading Co., ltd	1. T5 fluorescent tube (60cm and 120cm long; model: YZ28RR16)	0813/QD-BCT dated Jan 31st, 2008	Confirmative label	(08) 9507249 (08) 9507345	105B Ngo Quyen Str. – Ward 11 – District 5

Source: http://vneec.gov.vn/en/to-label/name-of-unit-products-registered-to-be-labeled-36002-12053.html

Figure 3.11-1 Example of Publicizing Name of Manufacturers and Types of Appliances (Viet Nam)

Table 3.11-8 Example of Description for Publicity of Participants for ES&L

7.9	ENERCON may publicize manufacturer's name and appliance type after the grant of 'Pakistan Energy Label'.

Source: Prepared by the JICA Survey Team

In the voluntary phase, if suppose any fan manufacturer changes some design parameters having impact on the service values, they have to apply for grant of Energy Labels again in case going from 2 star to 3 star in that case they have to get license renewed within voluntary period. Only to nurture a culture of Energy Labels printing on products, license renewal system is appropriate till the enactment of bill and making these standards mandatory. Renewal process is only involved due to absence of legislator and giving a bit relaxation to manufacturers

3.11.3 Amendment of 'MEPS for Fans'

Some words are proposed to be amended/added in the '*Minimum Energy Performance Standards (MEPS) for Fans*', vide Document No.EES-01/2013 ('*MEPS for fans*'), in order to manifest or show compliance with the policy matrix, and improve the ES&L framework of Pakistan.

1) Amendment for Compliance with the Policy Matrix

Although the policy matrix requests the establishment of both MEPS and labelling scheme, the current 'MEPS for fans' does not show that it is established as requested.

Therefore, some words are proposed to be amended in order to manifest or show compliance with the policy matrix, as shown in Table 3.11-9 below.

Table 3.11-9 Proposed Amendments in the Policy Matrix

Existing words	Proposed Changes (Note: Underline indicates new words.)	Referred Page, Paragraph, Section, or Clause
Minimum Energy Performance Standard (MEPS) for Fans	Minimum Energy Performance Standard (MEPS) and Labelling for AC Electric Fans	Title page
Pakistan Minimum Energy Performance Standard (MEPS) and Energy Star Rating for AC Electric Fans	Pakistan Minimum Energy Performance Standard (MEPS) and Labelling for AC Electric Fans	Page No. 1 (Title page)
Pakistan Minimum Energy Performance Standard (MEPS) and Energy Star Rating for AC Electric Fans	Pakistan Minimum Energy Performance Standard (MEPS) and Labelling for AC Electric Fans	Page No. 4 (Heading)

Source: Prepared by the JICA Survey Team

2) Introduction of Periodic Review System

Due to the reason mentioned in item 2) of Section 3.11.2, it is recommended that the policy on periodic revision of MEPS criteria and labelling criteria be defined in 'Labelling policy', and interval of revision of MEPS criteria and labelling criteria be defined in 'Minimum Energy Performance Standard (MEPS) for Appliance'.

So, the JICA Survey Team proposes introduction of periodic review of the MEPS criteria in order to continue effectiveness of the ES&L framework. For reference, an example of the description is shown in Table 3.11-10 below, as Section 4.6 (new section) and Section 7.9 (new section).

Table 3.11-10 Example of Description for Introduction of Periodic Review System

4.6 Detail of item of MEPS, included Scope, Normative Reference and Terms and Definitions, Technical Requirement, shall be requested within three (3) years (tentative value; it may be decided under acceptance from manufactures and importers) after last revision of this document by ENERCON to PSQCA. 7.9 The criteria for grant of "Pakistan Energy Label" shall be reviewed within three (3) years (tentative value; it may be decided under acceptance from manufactures and importers) after last revision of this document by ENERCON.

Source: Prepared by the JICA Survey Team

3.11.4 Review of ES&L Prepared by ENERCON, with Assistance from BRESL

Some words are proposed to be reviewed in the draft ES&L for AC electric fans, CFLs, and electric motors, respectively.

Details are provided in Sections 3.3, 3.4, and 3.5.

3.11.5 Issuance of ES&L Documents by the Ministry of Water and Power

In order to comply with the'*Policy matrix'*, '*Labelling Policy*' and '*MEPS for fans*', '*the other guidelines*' are proposed to be issued by MOWP.

3.11.6 Increase the Number of Steps in the Labelling Criteria

As shown in Table 3.1-4, most countries have set four or more steps for their respective labelling criteria. This is because consumers can judge the status of appliance regarding EE&C easier when there is a more detailed description.

According to an interview with the person in charge of BRESL, Pakistan adopted three steps of labelling based on the willingness and opinions of manufacturers as important stakeholders.

However, it is strongly recommended to increase the number of steps in the labelling criteria after long-term consideration, in the event of reviewing the labelling criteria as suggested in item 2) of Section 3.11.2.

CHAPTER 4
COUNTERMEASURES FOR PROMOTING EE & C IN PAKISTAN AND IDEA OF SUPPORT IN THE FUTURE

Chapter 4 Countermeasures for promoting EE&C in Pakistan and idea of support in future

4.1 Fundamental policy to promote EE&C in Pakistan

In order to promote EE&C in Pakistan in the future, at first ES&L scheme should be implemented from now, so it can facilitate ENERCON activities included this survey, and then the other countermeasure regarding EE&C should be deployed.

Recommended countermeasures to promote development:

1) Countermeasure1: to accelerate the spread of ES&L
(e.g. Measurement & Verification, awareness, financial assistance measure),
2) Countermeasure 2: to move ES&L from voluntary basis to mandatory basis
(e.g. Enforcement of financial assistance measure, enforcement of testing laboratory, support to move mandatory basis),
3) Countermeasure 3: to review building code (energy provision) and,
4) Countermeasure 4: to facilitate qualified person for energy management system.

Comparison of EE&C Bill countermeasures with other countries is shown in Table 4.1-1.

Table 4.1-1 Rough schedule to promote EE&C in Pakistan

item	2015 DPC3	2016 DPC4	2017 DPC5	2018	2019
Countermeasure1: to accelerate the spread of ES&L (e.g. Measurement & Verification, awareness, financial assistance measure)	→				
Countermeasure 2: to move ES&L from voluntary basis to mandatory basis (e.g. enforcement of financial assistance measure, enforcement of testing laboratory, support to move mandatory basis)			→	→	
Countermeasure 3: to review building code (energy provision)	•••	→	→		
Countermeasure 4: to facilitate qualified person for energy management system					••••▶

Source: Prepared by the JICA Survey Team

4.2 Political issues and suggestion on promotion of EE&C

4.2.1 Political issues and suggestion on promotion of ES&L

1) Enactment of EE&C Bill

The Energy Efficiency and Conservation Bill, 2014 (EE&C Bill, 2014) has already been

approved and submitted to the Parliament by the Council of Common Interest (all provincial chief ministers meeting held on 29th May 2014) for discussion and final approval. However, enactment of bill is delayed due to closing session of Parliament by political demonstration.

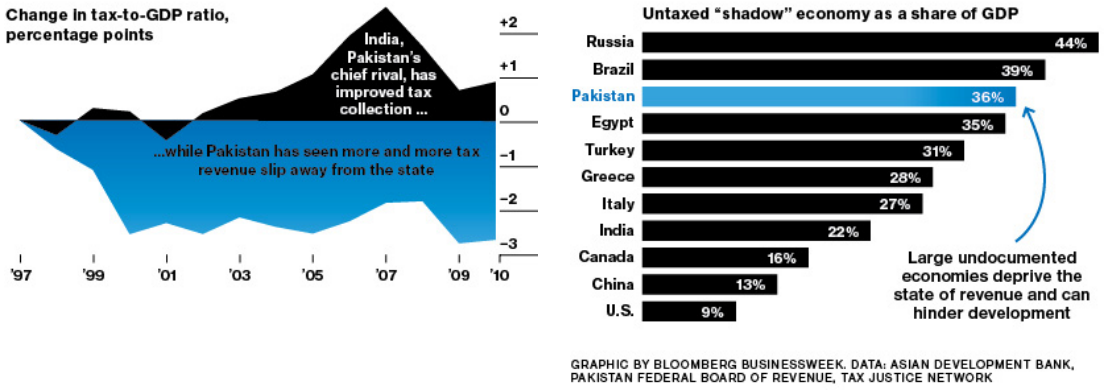
After enactment of EE&C Bill, existing ENERCON will be able to become renewal ENERCON, then they will have the power to enlarge budget and reinforce human resources. If they still have the current budget and human resources, ENERCON will not be able to implement ES&L and relative activities.

Hence, JICA Survey Team suggests to press enactment of EE&C Bill.

ENERCON recognizes the importance for enactment of EE&C Bill, and is anticipated to make efforts continuously to achieve its passage.

2) Underground market

Underground economy in Pakistan is shown in Figure 4.1-1. Its scale reaches approx. 40% of GDP. Based on interviews with retail shops that were carried out by JICA Survey Team in First Field Survey, smuggled goods reach approx. 40% of entire imported goods. Smuggled goods will not be affected by legislation regarding MEPS.



Source: Website of Blooming Business week, the article of "The Secret Strength of Pakistan's Economy" on 5th May, 2012

Figure 4.1-1 Underground economy in Pakistan

JICA Survey Team suggests that Pakistani Government should strengthen the legal framework against smuggled goods by enhancing investigation, prosecution, and penalties.

For example, ban on access of underground market energy related items into open market, Stoppage of production of energy inefficient electric appliances by the local manufacturers. Further because one of issues currently is that Government does not acquire smuggled goods, it is important to collaborate closely with customs department. Pakistan Government had already introduced automatic custom system with assistance of International Finance

Cooperation (IFC). So in future cooperation plan it is desirable to consider checking system for smuggled goods and defensive measures to prevent entry of the substandard appliances on MEPS.

3) Financial assistance measure

Despite that it is important to promote ES&L with introduction of financial assistance measure in phase of voluntary basis, no financial assistance measure have prepared yet at present.

JICA Survey Team suggests to implement a loan system with low interest rates, rebate program in case of purchase of EE&C (similar program to Eco- point program in Japan) as financial assistance measure for consumer; further to introduce Governmental Purchasing Program for ES&L Appliances and EE&C award as financial assistance measure for manufacturers and importers.

4.2.2 Political issues and suggestion on promotion of EE&C

1) Missing items in EE&C Bill, 2014

Comparison of EE&C Bill countermeasures with other countries is shown in Table 4.2-1.

EE&C Bill, 2014 includes almost the same items as in India and Japan, but numerical values are not set yet. Usually, the numerical provisions are set in related documents such as Rules, Regulations, Notifications. Fundamental policy is described with technical countermeasures regarding EE&C at new construction or replacement construction.

Table 4.2-1 Comparison of EE&C Bill countermeasure with other countries

Item	Pakistan EE&C Bill, 2014	India	Japan
Energy conservation in factories and buildings	Set on Article 6 (h). No numerical provision.	Access to Continuous load of 500kW or Contract over 600kVA Full commercial facility. (Ch 12, h)	Annual energy consumption of 1,500kL – TOE and over
Energy manager	Set on Article 6 (l), (m). No numerical provision.	Individuals that meet pre-defined criteria “energy manager” means any individual possessing the qualifications prescribed under clause (m) of section 14.	Energy management control officer, Energy management planning officer
Fundamental policies	NOT described	“Energy consumption standards” means the norms for process and energy consumption standards specified under clause (a) of section 14.	Energy management standard setting duties evaluation standard
Periodic report	Set on Article 6 (l)	Periodic report	Periodic report with medium – long term plans
Standards for energy conservation in building design	Building code	NOT described	Building code

Source: reviewed by the JICA Survey Team based on Data Collection Survey on Energy Sector Reform in Islamic Republic of Pakistan

JICA Survey Team suggests to prepare Rules and Regulations for EE&C Bill in order to fill non-numerical provision parts.

As shown in Table 4-2.1, it is necessary to prepare Rules and Regulations in order to specify scale of buildings and factories that are subject to (1) obligation for energy conservation, (2) obligation to have an energy manager.

4.3 Human resource, organizational issues and suggestion on promotion of EE&C.

4.3.1 Human resource, organizational issues and suggestion on promotion of ES&L

1) Cooperation more closely with industrial companies

According to interviews with industrial companies, some companies act like they are not given available information regarding MEPS and labelling and their opinion is not reflected in framework of MEPS and labelling, despite ENERCON have held conferences at times. For promoting EE&C policy including MEPS as well as labelling smoothly, it is very important to cooperate more closely between Governmental side and Private sector, to exchange information of the process of decision making and increase opportunities for communication.

JICA Survey Team suggests that ENERCON should establish cooperative relations with industrial companies. It will be helpful to carry out collaborative work with EDB, an umbrella organization of MOIP, because historically they have established good connections with industrial companies.

Draft EE&C Bill describes PEECB includes several members selected from the private sector, but it is desirable to select private sector members under recommendation from related associations such as PEMA. If this is not done, the information might not be shared with the other companies, and member selected from the private sector might state his personal opinion without reference to any collective opinion from the private sector.

2) Cooperation more closely with related Ministry and governmental body

Despite the necessity to improve testing laboratories in order to implement ES&L, JICA Survey Team found that ENERCON have inadequate contact with PCSIR, as national testing organization, and MOST, as control authority to PCSIR.

Both ENERCON and PCSIR should estimate number of needed laboratories and provide them.

JICA Survey Team suggests holding periodic meetings or facilitating contact among entities

considering laboratory preparation.

As number of laboratories, based on number of applications for grant of labelling in voluntary basis, number of applications for grant of labelling on mandatory basis will be estimated, to track necessary number of testing laboratories. In order to estimate it, time length for testing and acceptable waiting time length for manufacturers should be grasped. Role of ENERCON is to set number of applications for grant of labelling, acceptable waiting time length for manufacturers based on interview from manufacturers and track record of number of applications for grant of labelling on voluntary basis. Role of PCSIR is to set time length for testing. Government can take option to certify laboratory of private sector and oversee laboratory as accredited laboratory, besides preparing national laboratory.

3) Non regular staff in ENERCON

Based on interviews with ENERCON staff, ENERCON's project staff are assigned from other organizations (e.g. MOWP) for starting the project; then they return to their original organization upon finishing the project.

Hence, it is one of main causes that professional skill and capacity remains at a low level within ENERCON.

According to BRESL, at first phase of BRESL, due to shortage of manpower of ENERCON, capacity development was not carried out sufficiently.

After establishment of renewal ENERCON, it is important to reinforce human resources for ES&L in order to implement ES&L smoothly and properly.

JICA Survey Team suggests to increase number of regular staff of ENERCON and to install permanent department regarding MEPS and labelling. In order to implement ES&L, ENERCON should provide some kind of capacity, such as receiving and treatment of submitted applications by manufacturers, selection of appliances as subject to new MEPS, preparation of guideline document, periodical review for guideline of appliances of subject to MEPS, consideration to improve ES&L scheme including moving to mandatory basis.

Since number of receiving and treatment of applications is expected to increase rapidly after moving to mandatory basis, it is necessary to ensure adequate budget and human resources.

4.3.2 Human resource, organizational issues and suggestion on promotion of EE&C

1) Foundation of Cooperation organization with another Ministry

It is desirable to review Building Code Pakistan (Energy provision) in the future, According to

interviews with industrial companies, some companies act like they are not given available information regarding MEPS and labelling and their opinion is not reflected on framework of MEPS and labelling, despite ENERCON have held conferences at times. For promoting EE&C policy including MEPS as well as labelling smoothly, it is very important to cooperate more closely between Governmental side and Private sector, to exchange information of the process of decision-making and increase opportunities for communication.

4.4 Concept of support in the future

4.4.1 The project to accelerate the spread of ES&L

1) Verification for effect of introduction of ES&L

It is important to verify the effect of introduction of ES&L, as basic data to consider promotion measures of ES&L.

As part of promotion project of ES&L, technical expert should support to grasp number of appliances that comply with MEPS in market, and further to establish methodology and scheme for verification of amount of reduction of electric power demand and reduction of annual electric power consumption due to change to ES&L appliances from conventional appliances. At the same time, it is useful to improve awareness of manufacturers and importers, share information of appliance that comply with MEPS through preparation and publication of database of ES&L

2) Establishment of awareness framework

In order to accelerate the spread of ES&L efficiently and rapidly, it is desirable to go forward with the promotion of ES&L from both sides: promotion for manufacturers and importers, and promotion for consumers.

Regarding promotion for manufacturers and importers, the policy is to be recognized to move ES&L to mandatory basis after a few years from now, and to prepare financial assistance measure as discussed later, then provide incentives to manufacturers and import the appliances that comply with MEPS at an early date.

Regarding promotion for consumers, the policy is to hold public relations activities to inform ES&L, and to recognize the effectiveness of introduction of ES&L through demonstration (for visual understanding), and to prepare financial assistance measure as discussed later, then provide incentive to purchase the appliances that comply with MEPS. As promotion countermeasure for retailers, the same public relations activities should be taken to retailers, as

it is necessary to recognize the sale of the appliances that comply with MEPS generates returns.

Technical expert should support to establish promotion activities, with attention that ENERCON has a plan to hire local consultant regarding promotion activities, and for promotion activities, an expert of WB may give assistance to ENERCON, in collaboration with them.

3) Establishment of financial assistance measure

As mentioned above, it is effective to provide financial assistance measure in order to give manufacturers, importers and consumers a push to participate in ES&L.

Regarding financial assistance measure for manufacturers and importers, introduction of governmental purchasing program for EE&C appliances and Award to excellent ES&L have good effect.

Regarding financial assistance measure for consumers, Low interest rate loan for EE&C appliances and rebate program in case of purchase of EE&C appliances (similar scheme with ECO-point program in Japan) have good effect.

Technical expert should support to estimate budget for each program, to estimate effect with introduction of such programs, and to facilitate implement procedure.

Table 4.4-1 Summary of the project to accelerate the spread of ES&L (Tentative)

1. Name	The project to accelerate the spread of ES&L
2. Coauthor	ENERCON
3. Target	1) MOWP 2) MOF 3) ENERCON 4) EDB 5) PPRA
4. Object	To pervade ES&L in Pakistan
5. Expected effect	To enhance the capacity of ENERCON to accelerate the spread of Energy Standard and Labelling (ES&L)
6. Cost	0.7 million USD
7. Period	FY2015

8. Item

This project aims to enhance capacity of ENERCON and to improve implementation situation of ES&L through promotion of ES&L efficiently in whole Pakistan.

1) Verification for effect of introduction of ES&L 1 (Preparation of energy efficiency data base regarding ES&L)

- ✓ Establishment of Policy and Methodology regarding Database
- ✓ Implementation of Data collecting survey
- ✓ Support for Publicity of database and Improvement of Methodology

2) Verification for effect of introduction of ES&L 2 (Estimation of effect of introduction of ES&L)

- ✓ Survey for number of appliance that is subject to ES&L in market (e.g. questionnaire survey from manufacturers and importers)
- ✓ Survey for average time length to utilize appliance that is subject to ES&L (e.g. questionnaire survey from consumer)
- ✓ Support of publication of database and improvement of implementation method

3) Establishment of awareness framework 1 (Seminar to manufacturers and importers)

- ✓ Support to hold seminar for manufacturers and importers in order to promote ES&L

4) Establishment of awareness framework 2 (Seminar to consumer and retailer)

- ✓ Support of planning for publication to consumer in order to promote ES&L
- ✓ Support of planning and implementation for demonstration that is shown effect of introduction of effect in order to promote ES&L
- ✓ Support to hold seminar for retailer in order to promote ES&L

5) Establishment of financial assistance measure 1 (Governmental purchasing program for EE&C appliances)

- ✓ Grasp of current legal framework and issues regarding Governmental purchasing program
- ✓ Feasibility study and consideration of effect on introduction of Governmental purchasing program to Federal Government
- ✓ Feasibility study and consideration of effect on introduction of Governmental purchasing program to Local Government

6) Establishment of financial assistance measure 2 (Award to excellent ES&L)

- ✓ Establishment of policy and implementation procedure regarding Award to excellent ES&L
- ✓ Support to establish evaluation committee regarding Award to excellent ES&L

7) Establishment of financial assistance measure 3 (Low interest rate loan for EE&C appliances)

- ✓ Consideration and establishment of framework for Low interest rate loan
- ✓ Support to estimate needed budget and introduction effect for Low interest rate loan

8) Establishment of financial assistance measure 4 (rebate program in case of purchase of EE&C appliances)

- ✓ Consideration and establishment of framework for rebate program in case of purchase of EE&C appliances
- ✓ Support to estimate needed budget and introduction effect for rebate program in case of purchase of EE&C appliances

The Schedule (Non Application)

Item \ months	1 to 2	3 to 4	5 to 6	7 to 8	9 to 10	11 to 12
- Selection of consultant	•••••••••					
- Verification for effect of introduction of ES&L 1 (Preparation of energy efficiency data base regarding ES&L)		———	———	———		
- Verification for effect of introduction of ES&L 2 (Estimation of effect of introduction of ES&L)			———	———	———	———
- Establishment of awareness framework 1 (Seminar to manufacturers and importers)		———	———	———		
- Establishment of awareness framework 2 (Seminar to consumer and retailer)			———	———	———	———
- Establishment of financial assistance measure 1 (Governmental purchasing program for EE&C appliances)		———	———	———	———	———
- Establishment of financial assistance measure 2 (Award to excellent ES&L)		———	———	———	———	———
- Establishment of financial assistance measure 3 (Low interest rate loan for EE&C appliances)		———	———	———	———	———
- Establishment of financial assistance measure 4 (rebate program in case of purchase of EE&C appliances)		———	———	———	———	———

Source: Prepared by the JICA Survey Team

4.4.2 The project to move ES&L from voluntary basis to mandatory basis

1) Enhancement of financial assistance measure

The items for verification of effect of financial assistance measure, preparation of draft hard-hitting and/or additional countermeasure.

2) Enhancement of energy conservation performance test framework

As against energy performance test for fans and lighting appliances that is carried out simply measurement, such as air volume or light value, Energy performance test for room air conditioners and refrigerators require high level of technical capabilities, such as keeping constant, new International Organization Standardization requires to test under more than two temperature condition respectively, air temperature in test room must remain constant set temperature during test. Further the difference between constant speed appliances and variable speed control appliances (Inverter control) should be defined evaluation method.

Japan Government has some experience of training in Japan or technical expert dispatch, as assistance program for international standardisation regarding room air conditioners and refrigerators between ASEAN countries.

Technical expert should support establishment of test procedure regarding room air conditioners and refrigerators.

3) Support to move ES&L to mandatory basis

Prior to moving ES&L to mandatory basis, it is very important to consider deeply treatment policy against substandard appliances on MEPS. According to EE&C Bill 2014 that is on the desk at parliament, Federal Government will have power to prohibit manufacture, import, sale against the appliance that is not comply with MEPS. Because it is so strong power, it is very important to consider process, such as consensus with manufacturers and importers, legal procedure in case of execution of the power, counter policy in case that manufacturers and importers will take government to court.

Further number of human resources and laboratories needed on operation should be considered and provided.

As support to move ES&L to mandatory basis, technical expert should support to prepare legal procedure and carry out technical matters.

Table 4.4-2 Summary of the project to move ES&L from voluntary basis to mandatory basis (Tentative)

1. Name	The project to move ES&L from voluntary basis to mandatory basis
2. Coauthor	ENERCON
3. Target	1) MOWP 2) MOF 3) MOST 4) ENERCON 5) PSQCA 6) PCSIR
4. Object	To provide path to move ES&L from voluntary basis to mandatory basis
5. Expected effect	To enhance the capacity of ENERCON, PSQCA and PCSIR regarding ES&L implementation
6. Cost	0.4 million USD
7. Period	FY2017 - FY2018

8. Item

This project aims to improve capacity of ENERCON, PSQCA, PCSIR and further to improve implementation framework of ES&L through establishment of framework to move ES&L to mandatory basis.

1) Enhancement of financial assistance measure

- ✓ Verification of effect of implemented financial assistance measure and suggestion to improve financial assistance measure
- ✓ Consideration of new countermeasure of financial assistance measure

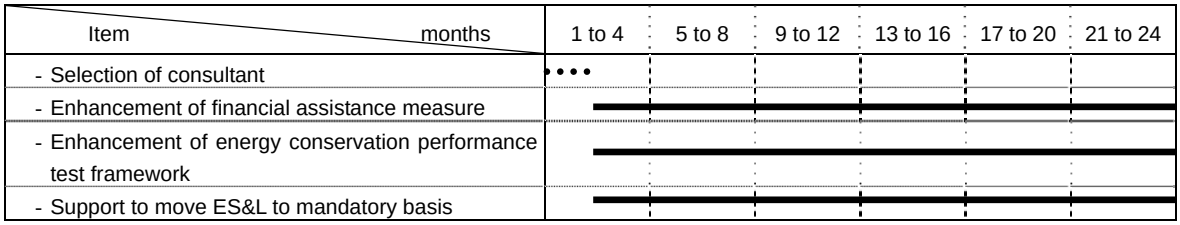
2) Enhancement of energy conservation performance test framework

- ✓ Introduction of international standard on energy performance test for Air Conditioner and Refrigerator and recent technical knowledge in Japan and clarification of main issues
- ✓ Current Situation and Issues of Review and Amendment of ES&L Criteria for Air Conditioner and Refrigerator
- ✓ Support to prepare plan of Review and Amendment of ES&L Criteria for Air Conditioner and Refrigerator
- ✓ Support to carry out plan of Review and Amendment of ES&L Criteria for Air Conditioner and Refrigerator

3) Support to move ES&L to mandatory basis

- ✓ Consideration of legal procedure to move ES&L to mandatory basis
- ✓ Support to facilitate consensus with manufacturers and importers
- ✓ Confirmation of crackdown methodology and risk (e.g. tribunal risk)
- ✓ Consideration of methodology of defensive measure to enter the substandard appliances on MEPS

The Schedule



Source: Prepared by the JICA Survey Team

4.4.3 The project to review Building Code (Energy Provision)

1) Review of building code (Energy provision)

In Japan experience, Ministry of Land, Infrastructure, Transport and Tourism, Japan (MLIT), targeted to improve energy efficiency for insulation and incidental facilities on building from enactment of Energy Saving Act, Japan. It also took variable countermeasures after 2000s that

focused on energy conservation in the commercial building sector.

For instance, Japan Government introduced “Comprehensive Assessment System for Built Environment Efficiency” (CASBEE) from 2001; it is a comprehensive evaluation system regarding environmental impact through building lifecycle. Further, it introduced ”Building Energy Efficiency Labeling System” (BELS) from 2014, which is a comprehensive evaluation system for energy performance of buildings.

Both systems are epoch-making since they not only specify standard of envelope insulation and standard of incidental facilities to be adopted, as is conventionally done, but they also evaluate overall energy efficiency of buildings including consideration of building operation and introduction of five steps labelling indication system for standard building.

So, in the review of Building Code Pakistan (Energy Provision), in light of Japan’s experience, technical expert should support on technical matters to adopt more aggressive energy provision.

ENERCON will carry out the project, in collaboration with MOST, that is supervisory authority of PEC, and MOHW, that is supervisory body for policy regarding buildings.

2) Establishment of implementation framework

Also in Japan, national government enacts building code, but local government, such as prefectures and municipalities, has discretion in operation of building code. The basic procedure is the same for any local government, but detailed procedure differs among local governments.

According to interviews at PEC, the situation in Japan is same as in Pakistan, but the weak point in Pakistan is only halfway operation of building code.

Thus, it is important to facilitate assured operation organization for revised Building Code Pakistan (Energy Provision) through development of recognition of need for building code.

In order to produce an effective building code, it is necessary that designers design based on keeping legal requirements in design phase, and contractors procure and construct under accredited design diagram in construction phase. Technical expert should support to facilitate implementation organization including checking system.

Table 4.4-3 Summary of the project to review Building Code (Energy Provision)

1. Name	The project to review Building Code (Energy Provision)
2. Coauthor	ENERCON
3. Target	1) MOWP 2) MOHW 3) MOST 4) ENERCON 5) PEC 6) Municipalities
4. Object	To go ahead with EE&C on building sector through improvement of building code (Energy Provision)
5. Expected effect	To enhance the capacity of ENERCON, PEC and Municipalities
6. Cost	0.4 million USD
7. Period	FY2016

8. Item

This project aims to enhance the capacity of ENERCON, PEC and Municipalities, further to improve implementation framework of Building Code (Energy Provision) thorough improvement of Building Code (Energy Provision).

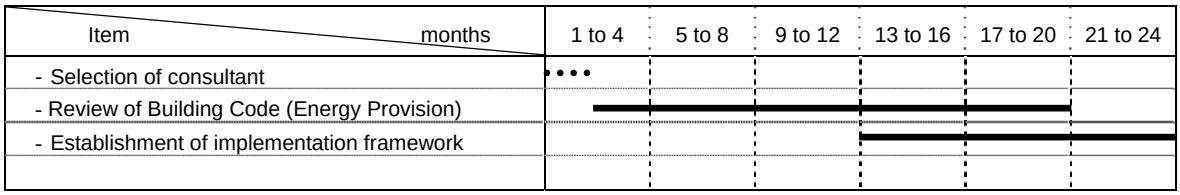
1) Review of building code (Energy provision)

- ✓ Introduction of history of Building Code and recent technical knowledge in Japan and clarification of main issues
- ✓ Consideration of methodology for evaluation of energy performance on buildings
- ✓ Drill of evaluation of energy performance on pilot buildings (renovation buildings or new buildings) and Verification of effectiveness
- ✓Consideration of item and procedure for review of Building Code (Energy Provision)

2) Establishment of implementation framework

- ✓ Grasp of issues of current implementation framework
- ✓ Consideration of draft implementation framework
- ✓ Preparation to implement guideline
- ✓ Preparation of seminar to develop the capacity of person in charge of municipalities

The Schedule



Source: Prepared by the JICA Survey Team