Policy Discussion Paper

ASSESSMENT REPORT

on Energy Efficiency Institutional Arrangements in Asia

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

Green Growth

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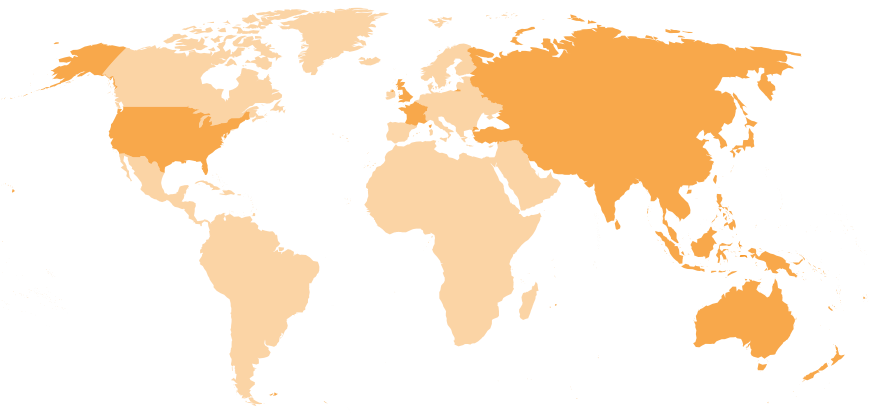

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DISCLAIMERS

This publication presents the energy efficiency institutional arrangements of most countries in Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan), South Asia (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) and South-East Asia (Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam).The remaining countries in these subregions were not covered due to difficulties in collecting information.

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FOREWORD

Energy security is high on the agendas of ESCAP member States. The dependence of many of these countries on imported energy resources from other regions of the world and the unequal distribution of relatively abundant energy resources in the region punctuate this concern. The volatility of the price of oil due to supply and demand economics is another related issue.

Under these circumstances, the technical and economic viability of energy efficiency has come into sharper focus. Promoting energy efficiency has been identified as an effective energy, economic and climate policy aimed at managing demand for energy, increasing economic revenues by decreasing cost, and reaping the rewards for mitigating climate change, respectively.

Energy efficiency is a technical term in the energy sector that means using less energy to provide the same level of energy service. Energy efficiency is aligned with the path to Green Growth, a concept that involves a paradigm shift from "quantity of growth" to "quality of growth." Such a shift is congruent with the aspirations embodied in an energy efficiency policy. Energy efficiency could be aptly considered a component of sustainable production and consumption path to Green Growth since it is based on the principle of improving the quality of consumption by reducing the quantity of resources used in production. Energy efficiency deviates from "old" economics in the sense that its emphasis is on building "virtual" power plants instead of building "more" power plants.

The promotion of energy efficiency is inadequate however, especially when fuel prices are low. In order to develop energy efficiency fully as a policy, an enabling environment should be developed. This environment consists of awareness, technology deployment, market, financing, regulations, legislation and institutional arrangements.

The institutional dimension, which has been lagging behind in development and policy debates for many years, is the focus of this publication. In the 1980s, a number of governments established entities to promote energy efficiency; however, they have been ineffective for a variety of reasons. As a result of weak institutional support and capacity, policy and programmes for energy efficiency have not received enough attention, which has a detrimental impact on their effectiveness.

Against this backdrop, ESCAP launched the project "Strengthening institutional capacity to support energy efficiency in Asian countries" with the support of the Korea Energy Management Corporation (KEMCO) under the East Asia Climate Partnership to develop policy options for promoting and implementing energy efficiency. During the first year of project implementation, existing institutional arrangements in the Central, South and South-East Asian subregions were reviewed. Case studies of varying institutional arrangements from countries and regions inside and outside the ESCAP region were also prepared. In March 2010, a regional workshop was held in Bangkok to present the results of the study and to solicit comments from country participants and other energy efficiency stakeholders.

This publication is the result of a review of the assessment conducted during the workshop. We hope that it will be relevant to national policymakers and energy institutions alike in their efforts to strengthen their capacity to promote energy efficiency and that it will contribute in advancing Green Growth in the long run.

Bangkok, Thailand
July 2010

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This publication was prepared under the overall direction of Shaoyi Li, who was the Chief of the Energy Security Section during the first months of the project and later was Officer-in-Charge of the Environment and Development Division. The publication has benefited much from the review, comments and advice of staff from the Energy Security Section, namely: Kohji Iwakami, Hongpeng Liu, Kelly Hayden and Sergey Tulinov. Maritess Cabrera, consultant to the Section also provided useful comments. Yuvaree Apintanapong provided secretarial support.

AUTHORS

Tienan Li. Dr Li has extensive experience in the field of quality management and standardization, particularly with respect to energy efficiency, including practical experience as the President of China Standard Certification Center where he develops and manages energy efficiency endorsement labeling programme of China. He also works with ESCAP and UNEP on their Regional Helpdesk on Sustainable Consumption and Production in Asia and the Pacific, and at the ELI Quality Certification Institute. Dr Li authored a number of publications on energy efficiency standards and labeling. He has a doctorate in environment economy and environment management from the Research Center for Eco-environmental Sciences at the Chinese Academy of Sciences. In this report, Dr Li wrote the assessment for South Asia and South-East Asia.

Sergey Molodtsov. Mr Molodtsov has extensive experience in the energy sector and has worked on energy policy as a research fellow in Moscow and participated in several energy efficiency projects. He is currently Deputy Director for Science of the Centre for Energy Policy in Moscow. He has a degree in thermal engineering from Moscow Power Engineering Institute. Mr Molodtsov wrote the assessment for Central Asia in this report.

Laurence L Delina. Mr Delina is an independent international consultant on energy and development. He has researched green buildings and energy efficiency and their application to developing countries while with the Institute for Global Environmental Strategies in Japan. Aside from writing the section on case studies of this report, Mr Delina provided support with compilation, editing, proofreading and layout. He holds a Master in Public Administration (organization and management) from Mindanao State University, the Philippines and a Master of Arts in Development Studies from the University of Auckland, New Zealand.

CONTENTS

CONTENTS *(continued)*

ABBREVIATIONS AND ACRONYMS

A&E	appliances and equipment
AC	air conditioner
ACE	ASEAN Centre for Energy
ADB	Asian Development Bank
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
BCM	billion cubic metres
BRESL	Barrier Removal to the Cost-effective Development and Implementation of EE Standards and Labeling Project
BTUs	British thermal units
CAREC	Regional Centre on Environmental Protection in Central Asia
CDM	Clean Development Mechanism
CFL	compact fluorescent lamp
CIDA	Canadian International Development Agency
CIS	Commonwealth of Independent States
CLASP	Collaborative Labeling and Appliance Standards Program
CNG	compressed natural gas
CO_2	carbon dioxide
DANIDA	Danish International Development Agency
DC	designated consumers
DSM	demand side management
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECCJ	Japan Energy Conservation Center
ECE	United Nations Economic Commission for Europe
EE	energy efficiency
EE&C	energy efficiency and conservation
EE21	Energy Efficiency 21
EEL	energy efficient lighting
EIA	Environment Impact Assessment
ELI	Efficient Lighting Initiative
ENERTEAM	Energy Conservation Research and Development Center

E^nR	European Energy Network
ERWG	End-Use Energy Rating Work Group
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
ESCO	energy service company
ESD	education for sustainable development
ESMAP	Energy Sector Management Assistance Programme
EU	European Union
EurAsEC	EurAsian Economic Cooperation
GBCI	Green Building Certification Institute
GDP	gross domestic product
GEF	Global Environment Facility
GHG	greenhouse gas
GJ	gigajoules
goe	gram of oil equivalent
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
GW	gigawatt
GWh	gigawatt-hour
HCFC	hydroclorofluorocarbon
HVAC	heating, ventilating and air conditioning
IEA	International Energy Agency
IEA 4E	IEA Efficient Electrical End-Use Equipment
JICA	Japan International Cooperation Agency
KEMCO	Korea Energy Management Corporation
ktoe	thousand tonnes of oil equivalent
KVA	kilovolt-ampere
kWh	kilowatt-hour
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
MEPS	minimum energy performance standards
MMBOE	million barrels of oil equivalent
Mt	million tonnes
$MtCO_2$	million tonnes of carbon dioxide
Mtoe	million tonnes of oil equivalent

MW	megawatt
MWe	megawatt electrical
NGO	non-governmental organization
OECD	Organisation for Economic Co-operation and Development
PMO	Project Management Office
PPP	purchasing power parity
PROMEEC	Promotion of EE&C Programme
R&D	research and development
REEEP	Renewable Energy and Energy Efficiency Partnership
RENEUER	Regional Network for Efficient Use of Energy and Water Resources in South-East Europe
S$	Singapore dollar
S&L	Standards and Labels; standards and labeling
SAARC	South Asian Association for Regional Cooperation
SARI/Energy	USAID South Asia Regional Initiative for Energy Cooperation and Development
SIDA	Swedish International Development Cooperation Agency
SME	small and medium enterprises
SPARE	School Project for Application of Energy and Resources
TACIS	Technical Aid to the CIS
tC	tonnes of Carbon
TOE	tonnes of oil equivalent
TPES	total primary energy supply
TWh	terawatt-hour
UNDP	United Nations Development Programme
UNFCCC	United Nations Frameworks Convention of Climate Change
UNIDO	United Nations Industrial Development Organization
US$	United States dollar
USAID	United States Agency for International Development
USGBC	United States Green Building Council
VA	voluntary agreement
VAT	value-added tax
W	watt

EXECUTIVE SUMMARY

Asian countries have demonstrated the most considerable economic growth in the past decade. Some developing and transition economies achieved annual GDP growth between 9 and 11 per cent in 2000 and 2007. Industrial development and rising income of growing population had considerably led to a surge in primary energy demand. Today, Asia covers the lion's share of the world's primary energy consumption. Between 2007 and 2030, the region is projected to account for 45 to 50 per cent of the increase in world primary energy demand. As a consequence, Asia will increasingly contribute to burden on energy consumption, deterioration of the environment connected with energy consumption growth, and increase of conventional energy utilization.

This mode of growth is unsustainable. Governments, therefore, should start looking for alternative paradigm where growth can be sustained without causing further stress to the environment. In the process, Governments are urged to review their current development paradigm which is based mostly on the ethos of "quantity of growth" instead of "quality of growth." Such paradigm shift involves striding a path towards Green Growth, a path where energy efficiency is an inevitable and essential component.

The development and implementation of wide-scale energy efficiency (EE) policy is the most reliable, technically acceptable and economically affordable way to overcome the above mentioned negative consequences and at the same time shift towards a new path to development congruent with Green Growth paradigm. Important directions of energy saving policy could involve the following:

- improvement of energy supply efficiency, in particular fossil fuel efficiency for electricity generation;
- reduction of fuel and energy transportation and distribution losses (fossil fuels, electricity, and heat power); and
- improvement of end-use EE through organizational, fiscal and technical measures across sectors.

EE should be scoped as encompassing the industry, building, household, and other sectors. For industry, the following relevant measures could be included:

- development and introduction of EE standards for industrial equipment;
- implementation of energy audits to identify potential areas for EE improvement;
- creation of financial incentives to produce or install energy efficient equipment and processes;
- introduction of voluntary agreements (VA) for improving EE in particular industries; and
- implementation of demand-side management (DSM) programmes (in cooperation with energy suppliers) to reduce energy demand and peak load.

For residential and commercial buildings, the following EE measures can be applied:

- building codes regulating the overall energy use per unit of residential or office floor space;
- energy audits to identify available energy saving potential;
- financial incentives for construction of energy efficient buildings and purchase of energy efficient equipment and materials; and
- information on best practices in building design and construction.

A considerable progress in improving EE in households and offices could be mostly achieved through:

- appliance standards of household appliances and office equipment; and
- appliance labels informing consumers about the efficiency or specific energy consumption of appliances and equipment for them to make more intelligent choices.

EE promotion in Asia

The rising prices of electricity and the growing demand for finite and diminishing fossil fuel resources, both developed and developing Asian economies began to pay greater attention to improving EE. This has now become one of the priority fields in energy, economic, and climate policy in the region. The potential benefits in terms of lower energy cost, enhanced energy security, and reduced environmental impact are widely understood.

In varying terms, many countries have demonstrated visible progress in the development and implementation of EE policies and measures. Legislation on energy saving or rational use of energy resources and regulations in construction, transportation, industry, agriculture, and environmental protection related to EE exist in many Asian countries. These determine the main directions in the implementation of EE programmes.

One of the main directions of EE policy in most Asian economies is oriented at end-use EE improvement where the policy of carrot and stick is widely used. In industry, this takes the form of:

- tax exemptions;
- low-interest loans for EE investments; and
- financial penalties for failure to install energy efficient industrial equipment.

Similar approaches are used in the building sector in the form of:

- mandatory or voluntary codes for residential and commercial buildings;
- tax exemption for efficient buildings; and
- penalties for constructing new buildings which are inefficiently designed and built.

In households and offices, incentive payments for purchase of energy efficient appliances and equipment have also taken place through various EE standards and labeling (S&L) programmes.

EE programmes are usually financed by national budget allocations, energy saving funds, bank credits, energy consumers, DSM programmes, and international donors and funders.

Governments have also widely used information and educational materials to support the promotion and implementation of EE policy. These are usually disseminated through:

- educational programmes in schools and universities and
- publicity and information campaigns through multi-media platforms (TV, print, radio, telephone, and internet).

EE institutions in Asia

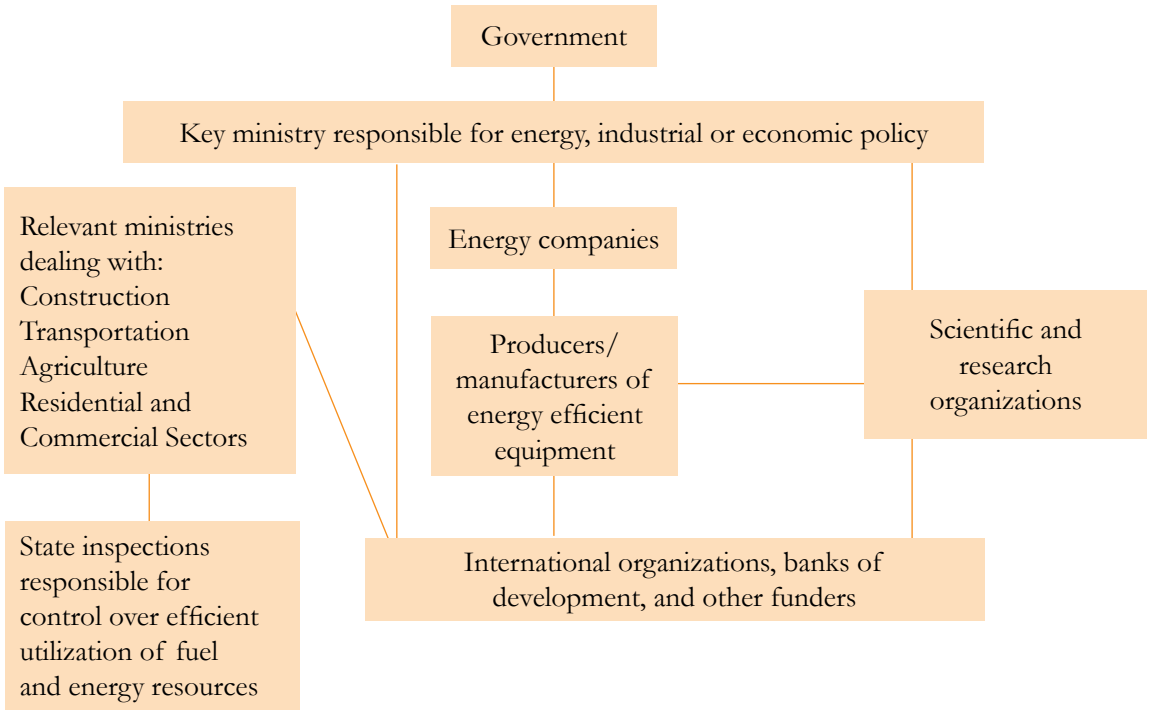
The institutions involved in the promotion and implementation of EE in Asia often include key government bodies, energy companies, financial institutions, and scientific and research organizations. Typically, most

Asian countries employ specialized institutions devoted to EE within the framework of state management (see Figure 1). These institutions are oftentimes placed under the aegis of central ministries. Their level of effectiveness, however, varies.

Most of the time, these institutions conduct cooperative activities not only with other government bodies and ministries, but also with energy companies (producers, distributors, and energy service companies or ESCOs), scientific and research organizations, national and international financial institutions, development banks, and others.

Aside from domestic cooperation, governments also reached out with each other at the regional level. They consider EE as important component of energy, economic and environmental policies that can be advanced as a regional group. South-East Asian countries, for instance, have joined together to create the Association of South-East Asian Nations (ASEAN) Centre for Energy (ACE); South Asian countries, through the South Asia Association for Regional Cooperation (SAARC), have established its own Energy Centre; while Central Asian economies have put energy a major focus of the Eurasian Economic Community (EurAsEC). A number of successful international projects have been implemented through this cooperation.

Figure 1 | Typical arrangement of EE institutions in Asian countries



Challenges

Despite the existence of institutions promoting EE at country and regional levels, promoting EE on a larger scale is still hampered by several challenges and barriers that vary from country to country. These barriers include informational, financial/funding, and institutional among others.

For the purpose of this publication, the following are the for effective institutional arrangements:

- Insufficiency or absence of legislative basis, national strategies and plans for EE;
- Insufficient organization of and coordination among institutional structures;
- Insufficiency or absence of interactions and communications among government structures and other potential participants (energy companies, producers of energy efficient equipment, financial institutions, R&D, final consumers);
- Unstable funding support;
- Weak capacity of human resources;
- Insufficiency or absence of coordination and flexibility within the government; and
- Insufficient capacity to develop and undertake EE programmes and projects.

Recommendations

In pursuit of effective EE policy, governments need to have effective institutions to develop appropriate EE programmes and activities, and to monitor their implementation. Part 3 of this publication presents some case studies of existing EE institutional arrangements inside and outside Asia for policymakers to learn from. These EE institutions were selected to produce an array of examples. Although they vary, elements essential to create and run a successful EE institution were identified as key to their effective management. These elements include:

- Planned institutional strategy,
- Established management and leadership structure,
- Buy-in and ownership among stakeholders, and
- Substantial funding.

In theory and practice, it is ideal to have all these institutional elements act in balance with each other to ensure the robustness of their systems. However, the external political, cultural and policy-enabling environment within which these institutions exist, as well as their continuing institutional evolution should be considered when reaching conclusions. Policymakers are challenged to take account all of these factors.

Generally, strengthening the capacities and arrangements of EE institutions in Asia would ideally involve:

- Enabling legislative framework to provide mandate and legal basis for their establishment;
- Building relevant macro and micro institutions (a special state institution such as an Energy Conservation Agency or Committee under ministerial control at the national level; legally and financially strengthening existing energy conservation departments or units at all levels; and establishing new EE units for those who have not done so);
- Strengthening subregional cooperation;
- Expert trainings and scaling-up of information dissemination campaigns;
- Adequate and sustained funding to realize institutional objectives;
- Strengthening human resources; and
- Strengthening management and leadership structure.

INTRODUCTION

In the past thirty years, Asia and the Pacific has contributed much to the increase of primary energy use in the world due to rapid economic growth, massive infrastructure investments and rising populations in the region. The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2008) reported that Asia and the Pacific region inefficiently produces and consumes energy compared with other parts of the world. The region's final consumption from 1992 to 2005, for instance, was about 40 per cent of the world's total (ESCAP, 2008:62). In the same vein, the International Energy Agency (IEA) (2009) reported that the region had consumed 35% of the global total in 2007. Future demand has been projected to climb with APEC and ADB (2009) forecasting annual growth rate of 3.4 per cent on average by 2030. Pursuing energy security, therefore, has become a paramount policy agenda for countries in the region. Ensuring the availability, sufficiency, affordability and sustainability of energy supplies has led to energy efficiency (EE) being sought as a vital policy option in meeting the required demand for energy security and sustainable development.

With an energy self sufficiency ratio (the ratio of total primary energy production over primary energy supply or demand) of 1.01 in 2005, the ESCAP region is producing just enough to meet its primary energy demand. However, the extent of energy independence varies at the subregions. In 2005 for instance, while the North-Central and South-East Asian subregions are self sufficient (the former having 2.14 energy self-sufficiency ratio while the latter has 1.12), the South and South-West Asian subregions barely met their energy requirement (at only 0.95 ratio) (ESCAP, 2008).

The strong demand for energy was driven by the demand in industry, household and transport sectors. These sectors were not only the region's largest energy-consuming sectors, but also its fastest growing (ESCAP, 2008:65). Same trends can be gleaned at the subregions. This sends the signal for vast EE potential.

ESCAP acknowledges the enormous opportunities for increasing EE in Asia. EE has been labelled as the most cost-effective mode to meet energy demand. It is paired with renewable energy in realizing a secure and clean energy future and mitigating global climate change. Most ESCAP member States have general energy laws containg provisions on EE provisions, a number have laws specific to EE. Programmes and projects that promote EE are also visible in many countries. At the international front, subregional organizations have initiated EE-promoting activities and global organizations have reach out to countries to maximize EE. However, gaps still exist. Legislation on EE, for instance, is absent in some countries. They also do not have institutional arrangements to support the promotion, development and implementation of EE policy, programmes and activities.

Review of energy statistics

Asia and the Pacific region possesses great amount of natural endowments including vast energy sources. These, however, are not evenly spread and consumed across countries. ESCAP member States have distinct history, political set-ups, level of development, legal and institutional frameworks which impact their fuel and energy complex. In Central Asia, for instance, the unity of energy balance and energy infrastructure of former Soviet Union republics was disrupted after the Union became defunct in 1991. Because of the sluggishness of energy supply system development, and high level of required capital intensity, most Central Asian countries (which are former Soviet Republics) were challenged to adapt to new circumstances.

Although Asia as a whole is energy self-sufficient, the ratio for energy self-sufficiency varies from country-to-country (see Table 1). Asian countries undoubtedly face the challenge of ensuring sustainable energy supply. Countries with limited fuel and energy resources have to spend for fuel imports, while those with rich energy resource base have to make sure the steady investment support for their fuel industries. It is therefore necessary for both types of countries that the stream of energy supply continue to flow to industries and households in order to sustain growth.

One important aspect of energy and economic policy for all Asian countries, therefore, consists of determining ways to reduce the growth rate of energy requirement without compromising economic and social conditions for development. The most important way to increase the level of energy security includes improvements in efficiency in fuel and energy use which preludes the shift towards an energy efficient culture.

Between 2000 and 2007, Asian countries have considerably achieved economic development as evidenced by increasing growth figures in Table 1. In Central Asia, GDP in Kazakhstan had almost doubled while that of Turkmenistan had increased 1.5 times. Kyrgyzstan and Tajikistan had also registered considerable economic growth during this period at 34 and 80 per cent, respectively. Growth was also impressive in South Asia. India grew by almost 70 per cent while its neighbouring countries registered impressive growth rates in varying degrees. In South-East Asia, Myanmar and Cambodia, where GDP had increased by 106 and 91 per cent, respectively, are the countries with the fastest growth rates in the subregion.

However, the volume of energy supply as measured in terms of Total Primary Energy Supply (TPES) did not grow as much as GDP had. As shown in Table 1, the growth rates of TPES in most Asian countries (except Malaysia and Thailand) had substantially lagged behind compared to GDP growth rates. For example, in Turkmenistan, TPES had increased only by 25 per cent while its GDP has grown by 148 per cent. In Bangladesh, TPES has grown by 39 per cent vis-a-vis its GDP which increased by 48 per cent. In Viet Nam, TPES has increased by 50 per cent while GDP by 69 per cent.

GDP energy intensities, considered as the indicator for energy efficiency, also varies across countries. In 2007, energy intensities in Central Asian countries are higher compared with their South and South-East Asian counterparts. For example, energy intensity in Uzbekistan was 0.86, whereas it was 0.10 in Sri Lanka and 0.09 in the Philippines. Although the magnitude for energy intensity is attributed to various reasons, higher intensities can be attributed to:

- low technical standards of energy producing and consuming processes and equipment;
- high percentage of distribution losses;
- the predominance of energy intensive sectors in production; and
- lesser (or absence of) consumer discipline.

The geographic location of the country and its level of development are also determinants of energy intensity.

Table 1 | Economic and energy indicators for selected Asian countries

Country/Indicators		GDP in purchasing power parity (PPP), billion US$2000	Population, million	GDP per capita, US$/person	Total primary energy supply (TPES), Mtoe	TPES per capita, TOE/person	GDP energy intensity, TOE/000 US$ 2000 (PPP)	Energy self-sufficiency (primary energy production/primary energy consumption)	Net import (+) and export (-) of energy resources, Mtoe	Electricity consumption per capita, kWh/person
CENTRAL ASIA										
Kazakhstan	2000	64.7	14.9	4342	40.31	2.71	0.62	1.98	-39.91	3169
	2007	127.7	15.5	8238	66.46	4.29	0.52	2.05	-69.74	4449
Kyrgyzstan	2000	7.4	4.9	1510	2.44	0.5	0.33	0.59	0.96	1904
	2007	9.9	5.2	1904	2.91	0.56	0.29	0.49	1.49	1769
Tajikistan	2000	4.4	6.2	710	2.85	0.46	0.65	0.44	1.59	2177
	2007	7.9	6.7	1179	3.9	0.58	0.49	0.41	2.32	2172
Turkmenistan	2000	15.4	4.5	3422	14.51	3.22	0.94	3.17	-31.46	1698
	2007	38.2	5	7640	18.07	3.64	0.47	3.66	-48.01	2285
Uzbekistan	2000	36.9	24.7	1494	50.36	2.04	1.36	1.09	-4.55	1780
	2007	54.6	26.9	2030	48.68	1.81	0.86	1.23	-11.34	1658
SOUTH ASIA										
Bangladesh	2000	199	153.3	1298	18.58	0.13	0.09	0.82	3.45	96
	2007	294.1	158.6	1854	25.76	0.16	0.09	0.83	4.67	144
India	2000	2402	1015.9	2364	457.38	0.45	0.19	0.8	91.48	402
	2007	4024.9	1123.9	3581	594.91	0.53	0.15	0.76	150.03	543
Nepal	2000	32.4	24.4	1328	8.11	0.33	0.25	0.88	1.03	58
	2007	40.8	28.1	1452	9.55	0.34	0.23	0.89	1.1	81
Pakistan	2000	262	138.1	1897	63.16	0.46	0.24	0.74	17.26	374
	2007	376.2	162.4	2317	83.27	0.51	0.22	0.76	20.22	475
Sri Lanka	2000	66.7	19.4	3438	8.33	0.43	0.12	0.57	3.83	286
	2007	93.1	19.9	4678	9.28	0.47	0.1	0.55	4.37	418
SOUTH-EAST ASIA										
Brunei Darussalam	2000	5.2	0.3	17333	2.45	7.37	0.48	8.02	-17.3	7550
	2007	6	0.4	15000	2.77	7.11	0.46	7.3	-17.4	8303
Cambodia	2000	22.8	12.8	1781	3.98	0.31	0.17	0.81	0.79	29
	2007	43.5	14.4	3021	5.13	0.36	0.12	0.71	1.54	93
Indonesia	2000	599.3	206.3	2905	150.93	0.73	0.25	1.56	-83.98	400
	2007	846.9	225.6	3754	190.65	0.85	0.23	1.74	-139.59	564
Malaysia	2000	204.7	23.3	8785	49.68	2.13	0.24	1.62	-28.65	3174
	2007	290.3	26.6	10914	72.59	2.73	0.25	1.3	-19.76	3668
Myanmar	2000	53.9	45.9	1174	12.5	0.27	0.23	1.23	-2.91	77
	2007	110.9	48.8	2273	15.65	0.32	0.14	1.53	-8.15	95
Philippines	2000	305.5	76.2	4009	40.96	0.54	0.13	0.49	21.55	511
	2007	429.7	87.9	4889	39.98	0.45	0.09	0.56	18.64	592
Singapore	2000	94.8	4	23700	19.33	4.8	0.2		40.91	7575
	2007	135.9	4.6	29543	26.75	5.83	0.2		54.03	8513
Thailand	2000	388.4	60.7	6399	72.29	1.19	0.19	0.61	31.98	1503
	2007	548	63.8	8589	103.99	1.63	0.19	0.57	47.95	2157
Viet Nam	2000	158.4	77.6	2041	37.07	0.48	0.23	1.3	-9.77	295
	2007	267	85.1	3137	55.79	0.66	0.21	1.33	-19.66	728

Source: IEA, 2009. Note: there is no available data for Afghanistan, Bhutan, Maldives, and Lao PDR.

EE in Asia

Substantial energy savings can be made not only from energy-intensive industries, but also from household and commercial sectors. For instance, ESCAP (2008) reported that in 2020, savings can be about 2,017 PJ in industry while it could be within 20 to 60 per cent in South-East Asia. In India, savings are projected at 10 to 70 per cent in households and 8 to 40 per cent in industry (ESCAP, 2008). Energy saving potential in Central Asian countries is estimated at about 35 to 40 per cent of total annual primary energy consumption in the regionamounting from 50 to 55 million tonnes of oil equivalent (Mtoe) (ECE/ESCAP, 2005).

The recovery of this huge energy savings potential can ensure a considerable increase in energy security of Asian economies. If unlocked, this potential may allow Asian countries to:

- reduce financial burden for energy consumers and the national budget;
- decrease net import dependency (for fuel importing countries);
- enhance energy export (for fuel exporting countries);
- improve competitiveness of local industrial products and services on the domestic and international markets; and
- mitigate adverse impacts on the environment.

In exploiting this potential, projects and programmes have been implemented across Asia. A number of these are directed towards raising the efficiency of fuel, electricity and heat power use in industry, households, residential and commercial buildings, and the fuel and energy complex. Some of these interventions include broad information and training programmes aimed at raising public awareness. International organizations, and financial institutions notably the World Bank, European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB), the United Nations Development Programme (UNDP), and the European Union have been supporting these interventions.

The creation of a modern legal and regulatory framework is a key factor in developing the potential of EE in Asia. Although not all, most Asian countries have started to establish and adopt regulatory frameworks in shaping their EE policy. Many times, these frameworks take the form of a legislation and mention the following:

- prioritizing EE;
- state supervision to ensure EE;
- mandatory accounting of produced, obtained, or consumed energy;
- certification of energy-saving equipment, materials and structures; and
- sanctions for those exceeding consumption limits; and
- arrangements and structures of institutions dealing with EE.

Although EE is commonly set under the aegis of a key ministry within the government, other relevant ministries and agencies also participate in EE efforts. Industrial enterprises, scientific and research organizations and financial institutions are also involved.

Despite these, the promotion and implementation of EE as a policy is faced with many challenges and barriers. First of these challenges is insufficient information and public awareness on EE despite the availability of training courses and information materials in many Asian countries.

The lack of financial support for EE activities is another barrier. A broad range of energy efficient technologies and equipment is already available in the market; however, penetration remains slow, if not static.

Another important challenge on the promotion of EE concerns the minimal prices of electricity as a result of government subsidies. In a free market economy, high energy prices often serve as the main incentive for introducing EE measures. Since electricity cost is often subsidized, there is very little incentive for consumers to adopt EE practices.

Institutional challenges also play a principal role in delaying the promotion of EE. These challenges include the absence of enabling laws to create institutions to address EE in some countries, weakness in organizational frameworks and arrangements in existing institutions, insufficiency or absence of coordination mechanism among entities involved with EE, and absence of adequate human and financial resources.

What is covered?

Of the challenges mentioned, this publication focuses on the institutions, their arrangements and structures. Acknowledging the important role institutions play for EE development, promotion, and implementation, this publication tries to provide an overall assessment of the current status of EE institutions in selected Central, South and South-East Asian countries. This is done by identifying the enabling policy and legal structures for EE, identifying the actors for EE, identifying selected EE programmes and activities, and identifying barriers and challenges for institutions to effectively promote and implement EE programmes. This publication is designed as a primary reference for government officials and others responsible for developing, implementing, enforcing, monitoring, and maintaining EE policies and programmes. It also presents an analysis of existing arrangements, structures and programmes in selected institutions inside and outside the ESCAP region. In copnclusion, it provides policy recommendations to support EE improvement with a focus on institutional issues as well as recommendations in the broader sense.

1

Subregional Assessments

SUBREGIONAL ASSESSMENTS OF EE PROMOTION AND INSTITUTIONAL ARRANGEMENTS IN CENTRAL, SOUTH, AND SOUTH-EAST ASIA

Most Asian economies have considered EE as one of the main priorities for energy, economic and climate policy and an important factor for regional energy security. The role of EE in dealing with the issues of energy security in Asia can be substantially strengthened through extension and deepening of economic and technological cooperation in the energy sector and on issues concerning the transition of Asian economies to an energy efficient pattern of development consistent with low carbon direction and green growth in the subregional level. Such policy direction complements the sustainable energy dimension in energy development which gives due importance on mitigating climate change.

Particularly, this shift concerns doing activities within the framework of subregional cooperation including joint financing and implementation of EE projects, R&D in advance energy efficient technologies, pilot and commercial projects, harmonisation of existing legislation related to EE issues, and training, education and information dissemination activities to widely promote and optimally implement energy efficient technology and behaviour. The level of EE penetration as a policy in many Asian countries can be increased through more extensive use of environmentally clean renewable energywithin the same framework of subregional cooperation.

This part of the Assessment Report tries to present, enumerate and describe the dynamics of EE policy and programmes in Central, South and South-East Asia with the purpose of identifying and summarizing these interventions to stimulate further discussions, and come up with policy options that are relevant to a particular subregion. Tables 1-1, 1-2 and 1-3 list the summaries of general barriers on implementing EE at country levels. The tables in this section are the outputs of the "Regional Workshop for Strengthening Institutional Capacity to Support Energy Efficiency in Asian Countries" held in Bangkok on 24-26 March 2010 and attended by EE practitioners from various Asian countries and international organizations. The lists, however, should not be considered as conclusive and exhaustive.

CENTRAL ASIA

About two-thirds of available EE potential in Central Asian countries is concentrated in the end-use sectors (industry, construction, agriculture, and buildings) which explain the primary attention paid by governments of Central Asian economies to EE improvement in these sectors. In the last five to seven years, Central Asian economies, in cooperation with international organizations and financial institutions, have undertaken many EE programmes in the end-use sectors. More than half (at 55 per cent) of these programmes were directed at raising the efficiency of fuel, electricity, heat power and hot water consumption in residential, commercial and public buildings. Around 20 per cent were mostly connected with improving the efficiency of energy intensive industries. The remaining portion were appropriated for informational, educational and training efforts.

In Central Asia, the EurAsian Economic Cooperation (EurAsEC) is the preeminent subregional organization which is not only focused on economic cooperation but also on matters involving the energy sector. At present, the subregional cooperation in EE is mostly

limited to technical and political studies as well as training and educational activities. At the national level, a number of scientific organizations and ministerial structures are involved in the development of new regulations including building codes and EE standards. Currently, Central Asian governments are working to strengthen EE legislation in their respective countries. These activities, however, varies from country to country.

Subregional initiatives and cooperation in Central Asia

EurAsian Economic Cooperation (EurAsEC)

EurAsEC is a subregional grouping among Central Asian countries namely Belarus, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan and Uzbekistan. Its role in EE policy promotion in the subregion includes: joint financing and implementation of EE projects; legislative base of the customs union; technical regulation and EE standards within the organization; information exchange and education; and harmonization of existing EE legislations.

Study on "EE and Energy Security in the Com monwealth of Independent States (CIS) and its Member-States"

Through the framework of the United Nations Economic Commission for Europe (ECE) Operational Activity Programme, the study on "EE and Energy Security in the CIS and its Member-States" was implemented. This ECE-initiated study was made in cooperation with the Economic Committee of CIS in accordance with the Joint Statement of the ECE Secretariat and the CIS Executive Committee of the CIS Economic Union on 4 September 1997. The purpose of the study was to assess the potential for energy conservation in CIS member countries (including Central Asian economies) to the year 2010 and to explain how improvements in EE of member countries could contribute to enhancing their energy security.

Strategy for Rational and Efficient Use of Water and Energy Resources in Central Asia

In accordance with the Tashkent Declaration of the Presidents of Central Asian States, the "Strategy for Rational and Efficient Use of Water and Energy Resources in Central Asia" was elaborated along with collaboration for safety of dams, establishment of a water-energy consortium and other problems. EE issues were included in the list of primary goals of the Strategy implementation (ECE/ESCAP, 2005).

Baku Initiative on EE and Conservation

The "Baku Initiative on EE and Conservation" is another document for subregional cooperation in EE in Central Asia. All main aspects of modern EE policy (institutional, legal, technological, financial, economic, as well as informational) are reflected in this document.

Support from other international organizations

Central Asian countries also receive support from various international organizations working at the regional level. Through the years, the Asian Development Bank (ADB), the World Bank, European Union and United Nations Development Programme (UNDP) have been working on energy development in the region, including options for EE.

Challenges and barriers to EE promotion in Central Asia

Central Asian countries spent many decades as republics of the former Union of Soviet Socialist Republics. This not only rationalizes their commonalities in terms of socio-economic and political development, but also extends to common barriers that impede the way to improved and effective options for EE. These barriers can be divided into five main categories: institutional, legal, financial and economic, information, and market. The barriers to promote EE at national level in Central Asian countries are summarized in Table 1-1.

Table 1-1 | Summary of barriers to EE promotion in selected Central Asian countries

Kazakhstan	• absence of financial incentives for consumers to adopt EE measures due to low level energy tariffs • inadequate financial means for existing institutional structures to support R&D • limited use of authority provided by existing EE policy and legislation • relatively small-scale EE projects (as compared to large oil and gas projects) which are not attractive for international investors • high interest rates on bank loans
Kyrgyzstan	• lack of investment to modernize existing productive and generating capacities • low purchasing power of local energy consumers making their financial participation in EE measures practically impossible • lack of equipment for measuring and controlling excessive energy consumption • insufficient commercialization of new efficient equipment achieved by R&D • limited activity of energy suppliers in the field of DSM programmes • lack of economic mechanisms and financial incentives to stimulate the development of energy conservation in the state sector • current low level of energy efficient building materials and construction technology • weak information support for EE policy • low energy tariffs and high share of non-payments • insufficient activity to attract foreign investment for EE project financing
Tajikistan	• insufficient financial instruments to support and implement EE measures because of subsidised energy tariffs and the poor economic situation in the country • imperfections in EE legislation • insufficient activity for EE promotion • weak control for excessive energy consumption and inefficiency in industry and residential sectors • absence of information dissemination activities to ensure market penetration of energy efficient technology and equipment
Turkmenistan	• absence of an energy conservation law or a definite EE programme
Uzbekistan	• the dominating share of energy intensive industries in primary energy mix • high level of energy distribution losses due to obsolete equipment • inefficient functioning of district heating systems • low heat power and hot water tariffs for households because of state subsidies • low level of secondary energy resources utilization • limited use of renewable energy potential • insufficient coordination among government bodies

Source: Regional Workshop on Strengthening Institutional Capacity to Support Energy Efficiency in Asian Countries, 24-26 March 2010, Bangkok, Thailand

SOUTH ASIA

About one fifth of the world's population - more than 1.3 billion people - lives in South Asia. With economic development and population growth, energy demand in the subregion is expected to grow rapidly. Projections tell that the energy intensityin the subregion will most likely reach 0.65 TOE/US$1000 as compared to world average of 0.29 (ADB, 2009). EE promotion is therefore essential to reduce the expected increase in subregional energy demand and intensity. The opportunity for EE promotion and implementation in this subregion, however, varies from country to country. Not all countries have legislation that provides an enabling environment for EE. Nonetheless, EE interventions through voluntary actions are carried out despite the absence of specific policy.

In the subregional setting, cooperation through the South Asian Association for Regional Cooperation (SAARC) has been set-up. SAARC is the preeminent subregional organization in South Asia. SAARC has an Energy Center to serve as the contact point for governments for their regional energy concerns, including EE. At the national level, governments (with the exception of India) are yet to identify or develop structures and institutions for EE policy and programmes. At present, devoted legislation for EE is only existing in India.

Subregional initiatives and cooperation in South Asia

The South Asian Association for Regional Cooperation (SAARC)

SAARC was established on 8 December 1985 by the Heads of State or Government of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. In April 2007, at the Association's 14th Summit, Afghanistan became its eighth member. It aims to accelerate the process of economic and social development in its Member States.

The regional EE cooperation began in 2000 with the establishment of a Technical Committee on Energy. In January 2004, the Council of Ministers approved the creation of a specialized Working Group on Energy. The First Meeting of SAARC Energy Ministers (Islamabad, 1 October 2005), decided the formation of an Expert Group to deliberate on the options and potential of EE measures and to formulate a road map for implementation in the SAARC region. The Expert Group formulated the following Road Map for implementation by the Member States (SAARC Homepage):

- Study and review the national policies and legislative frameworks relating to EE to benefit from mutual experiences for formulating and/or improving their respective policy/ legislative environment;
- Cooperate in institutional strengthening and capacity building of relevant institutions to promote EE;
- Share experiences, expertise and best available practices especially in industries, buildings, power, transport and agriculture sectors among Member States;
- Develop and harmonize standards, labeling programme, testing procedures to promote EE of energy consuming equipment and appliances;
- Launch programmes for creating awareness, training and education, and outreach to promote energy management and conservation in all sectors of economy;
- Increase regional cooperation on developing specific programmes and projects on energy conservation and efficiency;
- Promote public-private partnership in implementing energy conservation and efficiency practices;
- Develop an Energy Conservation Directory (listing sector specific energy efficient technologies adopted, and best practices followed);
- Include a page on energy conservation and EE in SAARC Energy Centre's website, when launched wherein Member States may contribute their information on the subject;

- Share experience on capacity building of Energy Managers and Energy Auditors including Certification Examination;
- Exchange delegations to share experience and information, especially on:
  - Best management models and practices to promote EE;
  - Energy efficient technologies;
  - Energy audit methodologies;
  - ESCO concept and practice, success and failures.

SAARC Energy Centre

SAARC Energy Centre was created under the aegis of the Dhaka Declaration in 2005. In this Declaration, the Heads of the State or Government agreed to the recommendation to establish the Energy Centre in Islamabad; to promote development of energy resources, including hydropower and energy trade in the region; to develop renewable and alternative energy resources; and to promote EE in the region. The Centre was formally established on 1 March 2006 in Islamabad.

SAARC Energy Centre has implemented a number of programmes since its establishment. The programmes implemented in 2009 include:

- Implementation of SAARC Road Map for EE;
- Preparation of Position Paper on Gas Hydrates Resource Potential of South Asia;
- Training Workshop on Energy Audit;
- Workshop on Harmonization of Appliances Standards and Labeling Programme;
- Workshop on Rural Electrification in Cooperation with Grameen Shakti for Wider Replication in Other Member States;
- Development of an Implementation Plan for Energy Ring in South Asia;
- Study on Affordable Electricity to Rural Population in South Asia; and
- Energy Conservation and Efficiency Improvement of Large Industries in SAARC Member States
- SAARC Energy Centre Youth Energy Award 2009 (SAARC homepage)

A case study of SAARC Energy Centre is presented in Part 3 of this Report.

The South Asia Regional Initiative for Energy (SARI/Energy)

The SARI/Energy programme was launched in 2000 to promote energy security through increased trade, investment and access to clean sources of power and fuel. The Initiative works to promote technical and institutional frameworks for regional energy planning and infrastructure investment involving cross-border trade in energy. Promoting regional power exchanges and developing regional power transmission networks are also among the purpose of the programme. SARI/Energy also helps provide access to untapped energy resources, and assure the reliability of energy supply and mutual support to South Asian countries.

Because of SARI/Energy-sponsored training, capacity building, and networking, energy sector restructuring laws throughout the region have been written. The programme supports institutional and organizational changes that make the sector more market-driven and better equipped to address the needs of under-served consumers. Moreover, the programme has identified significant opportunities for catalyzing private sector investments in regional energy infrastructure. These opportunities include:

- Building Institutional Capacity within governments, regulatory bodies, utilities, non-governmental organizations (NGOs), and the private sector through events such as training workshops, seminars, formal courses, and study tours. The region's energy professionals participate in these events usually held at multiple sites which encourage formal and informal networks.
- Promotion of Private Sector and Civil Society Participation in Energy Policy by supporting information-based dialogue among governments, private sector, and NGOs to reduce concerns and advocate opinions related to energy sector reform, commercialization, and

foreign investment in the energy sector. Business coalitions are also promoted.

- Creation and strengthening of regional forums, networks and associations that can influence politicians and decision-makers on energy cooperation and development.

SARI/Energy provides pre-feasibility studies, technical assistance, advisory services, seminars and training, peer exchanges, mapping and project development in each of the three above mentioned activity areas. Through these activities, the programme facilitates more efficient regional energy resource utilization, works toward transparent and profitable energy practices, mitigates the environmental impacts of energy production, and increases regional access to energy (SARI/Energy Homepage).

Regional Center for Energy Efficient Lighting

The Center has been created in April 2009 through a partnership with the U.S. Agency for International Development (USAID), the Sri Lanka Sustainable Energy Authority, and the Lighting Research Center. The Center serves eight countries in South Asia: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. It is designed to advance sustainable lighting and make it affordable in the subregion. The Lighting Research Center is the primary knowledge partner for the Center. It is part of Rensselaer Polytechnic Institute of Troy, New York, and is the leading university-based research center devoted to lighting.

Challenges and barriers to EE promotion in South Asia

The relatively high energy intensity in South Asian countries indicates a big potential for EE improvement. Although energy intensity in the region is predicted to be reduced, there are still a number of barriers in promoting EE, such as lack of policy framework, low level of EE awareness, weak institutional capacity and human resources, lack of dissemination of best practices and information modules, lack of EE standards and labeling programme, etc. The barriers to promote EE in South Asian countries are further summarized in Table 1-2.

Table 1-2 | Summary of barriers to EE promotion in selected South Asian countries

Bangladesh	• pay-back period criterion • information, transaction cost and limitations in access to foreign financial support • possible disruption of production and related "transition costs" • unstable economy with high inflation and unstable exchange rates and taxation • lack of skilled EE experts and/or energy managers • "invisibility" of the impacts of EE measures
Bhutan	• absence of EE enabling framework • absence of EE institution • inadequate resources (including competency) to implement EE measures • inadequate infrastructure • inadequate awareness on the importance of EE

Table 1-2 | Summary of barriers to EE promotion in selected South Asian countries *(continued)*

India	• lack of awareness • shortage of education and training • economic and market distortions • absence of equipment standards • financing • lack of effective co-ordination
Maldives	• absence of proper institutional mechanism • absence of laws, codes and standards for EE • insufficient human resources • lack of funds to promote, implement and stimulate EE investment
Nepal	• absence of legal framework • absence of modern testing laboratories • low level of public awareness • lack of capable human resources and technical expertise • financing
Pakistan	• weak EE policy framework • existing laws and regulations do not provide enough legal backing for enforcement of EE programmes • capacity constraints for testing energy consumption and efficiency performance of appliances • general lack of awareness about the importance of EE • unavailability of statistics on energy consuming products and their level of efficiency • low level of per capita income, thus non-affordability of expensive energy efficient products and lack of awareness regarding "first cost versus recurring cost" concepts • low level of product development and design capabilities of manufacturers • low level of awareness regarding international best practices • absence of monetary incentives and governmental patronage to drive the transformation • lack of co-ordination among various governmental agencies • lack of human resource and technical expertise
Sri Lanka	• weak policies and insufficient implementation • high initial cost(intellectual property rights, high import tax, etc.) • imperfect information • poor management awareness • low technical capacities • lack of financing • low price of electricity • lack of EE standards

Source: Regional Workshop on Strengthening Institutional Capacity to Support Energy Efficiency in Asian Countries, 24-26 March 2010, Bangkok, Thailand

SOUTH EAST ASIA

APEC & ADB (2009) estimates that South-East Asia's primary energy demand will likely increase to 988.2 Mtoe in 2030. The average energy intensity of South-East Asian countries has dropped by only 6.2 per cent from 1990 to 2005. Over this period, the energy intensity of the subregion stood between 0.6 and 0.7. Improving EE has recently become one of the primary issues for both the governments and private energy companies (APEC & ADB, 2009). Although low domestic energy prices impede the promotion of EE in a much larger scale in South-East Asia, laws, regulations, policies and programmes on EE in some countries are well in-placed for a long time. National efforts to promote EE in the Philippines and Thailand in the form of established institutions, mechanisms and programmes, for instance, manifest the presence of enabling environment for EE in these countries.

Subregional cooperation for EE has also become one of the priorities of the Association of Southeast Asian Nations (ASEAN) through the various EE activities of its Centre for Energy. The ASEAN is the paramount subregional organization of South-East Asian countries. Its membership comprised of governments which are also ESCAP member States. Most of the time, subregional cooperation in various fronts, including energy matters, are carried out through ASEAN.

Subregional initiatives and cooperation in South-East Asia

ASEAN Centre for Energy (ACE)

ACE is an intergovernmental organization established by Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore and Viet Nam. It is guided by a Governing Council composed of Senior Officials on energy from ASEAN member countries and a representative from the ASEAN Secretariat. Core funding is provided by an Energy Endowment Fund established from equal contributions of the ten member countries and managed by a private fund manager. As host country, Indonesia provides headquarter facilities and other amenities (ACE homepage).

ACE is envisioned to be a catalyst for the economic growth and development of the ASEAN region by initiating, coordinating and facilitating regional as well as joint and collective activities on energy and EE. To realize this vision, ACE will accelerate the integration of energy strategies within ASEAN by providing relevant information state-of-the-art technology and expertise to ensure that over the long term, necessary energy development policies and programmes are in harmony with the economic growth and the environmental sustainability of the region (Nexant SARI/Energy, 2005).

A case study of ACE is presented in Part 3 of this publication.

ASEAN Energy Efficiency and Conservation Sub-sector Network (EE&C SSN)

The EE&C SSN was founded in 1995 with the goal of expanding cooperation in EE&C by building institutions, increasing private sector involvement, enhancing public and industry awareness, and expanding markets for energy efficient products. The Network's projects include:

- EE&C Best Practices Competition/ASEAN Energy Awards, in the energy efficient buildings category
- ASEAN EE S&L Programme
- EE Benchmarking in Buildings Project
- Energy Audits [together with ACE and The Programme for the Promotion of EE&C (PROMEEC)]
- Capacity Building (establishing energy audit procedures and training, technology transfer workshops)
- Promotion of EE in the transport sector
- ASEAN Energy Business Forum (jointly with

New & Renewable Energy Sub-Sector Network) (Nexant SARI/Energy, 2005).

ASEAN Energy Awards

ASEAN launched the first ASEAN Energy Awards starting with energy efficient buildings on the occasion of the 18th Senior Officials Meeting on Energy/ASEAN Ministers of Energy Meeting held in Hanoi in 2000. The Awards is a joint undertaking of the EE&C SSN of the ASEAN Energy Cooperation and ACE. The objectives of the ASEAN Energy Awards are twofold:

- to promote regional cooperation in various fields of energy such as EE, and
- to serve as a platform to generate opportunities and interests of the private sector to be involved in energy development of the ASEAN region in partnership with the public sector.

ASEAN Energy Cooperation External Partners: ASEAN-Japan

PROMEEC has activities for buildings and industries including:

- workshops, building energy surveys, and audits;
- nomination of buildings to the ASEAN Energy Awards competition for energy efficient buildings;
- ASEAN Working Group for Benchmarking and Audit Guideline Development Project; and
- study tour in Japan for group members on benchmarking techniques and energy conservation technologies applied in modern construction.

PROMEEC Industry programme covered the following countries and related industries:

- Singapore (Food),
- Thailand (Chemical),
- Brunei (Cement),
- Cambodia (Clothes),
- Indonesia (Pulp and Paper),
- Laos (Power Generation),
- Malaysia (Textiles),
- Myanmar (Oil Refining),
- Philippines (Steel), and
- Viet Nam (Porcelain).

The relevant activities are:

- energy audits,
- on-the-job training of local personnel,
- local workshops on energy conservation technologies,
- development of a database and benchmarking system, and
- Clean Development Mechanism (CDM) (Nexant SARI/Energy, 2005).

Multi-Country Training Programme on Energy Conservation for ASEAN Countries

The MTPEC programme is funded by Japan's Ministry of Economy, Trade and Industry and implemented by the Energy Conservation Center Japan (ECCJ) on behalf of METI in cooperation with ACE. Generally, the programme aims to enhance the cooperation between Japan and ASEAN Member Countries in the field of EE, and achieve the following objectives:

- to provide participants from ASEAN governments, NGOs and non-profit organizations with a clearer understanding of Japan's policies and activities on EE;
- to disseminate practical knowledge and experiences on the methodologies, techniques and approaches for energy management, EE such as Top Runner Programme and energy manager system of Japan, ESCO, and so on;
- to learn EE best practices through site visits to be conducted at a best representative of the building or industry sector implementing EE programmes.
- to provide learning opportunities to enhance the ASEAN participants' understanding of the evolution and implementation of Japan's energy manager system that may find suitable application in the ASEAN member countries;

- to share and discuss EE policies and action plans adopted by the ASEAN member countries; and
- to identify the needs for a cooperation in EE between and among Japan and ASEAN countries (ECCJ homepage).

Challenges and barriers to EE promotion in South-East Asia

South-East Asian countries have shared common barriers in promoting EE including lack of industrial awareness, perceived high risk, high up-front cost, lack of confidence in the technology, fuel supply issues, and lack of financing capability. In order to promote EE, it is of utmost importance to determine the barriers that limit the efforts from achieving such. In the context of South-East Asian countries, a list of barriers is enumerated in Table 1-3.

Table 1-3 | Summary of barriers to EE promotion in selected South-East Asian countries

Cambodia	• lack of awareness • lack of EE policies • lack of government programmes and supporting funds or incentives • weak institutional capacity for planning, implementation and maintenance
Indonesia	• lack of institutional framework to coordinate EE initiative • lack of mandatory policies and regulations to support the implementation of EE • lack of human resources capability in the field of EE • lack of financial support to accelerate EE activities, such as tax incentive, low interest rate, etc. • lack of public awareness on EE effort due to low energy price
Malaysia	• limited awareness of EE techniques and their economic benefits • limited access to information on EE technologies and performance benchmarks for EE technologies • preference of industries to focus on investments in production improvements rather than on EE • insufficient energy policies and/or programmes • few EE technology demonstration projects either by industry or the Government • inadequate and low-quality local energy support services • lack of trained industry and financial sector personnel on energy management • lack of interested financiers for EE investments • lack of appropriate financing mechanism • insufficient financial resources for the adequate staffing of EE institution
Myanmar	• absence of EE laws • absence of follow-up activities and initiatives to implement EE • inadequate training programmes • absence of comprehensive, reliable and accurate energy consumption data

Table 1-3 | Summary of barriers to EE promotion in selected South-East Asian countries *(continued)*

Philippines	• insufficient fiscal and financial incentives • low level of awareness about the benefits of EE projects • presence of taxes and tariffs that discourage the import of foreign-manufactured energy efficient products and equipment
Thailand	• lack of confidence in EE projects • high cost of EE products and equipment • lack of budget (cash or credit) for investment in EE equipment or operation improvements • lack of knowledge and confidence in EE projects • lack of ability to analyze EE projects • lack of knowledge
Viet Nam	• inadequate information on potential EE improvements, costs and benefits of EE equipment, potential low-cost measures, and new technology/practices • lack of technical expertise • high capital investment costs of EE equipment as well as limited local manufacturing capability • high project development costs • lack of affordable financing • limited interest of end-users for energy efficient products • limited local EE products and equipment • inadequate policy implementation capacity • lack of knowledge information, skills and coordination to promote and coordinate the promotion of EE • low energy prices • insufficient financial incentives

Source: Regional Workshop on Strengthening Institutional Capacity to Support Energy Efficiency in Asian Countries, 24-26 March 2010, Bangkok, Thailand

2

Country Assessments

COUNTRY ASSESSMENTS OF EE PROMOTION AND INSTITUTIONAL ARRANGEMENTS

Country-level activities to promote and implement EE programmes and projects are essential to support EE as a national policy. For these activities to be successful, it is imperative that directional, institutional, financing, technical, and policy support are present and well-functioning. To this end, this section of the Assessment Report tries to summarize, enumerate, present, and assess interventions at country level in terms of projects and programmes geared at promoting and implementing EE.

A short overview of the country is first presented. Directional support to EE at national level, in terms of legislations and policy, follows. Institutional arrangements for EE promotion and implementation are also summarized and presented in tables as appropriate. These arrangements involved national actors and international organizations. Moreover, programmes, projects and activities to promote and implement EE are presented. While efforts are made to exhaust and list all EE interventions, we acknowledged that the list does not represent all of those. There are many projects supported by international donors, for instance, that are not directly listed as EE projects but have components for EE.

CENTRAL ASIA

EE policies, institutions, actors, programmes and projects for the following Central Asian countries - Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan - are discussed.

KAZAKHSTAN

Kazakhstan is the largest economy in Central Asia. The country's impressive average annual growth rate of 9 to 11 per cent in 2001 and 2007 (IEA, 2009) reflects not only a jump in earnings from oil and gas exports, but also the current growth in industry, construction, agriculture and communications. The energy sector holds a considerable part of the country's productive potential by providing the economy with large quantities of both sources of fuel and hard currency from exports. Total primary energy consumption in the country has risen from 40.31 Mtoe in 2000 to 66.46 Mtoe in 2007 (IEA, 2009). EE in Kazakhstan can be viewed as a function of its cold climate, extensive territory, and traditional energy intensive industrial structure which currently translate to low level of EE. This pictures a huge potential for EE in the country which has been estimated at 23 to 25 Mtoe savings (ECE/ESCAP, 2005, Kasymova, 2008).

EE enabling legislation and policy

Presidential Message to Kazakhstan's People 2010

This determines the main economic achievements of Kazakhstan in the last ten years, and gives priority targets and indicators for the nearest decade. One of the top priorities, in particular, is to reduce the level of GDP energy intensity in the country to at least by 25 per cent in 2020 through organizational, structural and technical improvements in the country's economy.

Package Plan on Energy Saving for 2009-2010

This Plan was approved in 26 February 2009 to improve organizational, legislative, informational and educational directions of Kazakhstan's EE policy. Standardization and certification issues are also one of the top priorities of this document. The development of regional EE programs is another key element of the Plan.

Law on Energy Saving of the Republic of Kazakhstan 1997

This law was entered into force in 1997. It has determined not only the functions of the government but also the functions of its authorized bodies and local authorities in matters of energy savings. The main directions of state energy conservation policy (regulation, standardization, certification, R&D, informational support and education) were reflected in the law. A new edition of the above Law with stricter requirements on the reduction of energy losses is expected to be adopted in Kazakhstan in 2010.

Major actors for EE promotion

Ministry of Oil and Gas (formerly Ministry of Energy and Mineral Resources)

Kazakhstan's energy saving policy is formulated at central government level with the Ministry of Oil and Gas in-charge of formulating overall policy (see Figure 2-1). The Ministry has an Energy Conservation Department that nominally monitors EE issues. The Ministry's activities in EE promotion is mostly focused on electricity and heat supply efficiency. The Ministry of Energy and Mineral Resources was the precursor of the Ministry of Oil and Gas and was the central government body in-charge of energy issues prior to government reorganization in March 2010.

Other government bodies

Other ministries and agencies involved in EE policy implementation at sectoral level are:

- Ministry of Industry and Trade (including the Construction Committee),
- Ministry of Transportation and Communications,
- Ministry of Economy and Budget Planning,
- Ministry of Environment Protection, and
- Agency for Regulation of Natural Monopolies.

The Ministry of Industry and Trade is in-charge with the following issues related to EE:

- scientific, research and innovative policy in the field of energy efficient industrial technology;
- licensing, certification and metrology of energy consuming equipment and devices;
- financial incentives (taxation) to ensure wide-scale market penetration of energy efficient technology;
- strategic planning from the standpoint of energy efficient development of domestic industry; and
- legal aspects of design, production and international trade of energy consuming equipment and devices, including technical regulation.

The Construction Committee is responsible for supervision and control of energy efficient construction materials, specific energy (mostly heat) consumption by existing and new buildings, and compliance with the state EE standards and requirements.

The Ministry of Transportation and Communications deals with the following EE issues:

- upgrading transportation fleet;
- reducing specific fuel consumption by transportation modes; and
- optimizing fuel structure in the transportation sector.

The Ministry of Environment Protection is also involved in Kazakhstan's energy saving policy as a considerable part of its activity in the field of environment protection is closely linked with projects aimed at reducing fossil fuel consumption, optimizing existing fuel and energy balance structure, and introducing renewable energy sources.

Among the main objectives of Kazakh Agency for Regulation of Natural Monopolies is to stimulate local fuel and energy suppliers for more energy efficient production and distribution of energy carriers by means of financial and economic mechanisms.

Sustainable Development Council

The Council is a government coordinating consultative body which also covers all aspects of the country's EE policy. The main objective of the Council is to

monitor the situation of the utilization of fuel and energy resources and develop recommendations for EE improvement for Kazakhstan Government.

Committee on State Energy Supervision

This Committee was established in 28 October 2004. It is responsible for supervision and control of reliability, technical safety and economic security of energy production, transportation, distribution and final consumption. The Committee does the following:

- monitoring and control of technical and economic indicators in the energy sector including specific fuel consumption by generating capacities, electricity and heat distribution losses;
- monitoring of works in the area of modernization of energy consuming equipment to improve its efficiency; and
- organization of energy audits and EE expertise for juridical persons.

Other institutions

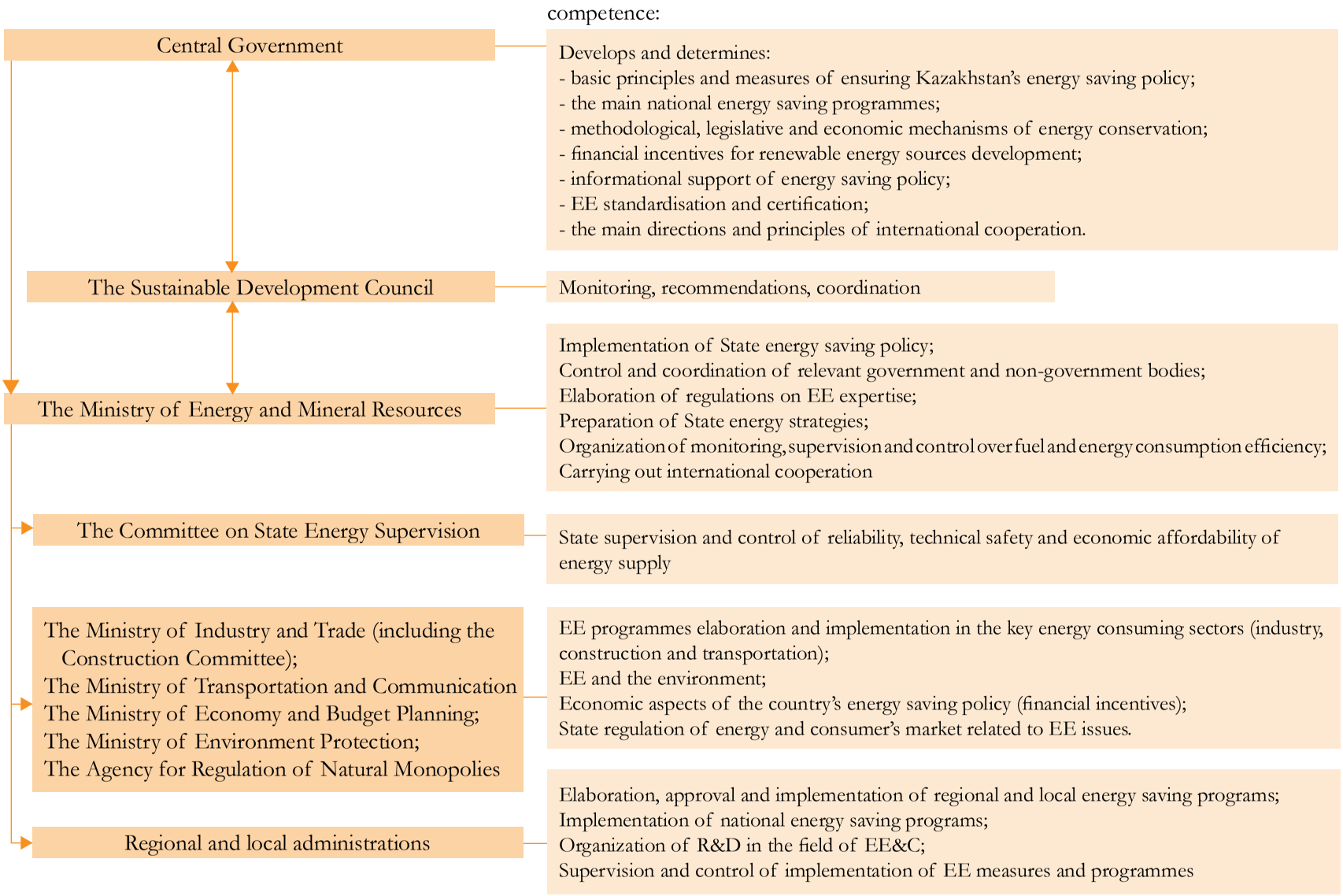
Kazakhstan's NGOs, associations, universities, scientific and research centres are also very active participants for energy conservation policy in the country (see Figure 2-2). These institutions carry the following activities for EE promotion and implementation:

- monitoring of energy and environmental security;
- critical analysis of best practices in the development and implementation of energy saving and environmental protection policies for its possible utilization;
- exchange and dissemination of information on international best practices on implementing EE policy;
- collection and dissemination of information on available energy saving potential in industry, agriculture, transportation, residential and commercial sectors;
- development of scientific research for innovative energy efficient and environmentally clean technologies;
- participation in different monitoring networks to obtain information on the use and development of energy efficient and energy saving technologies;
- creation of databases on energy efficient technologies and equipment;
- implementation of the full cycle of energy-saving services in industry and buildings – from energy audit to practical introduction of energy-saving measures;
- education in the field of EE and environmentally clean energy consumption;
- implementation of pilot and demonstration energy efficient projects;
- recommendations for government structures for EE improvement; and
- development and design of energy efficient equipment.

In their case, NGOs and scientific and research centres obtain financing from:

- federal, regional or local budgets;
- investments obtained from fuel and energy companies, industrial enterprises and other energy consumers involved in energy conservation policy (business activity); and
- financial support from international organizations, banks and programmes of development.

Figure 2-1 | Institutional Structure of Kazakhstan's energy conservation policy



Source: Ministry of Energy and Natural Resources of Kazakhstan, 2007

Figure 2-2 | NGOs, associations, scientific and research centres participating in EE policy in Kazakhstan

NGOs	Associations	Scientific and research centres
Cooperatives of residential space owners; Centre for Energy Efficiency and Clean Production; JSC Centre for Engineering and Technology Transfer; Coordinating Centre on Climate Change; Republican Scientific and Research Centre for Atmospheric Air Protection; Regional Centre on Environmental Protection in Central Asia (CAREC); etc.	Kazakh Power Engineering Association; Kazakh Nature Management Association for Sustainable Development; etc	KazNiPienergoprom; Kazelenergoproject; Almatyhydroproject; Almaty Institute of Energy and Communications; National Technological University; Academy of Design

Source: Ministry of Energy and Natural Resources of Kazakhstan, 2007

Selected EE programmes and projects in Kazakhstan

Energy Efficiency 21

ECE has defined a number of promising EE projects for future financing within the project "Energy Efficiency 21" in Kazakhstan, including:

- improving economic and environmental efficiency of North-Eastern thermal engineering complex of Almaty;
- increasing efficiency of district heating system in Astana;
- increasing efficiency of heat power utilization in Astana city technological park;
- ensuring EE of street lighting in Astana; and
- implementing EE measures in the heat supply sector in Atyrau.

A case study of ECE Energy Efficiency 21 is presented in Part 3 of this publication.

Public Sector Energy Efficiency Programme in Kazakhstan 2010

EBRD supports this programme which costs US$450 000 to be implemented in 2010 to determine existing obstacles and the scope and potential for ESCO type services in the country.

EBRD Support to EE and renewable energy development 2008

This is a US$75 million support under which loans were provided to participating banks for on-lending to local companies for introduction of energy efficient and renewable energy technology. Technical assistance to help Kazakh companies identify areas of energy losses and available energy saving potential will be available within this framework.

Promotion of the Education for Sustainable Development (ESD) into the system of higher education of Kazakhstan

This is a project spearheaded by CAREC and is the Centre's contribution to the implementation of the "Concept of Transition of the Republic of Kazakhstan to Sustainable Development for 2007 to 2024." The project seeks to promote ESD (including rational and efficient use of energy resources as an important component of sustainable development) into the system of higher education by introducing it into the curriculum of separate institutes of specific courses on ESD.

Upgrading the "PavlodarEnergo" 2007

EBRD provided US$30 million loan for upgrading the "PavlodarEnergo" combined heat and power

plant with 440 MW of installed capacity in 2007. The loan helped to increase the plant's fuel efficiency and reduce GHG emission per unit of electricity produced.

Increasing EE of Urban Heat and Water Supply 2006 to 2010

This project was developed on the basis of preparatory works funded by a GEF grant. The main objective of the project is to provide technical assistance to Kazakhstan to eliminate existing barriers and to use additional financing to improve EE of urban heat and water supply systems to reduce fossil fuels consumption and associated GHG emissions.

The main participants of the project include the Ministry of Energy and Mineral Resources, the Agency for Regulation of Natural Monopolies, local administrations (Almaty and Kokshetav) and heat supply companies. The project is expected to:

- create a legislative base and tariff policy to attract investment in EE improvement of urban heat and water supply systems;
- strengthen capacities of heat supply companies and municipal heat consumers to attract needed funding and implement economically effective measures on EE;
- attract investment of US$7 million into the modernization of district heating system in Kokshetav;
- create an ESCO in Almaty for implementation of economically effective EE measures in the building sector (residential and public buildings); and
- reduce the consumption of fossil fuels for heat generation purposes by about 5 600 TOE/year and related decline of GHG emissions by 18 000 tC/year through EE demonstration projects.

The project, once diffused throughout the country, can save about 1.75 Mtoe of annual energy and decrease a considerable emission of 6 $MtCO_2$/year. At the same time, an increase of EE and technical reliability of heat and water supply systems will most likely contribute to the sustainability of social and economic development of urban areas.

Energy Saving Programme 2004 (for 2005 to 2015)

EE policy in Kazakhstan can be considered as a multi-sectoral policy. Currently, EE issues are included in the main development programmes of all economic sectors at federal and local levels. Special attention was paid in this programme to institutional aspects (management structure) of energy conservation on national, regional and local levels. The creation of a special state energy saving agency and relevant infrastructure (national and regional centres and funds) was a key point of the programme. The programme provided measures to ensure:

- metering and recording of energy use by all energy-intensive enterprises and organisations in each industrial branch and region regardless of ownership type;
- technical upgrading of existing energy consuming facilities;
- rational use of energy resources through introduction of energy conservation technologies in different economic sectors in accordance with "best practice" principles.

The priorities identified in the programme included:

- detailed assessment of the energy conservation potential accumulated in Kazakhstan's economy;
- improvement of economic and financial mechanisms of EE policy; and
- creation of market environment in the field of energy efficient technologies, equipment and materials, etc.

The implementation of EE measures through this programme would allow Kazakhstan to reduce the level of GDP energy intensity by half in 2015 with respect to 2000.

Solar Project 2003

In July 2003, the first solar project funded by UNDP and the Canadian International Development Agency

(CIDA) was started in Almaty. Today, there are many positive examples of successful implementation of projects in the field of solar energy utilization. One of the best examples is the CAREC building. Located in residential area of Almaty, the building obtains hot water, heat power and electricity from solar collectors installed on the roof. The leadership of CAREC are planning to create a special demonstration zone of high EE and renewables utilization on the Centre's premises in the near future (CAREC, 2009).

EE promotion in the manufacturing and building sectors 2002

In 2002, the Norwegian Ministry of Foreign Affairs launched a programme directed at EE promotion in the manufacturing, industry, and building sectors. Along with training programmes, project development, implementation of pilot and commercial projects, informational activity, co-financing and coordination, the programme had established and developed the Energy Efficiency and Cleaner Production Centre in 2002. The major strategic direction of the Centre's activity is to develop and implement a large number of profitable EE and cleaner production projects including:

- Energy Auditing of Buildings (2003);
- Energy Monitoring of Buildings (2003 to 2004);
- EE and Cleaner Production in Industry (2004 to 2005);
- Financial Engineering of Small Hydropower Station (2004 to 2005) (participating in the Kyrgyz programme); and
- Municipal EE Plan, Almaty (2005 to 2006)

Power Engineering Development Programme 1999

In 1999, the Government adopted this programme between 2000 and 2030 to ensure the modernization and increase in EE of existing electric power plants. EE issues in the heating sector were also included especially on modernization and rehabilitation of heat supply systems (both centralized and decentralized) in cities and small towns.

Demonstration project at Almaty City Hospital 1999

The EE demonstration project implemented in the city hospital in Almaty had obtained support from Technical Assistance for the Commonwealth of Independent States (TACIS) "Bistro" project in 1999. A number of advanced energy efficient technologies was introduced and demonstrated within the project. German and Belgian experts provided consultative support.

Central Asian Coordination and Consultative Group 1997

The Central Asian Coordination and Consultative Group was established in 1997 within the framework of EC/SYNERGY programme. The Group was mostly oriented at informational and educational activity in the field of rational and efficient energy use (training, seminars, and workshops) and pilot projects.

Programme on Renewable Energy Development 1995 and State Energy Saving Programme 1996

A policy that has been proven effective in reducing energy intensity is the introduction of measures to increase EE from primary energy production to final energy consumption. The main objectives of Kazakhstan's EE policy are presented in a number of state programmes and strategies. Among these is the Programme on Renewable Energy Development which was developed in 1995 and has become a structural part of the State Energy Saving Programme adopted in 1996. This programme made it a national priority to increase energy productivity and determined the main targets for the reduction of energy use per unit of GDP.

Removing Barriers to EE in Municipal Heat and Water Supply 1995

This is one of UNDP's several supported EE projects in Kazakhstan. With total budget of US$8.94 million, this project seek to remove barriers on EE and to leverage additional financing for improving the efficiency of municipal heat and hot water supply systems in the country.

GEF projects

GEF small-scale grant programmes with a total budget of US$116 670 include a number of projects in the following areas:

- biogas;
- demonstration of alternative solutions in the field of solar energy utilization for hot water and heat supply in maternity hospital in Kyzylorda; and
- grants for development of pilot projects.

USAID projects

The Regional Mission of USAID in Central Asia has also provided about US$300 million of financial support to Kazakhstan since 1992. This support was directed to the development of small and medium enterprises, environment protection, health protection and fiscal policy improvement. Some part of USAID activity was dedicated to EE issues including:

- Support for the development of National Programme on Energy Saving;
- EE and market reforms; and
- Environment protection policy and strengthening organizational structure in Central Asia.

Also, within the framework of agreement with "Kazcommertsbank" in 2004, USAID had provided 50 per cent guarantee for credits of US$15 million directed at the implementation of EE projects. The duration of this agreement is seven years.

Main barriers to EE promotion in Kazakhstan

The following are the main barriers to the expansion of energy conservation activity in Kazakhstan:

- low level of energy tariffs regulated by administrative methods which results to the absence of financial incentives for consumers to adopt EE measures. Moreover, the situation does not allow local energy suppliers to obtain needed investment to develop and implement DSM programmes;
- low level of financial means to support R&D in key energy intensive sectors of the domestic economy, and to introduce energy efficient equipment, devices, technologies and materials;
- limited use of authority provided by existing legislation which impedes government bodies to monitor and control excessive energy consumption;
- relatively small-scale EE projects which are not attractive for international financial institutions and consulting companies (compared with projects in the oil and gas sector); and
- high interest rates on bank loans.

KYRGYZSTAN

Kyrgyzstan is an industrial and agrarian country with key industries in non-ferrous metallurgy, power engineering, machine building and food production. Relative high economic growth rates had taken place in the country with GDP indicator increasing to 34 per cent in 2007 compared with the 2000 figure. Consequently, TPES had increased by 19 per cent (IEA, 2009). The indicator for energy use per unit of GDP in Kyrgyzstan is the lowest among Central Asian countries. The ratio between total primary energy production and TPES had declined by 20 per cent from 2000 to 2007 achieving the level of 0.49 in 2007 (IEA, 2009). Energy conservation potential as a whole can be estimated at 35 to 40 per cent of total primary energy resources consumption in 2007 (ECE/ESCAP, 2005; Kasymova, 2008).

EE Enabling legislation and policy

Amendments to the Law on Energy Savings of Kyrgyzstan 2008

To promote the development of the legal and regulatory framework for EE, this legislation was adopted in 2008 stipulating a number of new standards and provisions, including:

- more precise definition of financial sources for EE policy;
- mandatory state energy inspections and expertise; and
- responsibility of the federal, municipal and local executive bodies.

Law on Energy Saving 1998

This legislation adopted in 1998 is Kyrgyzstan's basis for EE. It not only established the energy conservation system, but also determined the main targets and objectives of the country's EE policy. The law addressed issues of EE accounting, regulation, control, standardization, certification and auditing. The issues of training, education, scientific and technological development as well as informational support for domestic energy conservation policy are also included in the legislation.

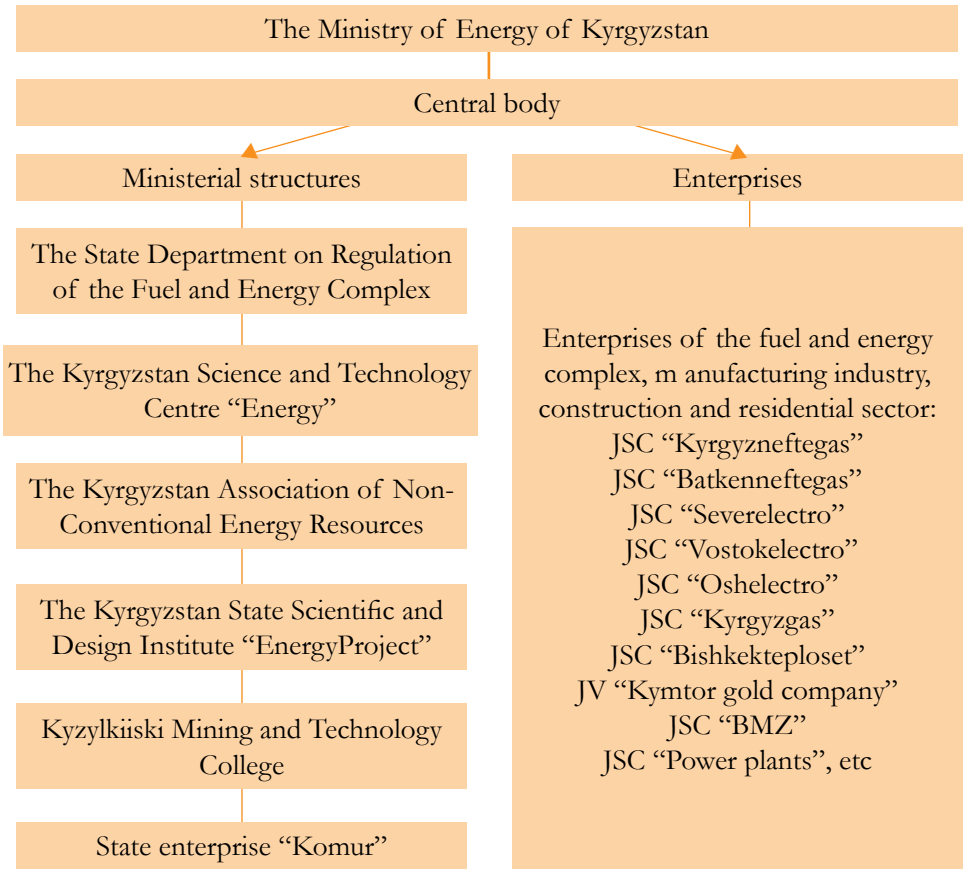
Major actors for EE promotion

Ministry of Energy

This is Kyrgyzstan's central executive body responsible for development and implementation of EE policy in the country (see Figure 2-3 for the Ministry's management structure). The Ministry:

- provides state regulation for the rational and efficient utilization of fuel and energy resources (natural gas, electricity and heat power) in enterprises, organizations and institutions, regardless of form of property;
- provides state supervision and control for energy saving at all levels of fuel and energy resource utilization (production, transportation, distribution, and fuel consumption) in industrial , consumers and fuel and energy enterprises;
- creates favourable conditions for domestic and foreign investment attraction to EE project financing;
- creates economic and financial incentives for industrial, scientific and technological activities

Figure 2-3 | Management Scheme of the Ministry of Energy of Kyrgyzstan



Source: Energy Saving Programme of Kyrgyzstan for the Period 2009 to 2015, Bishkek, 2009

in the development and market penetration of energy efficient and innovative technologies for energy consuming sectors, the industrial sector, and the fuel and energy complex of the country;
- develops and implements national strategies and state programmes in energy conservation and coordinates inter-ministerial and inter-branch cooperation related to EE issues.

The Ministry serves as a key element to the organizational management scheme for Kyrgyzstan's Energy Saving Programme for the period 2009 to 2015 (see Figure 2-4).

State Inspection on Energy and Gas (Gosenergoinspectsia)

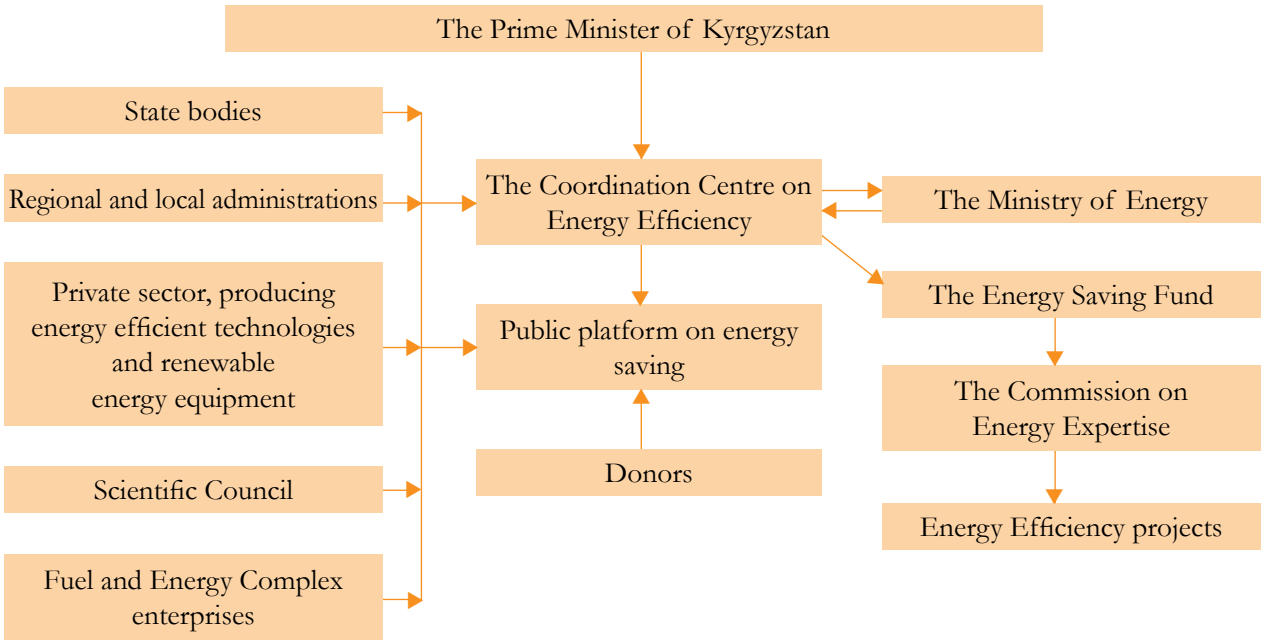
Gosenergoinspectsia is overseen by the Ministry of Energy and is in-charge of the monitoring and control for reliable and safe operation of energy equipment used for production, distribution and consumption of electricity, heat power and natural gas. In relation to EE issues, Gosenergoinspektsia:

- facilitates the implementation of uniform state energy conservation policy in production and distribution of electricity, heat power and natural gas;
- monitors and controls the level of fuel and energy losses in production and consumption systems;
- develops energy saving programmes and mechanisms; and
- promotes renewable energy sources development.

Moreover, Gosenergoinspectsia has the following functions:

- conduct of periodic EE examinations of energy generating and energy consuming equipment in power plants, boiler houses, electric grids, heat supply networks and final consumers, and issuance of examination reports and energy passports, in accordance with existing legislation;

Figure 2-4 | Organizational management scheme for the Energy Savings Programme in Kyrgyzstan for the period 2009 to 2015



Source: Energy Savings Programme of Kyrgyzstan for the Period 2009 to 2015, Bishkek, 2009

- examination of newly designed, upgraded, repaired or imported energy consuming equipment to check their compliance with the state EE standards norms and regulations; and
- decisions about cancelation to produce electricity and heat power-consuming equipment that do not meet existing EE and technical safety requirements.

State Agency for Environment Protection and Forestry

Within its own jurisdiction, this agency also takes part in the development and implementation of EE policies and measures. Particularly, it participates in attracting foreign investments and grants for EE projects, identifying scientific and technical priorities related to EE and environmental protection, and developing environmental norms and standards.

State Agency on Architecture and Construction

This agency, through periodic inspections, controls the efficiency level of construction materials, as well as existing and newly designed buildings.

Kyrgyz Association of Non-Conventional Energy Sources and Kyrgyz State Engineering and Project Research Institute "Energoproject"

Both institutions are supervised by the Ministry of Energy. They are involved in the relevant aspects of EE policy related to renewable energy sources development and creation of innovative energy efficient technologies and equipment.

Coordination Centre on Energy Efficiency

The Centre is yet to be established in Kyrgyzstan to ensure organizational support of the Energy Saving Programme. The Centre will consist of representatives from government organizations, local administrations, energy companies, scientific and research organizations, and producers of energy efficient technologies, equipment and materials. The Energy Efficiency Unit within the Ministry of Energy will become the executive body of the Centre. The Centre will have the following functions:

- project selection;
- financial support (direct investments, grants, credits); and
- development of legislative acts and EE action plans.

Public platform on energy saving will also be created within the Ministry of Energy. It will provide:

- assistance to interested parties in facilitating interdepartmental and international contacts for EE investment; and
- information exchange and dissemination on the best domestic and international EE practices for project development.

Commission on Energy Expertise

The Commission will be established in Kyrgyzstan as an independent organization to examine newly designed energy consuming projects and check their compliance with state EE standards and requirements.

Kyrgyz Science and Technology Centre "Energy"

The Kyrgyz Science and Technology Centre "Energy" also operates within the Ministry of Energy. It provides scientific and technological support for the implementation of Kyrgyzstan's energy saving policy. The Centre is in-charge of the following:

- development, design and introduction of new energy efficient innovative technologies in the fuel and energy complex;
- informational support to energy consumers related to efficient ways of fuel and energy utilization;
- certification and determination of technical standards for energy consuming equipment; and
- development of EE laws and national and international programmes for the power engineering sector.

Selected EE programmes and projects in Kyrgyzstan

Energy Saving Programme 2009 to 2015

The main objective of the programme is to save 0.84 Mtoe by 2015 by enhancing organization and management. The first stage of the programme (2009 to 2011) concentrates in relatively low-cost measures. More capital intensive measures ensuring long-term and considerable energy saving effect will be implemented during the second stage (2012 to 2015). The programme seeks to ensure an increase in GDP without increasing energy consumption by 2015 through active implementation of available energy conservation potential in production, distribution and consumption of energy resources. Particularly, the programme aims to :

- increase the level of modernization for power engineering and natural gas equipment to 50 per cent by 2015,
- improve the level of energy consumption efficiency in industry by 1.5 times, and
- increase energy consumption efficiency in the residential sector and in agriculture to 50 per cent by 2015.

Aside from investment deficit and the lack of financial incentives, the following problems are also mentioned in the programme:

- unacceptable high commercial and technical electricity losses (3.9 billion kWh, or 33.6 per cent of total electricity consumption in 2008);
- inefficient system for end-use energy pricing (especially for electricity and heat) and energy subsidy. Energy prices for the general population remain subsidized with only 59 per cent of electricity and 31.2 per cent of heat production and distribution cost covered by electricity and heat tariffs for households in 2008;
- non-payments of energy bills. From 2001 to 2008, the level of non-payments for electricity consumption has grown 2.5 times (the share of population is about 75 per cent).
- poor system of metering and control over electricity consumption with only 14 per cent of existing electricity meters in electricity distribution networks meeting modern require ments;
- imperfection of domestic EE standards for energy-consuming equipment;
- weak system of education and training on EE issues;
- low level of EE management; and
- lack of investment in Kyrgyzstan's energy sector. This situation limits the possibility of compensating for the loss of productive capacity (about 80 per cent by 2010), and modernizing and refurbishing basic plant and equipment, most of which are worn out. Interestingly, Kyrgyzstan's power engineering enterprises saved about 56 ktoe in 2007 due to increase in efficiency of existing equipment and decline of electricity and heat distribution losses.

A list of strategic targets and indicators and a map of personal responsibilities are included in the programme through the Action Plan which involves the following EE components:

- creating efficient institutional support for energy conservation policy;
- increasing EE level of state-owned organizations;
- improving existing legislation for energy conservation;
- reducing the level of commercial and technical electricity, heat and natural gas losses;
- introducing efficient energy tariff system (2009 to 2010);
- equipping energy consumers with electricity, heat and gas meters;
- optimizing DSM;
- promoting financial support to EE policy implementation;
- improving database and monitoring activities;
- providing information support for the public regarding EE benefits;

- creating economic and organizational conditions to enhance scientific, technical and innovative activities;
- creating a multi-level system of education in the field of EE; and
- stimulating the production and consumption of advanced energy efficient technologiy, equipment and materials.

The establishment of the Coordination Centre for Energy Conservation as a tool for practical implementation of policies aimed at improving EE in the country is one of the most important component of the programme. The Centre would ensure the management system of programme implementation as well as coordination among its participants.

The total cost of the Programme was about US$805 million with funding support from:

- the State,
- local energy companies accumulated through the Fund for Energy Conservation, and
- voluntary investment of juridical and private persons.

The main directions of state support include:

- the creation of a favourable investment climate in the field of EE;
- interaction with the business community and financial institutions, through public-private partnership;
- the creation of the Fund for Energy Conservation;
- implementation of EE financial mechanisms; and
- information, scientific and educational support at federal, regional and municipal levels.

The responsibilities of government officials, top-managers of energy producing and distributing companies, and heads of regional and local administrations for each particular strategic goal and indicator of the State Energy Saving Programme is summarized in Table 2-1.

The key indicators for the Energy Saving Programme will be constantly monitored and periodically measured by responsible organizations (see Table 2-2).

National Energy Programme of Kyrgyzstan 2008 to 2010

This programme was approved in 2008 underlining the main targets and objectives of Kyrgyzstan's fuel and energy complex development. EE is among the top priorities of the programme.

Improving EE in buildings 2008 to 2012

This US$4.132 million GEF/UNDP-funded project seeks to reduce energy consumption and associated GHG emission in Kyrgyzstan building sector by 30 to 40 per cent. The project covers two pilot projects involving two energy efficient middle school buildings, monitoring EE and GHG emission, EE education, and legislative aspects related to EE policy in the building sector.

Bishkek City Administration's Energy Savings Programme 2006 to 2016

The Bishkek City Administration developed and implemented a long-term Energy Savings Programme at the municipal level in 2005. The project was conducted as part of the Municipal Energy Efficiency Planning for Buildings. It is to be implemented by Energy Saving International and Demozone, a Norwegian-Kyrgyz company, and coordinated by the Household and Communal Services Department and Fuel and Energy Complex. The Bishkek City Administration established a special department to implement the programme and appointed an officer to manage it. The goal of the programme is to optimize allocation of budget funds, start a modern energy consumption system, improve indoor climate of municipal buildings, and benefit the environment.

The Bishkek City Administration initiated the creation of a municipal revolving fund called the Special Settlement Account within the Household and Communal Services Department and Fuel and Energy Complex. The Special Settlement Account was

Table 2-1 | Strategic goals of Kyrgyzstan's State Energy Savings Programme and responsible persons

Goal	Indicators	Responsible person
To ensure GDP growth with no increase in TPES by 2015	• Energy consumption per unit GDP • Electricity consumption per unit of GDP • Total energy savings • GDP growth/TPES growth	The First Vice-Prime Minister
To reach 840 ktoe of energy savings through organizational policies and measures	Physical volume of energy savings	The Minister of Energy
To increase EE level of tate-owned organizations	Physical volume of energy savings	The leadership of state-owned organizations
To improve existing EE legislation	The quantity of newly elaborated and approval legislation	The Minister of Energy
To reduce the level of commercial and technical losses in compliance with existing regulations by 2015	The level (percentage) of commercial and technical losses in the gas industry, power engineering and thermal engineering	The Minister of Energy
To introduce in 2009 to 2010 the energy tariff system stimulating energy conservation in the energy sector	Ratio of energy production and distribution cost to energy tariff	The Minister of Energy
To equip 100 per cent of local energy consumers with metering equipment by 2015	The share of energy consumers equipped with modern metering devices (electricity, heat and natural gas meters)	The leadership of distributing companies
To ensure 100 per cent payments in the energy sector	The share of non-payments in the gas industry, power engineering and thermal engineering	The Minister of Energy
To optimize DSM activities	The quantity of accidents due to overloaded electricity grids	The Head of JSC "The National Electricity Grid of Kyrgyzstan"
To develop and introduce financial incentives for energy saving policy	Total annual financing of the Energy Savings Programme in Kyrgyzstan for the period 2009 to 2015	The Minister of Energy
To improve statistics and monitoring system in the area of energy saving	The share of non-registered energy consumers in all sectors of Kyrgyz economy	The Head of the National Statistics Committee of Kyrgyzstan

Table 2-1 | Strategic goals of Kyrgyzstan's State Energy Savings Programme and responsible persons *(continued)*

Goal	Indicators	Responsible person
To ensure wide-scale information support to energy conservation in each region of the country	The quality of information and educational programmes and PR actions for energy saving implemented by the Ministry of Energy	The Minister of Energy
To realize available technical potential of energy saving (490 ktoe by 2015)	Physical volume of energy saving	The Minister of Energy
To improve the level of modernization in the energy sector by 50 per cent in 2015	The share of obsolete equipment in the gas industry, power engineering and thermal engineering	The leadership of domestic energy companies
To create favourable conditions for scientific, research and innovative activities in energy saving	Expenditure on R&D for EE	The Minister of Energy
To introduce multi-level educational system in the field of EE	The quantity of educational programmes introduced to higher and professional education	The Minister of Education and Science
To stimulate renewable energy equipment production	The quantity of renewable power plants; Physical volume of electricity and heat power produced by renewable energy sources	The Minister of Energy
To increase the level of EE in the agricultural sector by 50 per cent by 2015	The share of fuel and electricity in total cost of agricultural products; The share of obsolete equipment	The Minister of Agriculture and Water Resources
To improve the level of efficient utilization of fuel and energy resources in the residential sector by 50 per cent by 2015	The percentage of technical and commercial losses of electricity and heat power in the residential sector	The leadership of regional and local administrations

Source: Energy Savings Programme of Kyrgyzstan for the Period 2009 to 2015, Bishkek, 2009

Table 2-2 | The map of responsibility and periodicity of measurement for key indicators of Kyrgyzstan's Energy Savings Programme

Indicators	Responsible person	Periodicity of measurement
Ratio of TPES growth/GDP growth	The National Committee for Statistics	Monthly
Physical volume of energy saving	Gosenergoinspektsia	Monthly
GDP energy and electricity intensity	The National Committee for Statistics	Monthly
The level of technical and commercial losses in the gas industry, power engineering and thermal engineering	The Department of the Fuel and Energy Complex of the Ministry of Energy	Monthly
Ratio of electricity and heat power production and distribution cost to average tariffs	The Department of the Fuel and Energy Complex of the Ministry of Energy	Monthly
Shares of consumers equipped with electricity, heat and natural gas meters	The Department of the Fuel and Energy Complex of the Ministry of Energy	Quarterly
Percentage of non-payments in the gas industry, power engineering and thermal engineering	The Department of the Fuel and Energy Complex of the Ministry of Energy	Monthly
Quantity of accidents because of overloaded electricity grids	Gosenergoinspektsia	Monthly
Physical volume of fuel savings in the power engineering sector	The Department of the Fuel and Energy Complex of the Ministry of Energy	Quarterly
Annual financing of the Energy Savings Programme for the period 2009-2015	The Department of the Fuel and Energy Complex of the Ministry of Energy	Annually
Share of non-registered energy consumers	The Department of the Fuel and Energy Complex of the Ministry of Energy	Quarterly
Energy savings achieved through technical measures	Gosenergoinspektsia	Quarterly
Shares of obsolete equipment in the gas industry, power engineering and thermal engineering	The Department of the Fuel and Energy Complex of the Ministry of Energy	Quarterly

Table 2-2 | The map of responsibility and periodicity of measurement for key indicators of Kyrgyzstan's Energy Savings Programme *(continued)*

Indicators	Responsible person	Periodicity of measurement
Expenditure on energy efficient innovative technologies	The Department of the Fuel and Energy Complex of the Ministry of Energy	Annually
Quantity of educational programmes for energy savings at all levels	The Ministry of Education and Science	Annually
Decline in quantities of air pollutant emissions, concentration of solid wastes and CO_2 emissions	The State Agency on Environment Protection	Quarterly
Quantity of enterprises-producers of energy efficient equipment	The Department of the Fuel and Energy Complex of the Ministry of Energy	Annually
Quantity of renewable power plants and electricity produced by them and sold through the national electricity grid	The Department of the Fuel and Energy Complex of the Ministry of Energy	Annually
Energy savings achieved by structural measures	The Department of the Fuel and Energy Complex of the Ministry of Energy	Annually
Share of fuel and electricity in production cost of industrial and agricultural products	The National Committee for Statistics	Annually
Technical and commercial losses of electricity and heat power in the residential sector	The Department of the Fuel and Energy Complex of the Ministry of Energy	Monthly
Share of obsolete equipment in industry	The Department of the Fuel and Energy Complex of the Ministry of Energy	Annually
Share of obsolete equipment in agriculture	The Ministry of Agriculture and Water Resources	Annually

Source: Energy Saving Programme of Kyrgyz Republic for the Period 2009 to 2015, Bishkek, 2009

established in accordance with a regulation approved by the Mayor of Bishkek on the "Establishment and disbursement of Special Settlement Account funds for energy savings" developed by the City's Finance Department. The regulation:

- defined the operational rules of the Special Settlement Account;
- detailed how the fund should be formed;
- outlined budget planning and the process selection and financing procedures;
- detailed the maintenance and schedule of revolutions of the fund; and
- discussed how the Special Settlement Account is to be maintained.

Financing for the fund is provided based on the decision of Executive Authorities of the Bishkek City Administration, according to Special Settlement Account regulations and the current provisions of the budget code.

With funding from the Special Settlement Account, Demozone and the Household and Communal Services Department, several EE projects in kindergartens and schools have been implemented including the:

- installation of automated regulators for indoor temperature during non-business hours thereby lowering heat consumption;
- installation of hot water mixers;
- balancing heating system;
- insulation of hot water pipelines;
- installation of meters and window panes; and
- installation of an Energy Monitoring System.

Overall project investment in school No. 11 was US$23 000, and US$6 700 in kindergarten No. 28. Annual estimated financial savings were US$5 300 and US$1 800 with a payback of 4.4 and 3.7 years, respectively. Estimated annual energy saving for 2007 were 407 200 kWh in school No. 11 and 85 000 kWh in kindergarten No. 28.

Throughout the eleven years of project life and its completion in 2016, the city plans to retrofit 312 buildings. Depending on the volume of retrofits conducted in each building, total investment will range from US$2 to 5 million, with US$0.56 million to 1.6 million coming from the city budget, and US$1.44 million to US$3.4 million from the Special Settlement Account. Overall savings in 312 buildings are estimated to range from US$0.44 million to US$7.8 million, depending on whether 107 of 247 EE projects are implemented.

Promoting the Development of ESCOs (2004 to 2006)

This project was initiated to develop the mechanism of Energy Performance Contracting. It was supported by the Slovak Official Development Assistance and CIDA. Implementing partners were UNISON Energy Consulting s.r.o. from the Slovak Republic, and the local ESCO "Narynteplokomenero."

The development of ESCOs is expected to benefit not only cash-strapped municipalities, but also improve the functionality of commercial infrastructure, which can, in turn, help stimulate the market for energy saving technology. An assessment of ESCO potential in Kyrgyzstan demonstrated that the largest potential for ESCO intervention is concentrated in the public and commercial services sector (UNISON, 2006).

The implementing team worked with the ESCO to adapt their tools to the project environment. Local professionals were likewise trained to create energy performance contracts, energy performance reports, project implementation agreements, protocols of delivery/acceptance of implemented measures, and ESCO administration scheme. Several case studies have already been implemented in the building sector (school, kindergarten, public administration buildings, and boiler house). The criteria for assessment include:

- level of energy saving potential;
- replication potential throughout Kyrgyzstan;
- payback period of two to three years favourable to the ESCO;

- social significance of the facility;
- client motivation; and
- willingness of local authorities to provide guarantees.

UNISON, Energy consulting s.r.o. and the ESCO had chosen the municipal kindergarten Altyn Balalyk in the city of Naryn as a demonstration project. The following EE measures have been implemented within the contract:

- installation of automatic regulation valve;
- installation of heat meter;
- rehabilitation and sealing of windows and doors; and
- rehabilitation and insulation of the main horizontal heating pipes.

By insulating the pipes, heat loss was reduced by approximately 60 per cent. After sealing the windows, heat losses through ventilation were reduced by 30 per cent. Overall monitoring of the 2005 to 2006 heating season indicated that energy savings were 67 per cent significantly exceeding the 20 per cent savings guaranteed in the contract. About 24 to 28 per cent were the real energy savings as a result of the implemented EE measures, and the rest of 40 to 43 per cent was a result of insufficiencies in existing methodology for heat consumption accounting used by local heat suppliers and shortcomings of the Kyrgyz standards on building energy performance.

At the same time, the following barriers were identified during project implementation:

- cloudy utility billing process;
- low capacity of energy officers and public authorities in coordinating and planning EE projects;
- subsidized energy tariffs; and
- lack of supportive legal framework.

School Project for Application of Energy and Resources (SPARE) 1996

SPARE, an international school project that has been run by the Norwegian Society for the Conservation of Nature is one of the very active EE projects in Kyrgyzstan. The main objectives involve the reduction of GHG emissions and contribution to natural ecosystem preservation. Solar energy use for heating water, instead of coal and wood, results in a significant decline of negative human impact on nature. SPARE implemented a number of solar water heating projects in rural regions of the country where it was met with great interest. In twenty villages, a number of families were trained on how to build low cost solar water heaters. Total number of trained persons was more than 300.

The activities involved in the project include developing and adjusting solar installations and devices to an affordable price, training local population to construct the installations themselves, and organizing regional solar-energy-use by using demonstrative stands as well as establishing permanent exhibitions of solar installations. The project has conducted the following activities:

- explored potential for solar energy use in Kyrgyzstan;
- conducted research on hot water demand and needs, and how to accordingly chose and develop technology;
- provided training for future trainers;
- spread knowledge on solar energy use for water heating throughout Kyrgyzstan by distributing information materials;
- established cooperation between schools and NGOs;
- developed and adjusted existing technology for solar collectors by using easily accessible and low-cost materials;
- trained more than 300 locals in twenty villages to construct solar installations;
- set seven stands for demonstrating solar energy exploitation, one in each Kyrgyzstan county; and
- developed monitoring programme on the effectiveness of the project.

The project was financed by Small Grants Programme of GEF-Kyrgyzstan and the Norwegian Ministry of Foreign Affairs. Although the project was terminated in 2007, results monitoring and recording, as well as further dissemination of low cost technology, policy development and information on solar water heating continue.

Support from international organizations

A number of international organizations and banks of development (UNDP, GEF, the World Bank, ADB, etc.) have been providing financial, organizational and consultative support to local governments and NGOs in the development and implementation of EE programmes and projects at national, regional and local levels. Many projects were directed to estimating available EE potential.

In particular, many energy audits in industry and in the building sector have been implemented in the framework of the TACIS programme. A set of low-cost EE measures have been identified as a result of energy audits. For instance, about 20 to 25 per cent of total energy consumption in industry could be saved due to no-cost and low-cost EE measures (for example, heat recovery from discharged gases). Several EE demonstration projects have also been implemented in the building sector, including:

- improvement of heat insulation quality;
- installation of heat valves to regulate indoor temperature depending on the ambient temperature; and
- installation of heat and hot water meters.

Heat Supply Strategy of Kyrgyzstan 2001

This World Bank-funded project provides a number of practical recommendations on improving EE of heat supply systems in Kyrgyzstan.

Main barriers to EE promotion in Kyrgyzstan

Kyrgyzstan has the most ambitious plans for EE policy development among Central Asian countries as reflected in major strategic energy policy documents. The transition of Kyrgyzstan's economy to energy efficient pattern of development, however, is hampered by the following barriers:

- lack of investment to modernize existing productive and generating capacities. For instance, the share of obsolete equipment in the energy sector is projected to most likely reach 80 per cent by 2010 (Energy Saving Programme of Kyrgyz Republic for the Period 2009 to 2015, Bishkek, 2009);
- low purchasing power of local energy consumers making their financial participation in EE measures practically impossible;
- lack of equipment for measuring and controling excessive energy consumption;
- insufficient commercialization of new efficient equipment achieved by R&D;
- limited involvement of energy suppliers in DSM programmes;
- lack of economic mechanism and financial incentives to stimulate the development of EE in the state sector;
- low level of energy efficient building materials and construction technology;
- weak information support for EE policy;
- low energy tariff and high share of non-payments; and
- insufficient activity to attract foreign investment for EE projects.

TAJIKISTAN

Tajikistan is an industrial and agrarian country with leading industries in power engineering, food, chemical, and non-ferrous metallurgy. Although Tajikistan has one of the lowest GDP per capita ranking in Central Asia (see Table 1), it had enjoyed sustained economic growth. The level of GDP in 2007 reached US$7.9 billion - an increase of 80 per cent compared with 2000 figure (which was US$4.4 billion). Per capita GDP had also increased to US$1 179 in 2007 from US$710 in 2000. While Tajikistan's GDP has grown rapidly in recent years, primary energy use has not increased as quick, leading to a reduction of energy intensity. Tajikistan's present economic conditions allow a positive direction for EE activities.

EE enabling legislation and policy

Presidential Decree on Additional Measures for Efficient Energy Use and Energy Saving 2009

On 24 April 2009, this decree was released underlining the necessity to switch the whole country over to the use of energy efficient electric bulbs by the end of 2009. The decree lists the following government bodies responsible for the implementation of the measure:

- Central and local authorities;
- Ministry of Finance;
- Ministry of Economic Development and Trade;
- Ministry of Energy and Industry;
- Ministry of Labour and Social Protection; and
- Agency for Standardization, Metrology and Certification.

JSC "Barki Totchik" was tasked to equip 241 000 of the poorest households with energy efficient light bulbs free of charge. To produce these bulbs, two factories are to be created between 2009 and 2011. The decree also required JSC "Barki Totchik" and relevant ministries (Ministry of Energy and Industry, Ministry of Economic Development and Trade, Ministry of Justice, State Agency for Energy Inspection) to develop the Energy Savings Programme for years 2010 to 2015. Ensuring natural gas and electric power self-sufficiency in the country within three to four years is another important component of the decree.

Moreover, the decree identifies the following responsibilities for the government:

- to develop the programme of construction of new power plants and the modernization of existing power plants;
- to create an expert commission consisting of qualified experts from relevant ministries and local authorities to implement energy saving measures;
- to ensure wide scale utilization of non-conventional and renewable energy sources; and
- to ensure wide scale application of energy saving technologies by all relevant organizations at all levels.

The decree also includes measures to extend awareness of EE opportunities and benefits through publicity campaign.

Law on Energy Savings of the Republic of Tajikistan 2002

Before the approval of this legislation in 2002, EE was part of the Resolution of the Government of Tajikistan "On Measures for Rational Use of Fuel and Energy Resources in the National Economy of the Republic of Tajikistan for 1995 through 1997." Upon the expiration of this resolution, a new resolution "On Normalization of Fuel and Energy Use in the National Economy of the Republic of Tajikistan" was enacted which elaborates means to provide technically and economically feasible and progressive norms of electric and thermal power use in the country.

This legislation describes the main principles of state policy aimed at ensuring efficient utilization of fuel and energy resources. It identifies government bodies responsible for the development and promotion of EE policy in the country. It also identifies the following EE components:

- state regulation and control;
- energy audits;
- accounting and statistics;
- standardization, certification and metrology;
- limits and norms for energy losses;
- economic and financial mechanisms;
- financial incentives and sanctions;
- international cooperation; and
- education, training and information.

Major actors for EE promotion

A serious restructuring had taken place within the government system of Tajikistan over the past few years. On 30 November 2006, several key ministries (including Ministry of Industry, Ministry of Energy, Ministry of Agriculture, State Committee for Construction and Architecture, State Committee

for Environment Protection and Forestry) as well as some other governmental bodies were abolished by a Presidential Decree to improve efficiency in the government. Consequently, the government has established the Ministry of Industry and Energy, Ministry of Agriculture and Environment Protection, and Government Agency for Construction and Agriculture. The Agency for Standardization, Metrology, Certification and Trade Inspection has also become a state agency under the Government of Tajikistan from being a body under the Ministry of Economy and Trade. Furthermore, the Ministry of Agriculture and Environment Protection was renamed into the Ministry of Agriculture by another Presidential Decree dated 28 February 2008. The Committee for Environment Protection was likewise established.

Ministry of Industry and Energy

This is the main government body responsible for developing, implementing and monitoring the implementation of state EE policies and programmes (see Figure 2-5 for the location of the Ministry in EE policy). As indicated in the Law on Energy and the Law on Energy Saving, the Ministry has the following responsibilities:

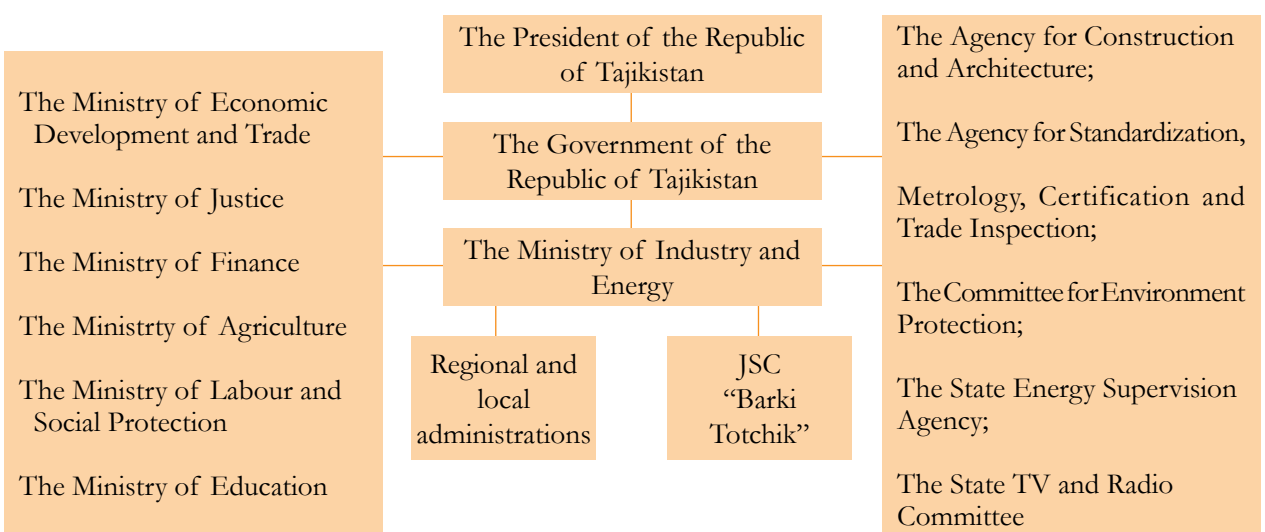
- introduction of advanced energy saving technologies, equipment and materials in the energy sector and in industry;
- development and improvement of legislation related to EE issues;
- monitoring, evaluation and analysis of results achieved by EE programmes;
- introduction of renewable, non-conventional, and secondary energy sources; and
- organization of inter-branch and inter-ministerial cooperation within the government

Through the Presidential Decree on Additional Measures for Efficient Energy Use and Energy Saving enacted on 24 April 2009, the Ministry of Energy and Industry in cooperation with the Ministry of Economic Development and Trade, Ministry of Justice and State Agency for Energy Inspection took part in the development of the Energy Savings Programme for years 2010 to 2015.

Other ministries and government bodies

The Ministry of Economic Development and Trade develops plans, programmes and scenarios for economic and industrial development taking into

Figure 2-5 | Institutional structure of Tajikistan's energy savings policy



Source: Presidential Decree "On Additional Measures for Efficient Energy Use and Energy Savings," (Dushanbe, 2009).

account EE programmes. The issues related to financial incentives for EE products (manufacturing and trade) are also under the jurisdiction of the Ministry.

The Ministry of Justice controls juridical aspects of the state EE policy. The Ministry of Finance and the Ministry of Labour and Social Protection in cooperation with the Ministry of Economic Development and Trade, Ministry of Energy and Industry, local administrations and JSC "Barki Totchik" are responsible for free-of-charge supply of energy efficient electric bulbs for poorest households.

The main role of the Ministry of Education and the State TV and Radio Committee in the structure of Tajikistan's EE policy is to provide informational and educational support for local consumers with regards to energy efficient equipment, devices and materials as well as EE services and methods of increasing EE in the residential sector. The Ministry of Agriculture monitors and controls the level of energy consumption efficiency in agricultural enterprises and complexes.

Agency for Construction and Architecture

The agency is in charge of EE policy planning in the building sector. It controls EE indicators of construction materials and thermal insulation.

Agency for Standardization, Metrology, Certification and Trade Inspection

The agency is tasked with the following: development and consideration of EE standards and norms; certification of energy consuming equipment; and protection of internal market from inefficient energy consuming products.

State Energy Supervision Agency

The agency is in-charge with monitoring and control of established EE standards for fuel and energy resources utilization not only at the level of domestic consumers, but also to that of producers of energy consuming equipment, appliances and devices.

Committee for Environment Protection

The Committee participates in the state energy savings policy by elaborating and implementing environmental protection programmes and measures aimed at minimizing energy consumption.

Regional and local administrations

They are obliged in accordance with existing legislation and the Presidential Decree mentioned above to develop aenergy savings programmes and measures. They cooperate with relevant Ministries and agencies in the promotion of energy efficient electric bulbs and ensuring information support for the state EE policy.

JSC "Barki Totchik"

This is Tajikistan's major energy producer and supplier. The company's involvement in DSM activity is in the form of cooperation with government bodies and local administration in the supply of energy efficient electric bulbs for poor households. JSC "Barki Totchik" is also an active participant during the development of the Energy Saving Programme for 2010 to 2015.

Academy of Sciences of Tajikistan

The scientific and research organizations of the Academy of Sciences of Tajikistan take part in the development, adaptation and market introduction of energy efficient technologies and methods in the country's economy.

Selected EE programmes and projects in Tajikistan

SPARE (2006 and 2007)

SPARE experts have organized a number of seminars, workshops and training courses for pupils and teachers. The most advanced, technically available, and economically affordable EE measures were presented for Tajik trainees. Several EE projects were implemented jointly by Tajik and foreign specialists.

In 2006, the environmental organization "Little Earth" with support from the Norwegian Society for the Conservation of Nature launched the implementation of a demonstration project for winterization (heat insulation improvement) of School No.15 in Pishambe village of Varzob district.

All single-pane windows in the school were replaced with new sealed double-glazed units (nine windows sized 1.5x1.5 meters). To make the floor cold-proof, the rammed-down ground of the foundation was covered with para-insulation foil which was then overlaid by one layer of glass-wool (5 cm thick). The ceiling was insulated using polyethylene film and glass-wool. With these measures implemented, the temperature in the school in wintertime is raised by five to eight degrees. Similar projects were also implemented in some other schools.

In 2007, the project for replacement of windows was implemented in School No. 22 of Nosiri Khusrav district. Solar panels were installed in the Labijai School. Partial winterization of the school in Shultak village was implemented. Five more schools were surveyed for winterization upon request of the UN Children's Fund in Tajikistan.

Energy Loss Reduction (2005 to 2012)

This US$18 million World Bank project seeks to assist in reducing commercial losses in the electricity and gas systems, and to lay the foundation towards improving the financial viability of electricity and gas utilities in a socially and responsible manner. Through its electricity component, the project supplies and installs new electrical energy meters in the Dushanbe electricity network. The project also involves the design, procurement, and installation of electricity billing system.

UNDP support

UNDP has provided financial and consultative support to the Government of Tajikistan in fulfilment of its environmental obligations under the Kyoto Protocol. The support concerns the implementation of EE measures in the power engineering sector (modernization and replacement of obsolete, inefficient equipment), in industry and residential and public buildings as well as development and promotion of renewable energy sources in remote rural areas.

Main barriers to EE promotion in Tajikistan

The following are the barriers to the development of energy conservation in Tajikistan:

- insufficient financial instruments to support and implement EE measures;
- subsidised energy tariff and the poor economic situation in the country;
- imperfections in EE legislation;
- insufficient activity for EE promotion;
- weak control for excessive energy consumption
- inefficiency in industry and residential sectors; and
- absence of information dissemination activities to ensure market penetration of energy efficient technologies, devices and materials.

TURKMENISTAN

Between 2000 and 2007, Turkmenistan had the highest relative GDP increase (almost 2.5 times) among Central Asian countries. This increase is mostly connected with favorable market conditions for natural gas export. Turkmenistan has abundant resources of sulphur, salt, non-ferrous and rare earth metals. The country has a big chemical and oil-chemical industries and well-developed fuel and energy complex. The level of GDP energy intensity in the country has decreased twice in 2000 to 2007 (see Table 1). Along with favorable energy prices and growing export revenues, this can be explained by modernization of existing and construction of new energy efficient production capacities in the industrial sector and in the fuel and energy complex.

EE enabling legislation and policy

Practically, there is no serious activity with regards to EE improvement in the country. This is definitely connected to some extent with excessive production

of energy. There is almost no legal framework for EE in Turkmenistan which obviously shows that the key policy direction is towards increasing fuel production and consumption. Gas, electricity and heat power consumption metering, as a matter of fact, is limited at the customer's level.

The Presidential Decree "On free supply of electricity, gas, water and table salt to the population of Turkmenistan until 2030" was adopted in 2003. Free access to energy resources and energy services makes energy affordable even for the poorest households. On the other hand, it yields negative effect on EE in the residential sector as local population has no incentive for adopting energy conservation activity.

Nevertheless, EE can still be explored and considered in the national economy particularly as important player in increasing export potential and providing solutions to environmental problems.

Major actors for EE promotion

Turkmenistan's fuel and energy complex has been mostly oriented towards wide-scale energy export, thus EE is not included in the list of top priorities for economic and energy development. This situation explains the absence of any national strategy, programme, or legislation on EE. This follows that no special government organization for EE concerns exist inside and outside the bureaucracy. Nevertheless, the following government bodies could form the institutional framework in case Turkmenistan develops its state energy saving and EE policy:

Ministry of Energy and Industry

Since energy policy issues are in the competence of the Ministry of Energy and Industry, it could play the role of a central government body to develop and promote EE policies in the country.

Ministry of Construction and Ministry of Construction Materials

This Ministry which ensure state regulation in the area of construction (both industrial and residential) may develop, control and monitor implementation of construction standards, norms and regulations for efficient structures and conduct periodic inspections of construction projects.

State Agency for Management and Use of Hydrocarbon Resources

The agency, an office under the Office of the President established in 2008 is also among the structural components of Turkmenistan's energy policy which can be tapped to promote EE policy.

Inter-Branch Committee on the CDM

In light of Turkmenistan's accession to the UNFCCC in 1995 and ratification of the Kyoto Protocol in 1998, an Inter-Branch Committee on the CDM will be established as stated in a regulation signed by the President in 24 May 2009. The Committee is expected to develop and introduce environmentally clean and energy efficient technologies. It will be in-charge for the selection, approval and implementation of CDM projects in the country (Ministry of Nature Protection of Turkmenistan, 2008).

Ministry of Nature Protection

This Ministry is in-charge with the development and implementation of state policy for environment protection and rational use of natural resources (including hydrocarbons).

Main barrier to EE promotion in Turkmenistan

The absence of an energy conservation law or a definite EE programme in the country shows that EE policy is not among the energy policy priorities in Turkmenistan. However, direct and separate EE efforts are realized as a primary result of fuel savings due to the modernization of productive capacities and the construction of new modern facilities. This is shown by a considerable decline in GDP energy intensity achieved in the last few years. This said, the major barrier to EE policy in Turkmenistan concerns the primary orientation of country's leadership towards energy production and increase in the volume of energy export.

UZBEKISTAN

Uzbekistan is Central Asia's second largest economy. It is an industrial and agrarian country with a fuel and energy complex as the dominating sector in production. The country has the highest GDP energy intensity among Central Asian countries (see Table 1) which can be attributed to the existing energy intensive industrial production structure, and the technological inadequacy of fixed production assets. Nevertheless, the indicator of GDP energy intensity in the country has decreased by 37 per cent in 2007 compared with 2000 (IEA, 2009) due particularly to considerable economic growth and simultaneous decline of TPES. A market increase in the output of export-oriented products of gas processing and oil refining operations and in natural gas exports had caused this decline. According to expert estimates, it is technologically and commercially feasible even under the existing pattern of energy consumption to cut the current use of energy by 8 to 12 Mtoe. Although about 30 per cent of the above potential is accumulated in the industry sector, the largest savings can come from improvements in the residential sector (which is around 45 per cent) (ECE/ESCAP, 2005; Kasymova, 2008).

EE enabling legislation and policy

Energy Saving Programme 2000

The programme which runs until 2010 has been prepared in accordance with Article 12 of the Uzbek Law "On Rational Energy Use" and Cabinet of Ministers Resolution No. 517 dated December 2000. The Programme has participants from national ministries and agencies, associations, unions and organizations, regional administrations and the Tashkent city council. The implementation of organizational and technological measures on energy saving through this programme will decrease the level of GDP energy intensity in the country by 33 to 35 per cent.

The relevant industrial and regional energy savings programmes have been elaborated with the involvement of 48 national ministries, agencies, companies, associations, and organizations and the authorities of Uzbekistan's fourteen regions. Absolute priority among energy saving measures in the country both in the fuel and energy complex and among energy users goes to the so-called no-cost measures such as: (1) improvements to already existing arrangements, (2) introduction of incentives for EE, and (3) organizational efforts to achieve elementary order in the field of energy consumption. Low-cost EE measures with relatively quick payback period include, for example:

- identification of optical operating modes for technological facilities, and other production mode rationalization;
- better insulation to decrease heat losses;
- prevention of fuel and lubricant leaks from valves, painting of fuel tanks, and mounting breathers;
- electricity saving by making the most natural lighting;
- consumer's supply with gas, heat and electricity meters;
- indoor temperature regulation depending on outside air temperatures; and
- increasing the use of modern energy saving light bulbs.

Another set of EE measures which require the availability of investment includes:

- the introduction of decentralized heat supply systems in the residential sector and public buildings;
- modernization of burning equipment and replacement of existing boilers by more advanced facilities;
- modernization and repair of thermal power plants facilities (JSC "Uzbekenergo"); and
- switch-over from "wet" to "dry" production modes in the manufacture of cement.

Several wide-scale programmes in the field of installation of gas, heat and hot water meters had been implemented in the residential sector in the

last few years within the Strategy of Mitigation of Greenhouse Gases Emission. The results of the above programmes implementation include the following:

- 3.9 million apartments equipped with gas meters between 1999 and 2005;
- 26 000 residential buildings equipped with heat meters from 2005 to 2006;
- 627 000 apartments equipped with hot water meters from 2007 to 2008 (JSC "Uzbekenergo," 2009).

Uzbekistan is also implementing the Energy Saving Programme in the oil and gas sector. The following results in the field of fuel and energy saving are expected to be achieved in this sector from 2007 to 2012:

- natural gas – 3620.9 million cubic meters;
- condensate – 279.6 thousand tonnes;
- natural gas liquid – 1637 thousand tonnes;
- heat power – 2 175.8 thousand Gcal
- electric power – 140 million kWh

Average savings of fuel and energy resources in the oil and gas sector in 2007 to 2012 is expected to total 5.37 Mtoe. The level of CO_2 emission for this period will be decreased by 13 435 thousand tonnes. Total financial cost of the programme is going to be about US$84 million sourced from JSC "Uzbekneftegas" company plus US$385 million of direct foreign investment and credits (Ministry of Economy of Uzbekistan, 2009).

Uzbek Law on Rational Energy Use 1997

This legislation developed and approved in 1997 includes:

- standardization and certification of energy consuming equipment and devices;
- State control over energy consumption and EE;
- State management system in the field of rational energy consumption;
- responsibilities of Uzbek Government to develop and implement relevant EE measures and programmes;
- energy audits and expertise;
- financial sources for EE programmes;
- implementation of financial mechanism for energy conversation measures;
- renewable energy sources development;
- responsibility for inefficient use of fuel and energy resources; and
- international cooperation in the field of energy conservation.

Major actors for EE promotion

Ministry of Economy

This is the central state institution in EE policymaking in Uzbekistan. The Ministry determines the main strategic goals and indicators of the country's fuel and energy complex development, develops and implements EE policy, monitors results of implemented programmes, and supports renewable energy sources development.

Department of Fuel and Energy Complex Development

The Department under the Cabinet of Ministries was established in 2001 with the purpose of improving efficiency of government management system in the fuel and energy complex of the country. The Commission for Fuel and Energy Resources Savings was established within the structure of this department (see Figure 2-6). The Department is responsible for key energy policy issues including:

- preparation of short-term and long-term energy development forecast;
- attraction of foreign investments in the domestic fuel and energy complex;
- preparation of fuel and energy balances;
- coordination of works on sustainable energy supply for domestic consumers;
- feasibility studies and financial schemes of key investment projects in power engineering and the oil and gas sector; and
- development of country's energy support potential.

The Department is also in-charge of rehabilitation and modernization of productive and generating capacity of advanced energy efficient equipment and technology. It also coordinates inter-ministerial and inter-sectoral activities in the field of rational and efficient use of fuel and energy resources, and controls implementation of existing directives and regulations.

The State Oil and Gas Supervision Agency "Uzbekneftegasinspektsia"

In relation to energy savings, the supervision agency "Uzbekneftegasinspektsia" is in charge of:

- organization and implementation of regular control and inspections of efficient utilization of petroleum products and natural gas in economic sectors;
- economic sanctions for inefficient use of petroleum products and natural gas by producers and consumers;
- organization of technological control of petroleum products and natural gas consuming equipment including control of its efficiency; and
- licensing of ESCOs (including energy audits).

The State Electricity Supervision Agency "Uzgosenergonadzor"

In accordance with Presidential Decree No. 2812 dated 22 February 2001, "Uzgosenergonadzor" was moved from JSC "Uzbekenergo" and became an independent state agency (see Figure 2-6 and 2-7). "Uzgosenergonadzor" is responsible for:

- development of standards, regulations and norms in coal and electric power production, transportation and fuel consumption;
- organization (and licensing) of energy audits and expertise;
- licensing of electricity production in electric power plants;
- creation of favourable conditions for renewable energy sources development;
- control of the level of efficiency of electricity generation, transportation, distribution and final consumption;
- economic sanctions for inefficient use of electric power; and
- assessment of power engineering projects from the standpoint of technical safety and EE and commissioning (permission) of new facilities in commercial operation.

JSC "Uzbekneftegas" and JSC "Uzbekenergo"

Uzbekistan's system of state management and regulation in the energy sector covering all stages of energy utilization – from primary energy production to final energy consumption - is the basis for sustainable energy development in the country. Uzbekistan's fuel and energy complex is under control of state-owned companies which include:

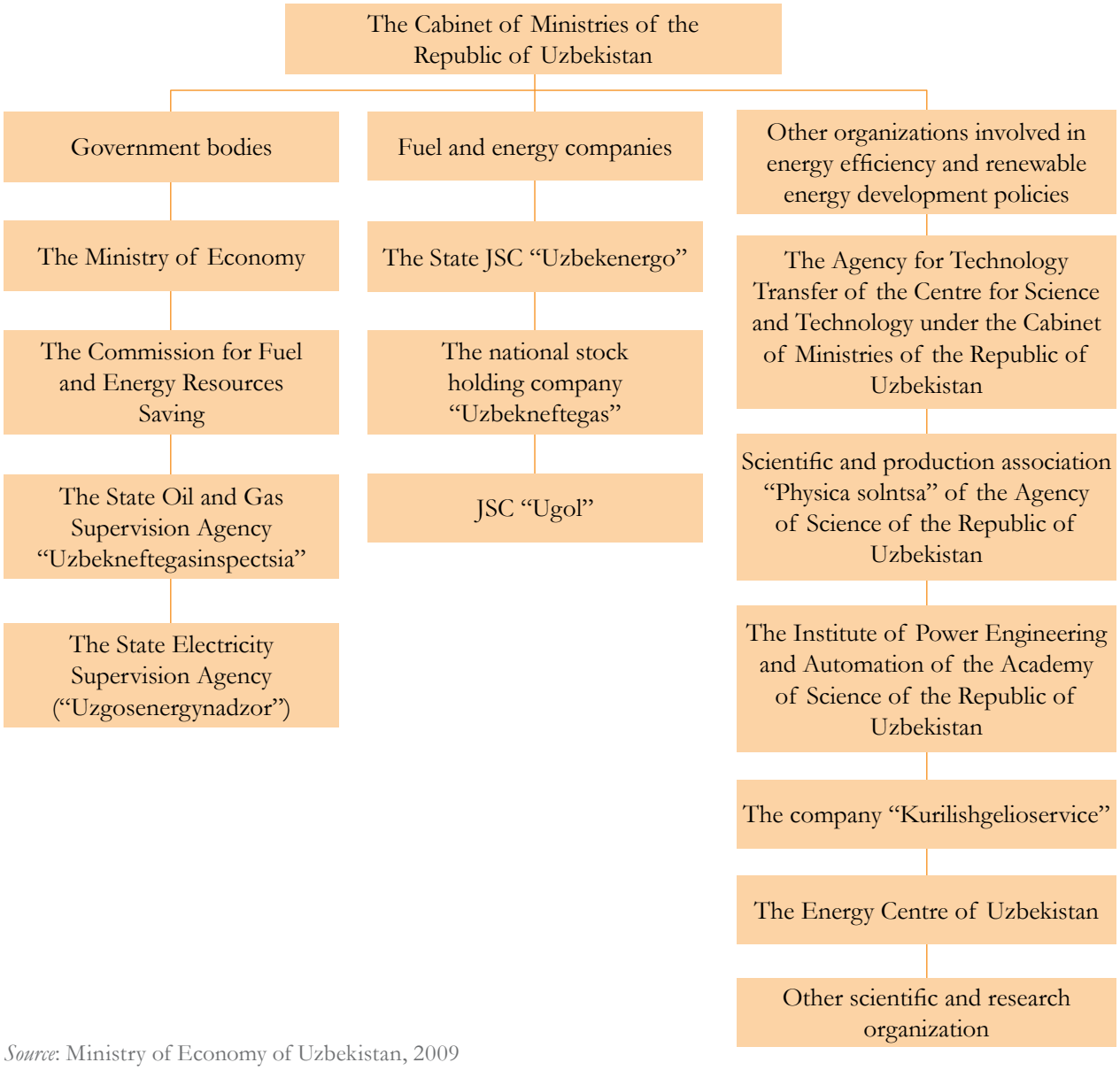
- the national holding company JSC "Uzbekneftegas" , and
- JSC "Uzbekenergo" which controls power engineering as well as coal industry via JSC "Ugol"

These fuel and energy companies also take part in the development and implementation of EE policy by improving their efficiency through modernization and introduction of advanced equipment and DSM programmes. For instance, JSC "Uzbekenergo" equips residential consumers with advanced heat power and hot water meters.

JSC "Uzbekenergo" is the largest energy producer and consumer in the country. Its share in total natural gas consumption is about 35 per cent. The company is also the largest producer of CO_2 emission. The main strategic objectives of the company for EE are:

- reduction of the level of specific fuel consumption from 271 goe/kWh in 2004 to 240 goe/kWh in 2020 allowing annual savings of about 2.5 BCM of natural gas; and
- implementation of DSM programme in the installation of highly efficient electricity meters in the residential sector.

Figure 2-6 | Institutional structures of Uzbekistan's energy savings policy



Source: Ministry of Economy of Uzbekistan, 2009

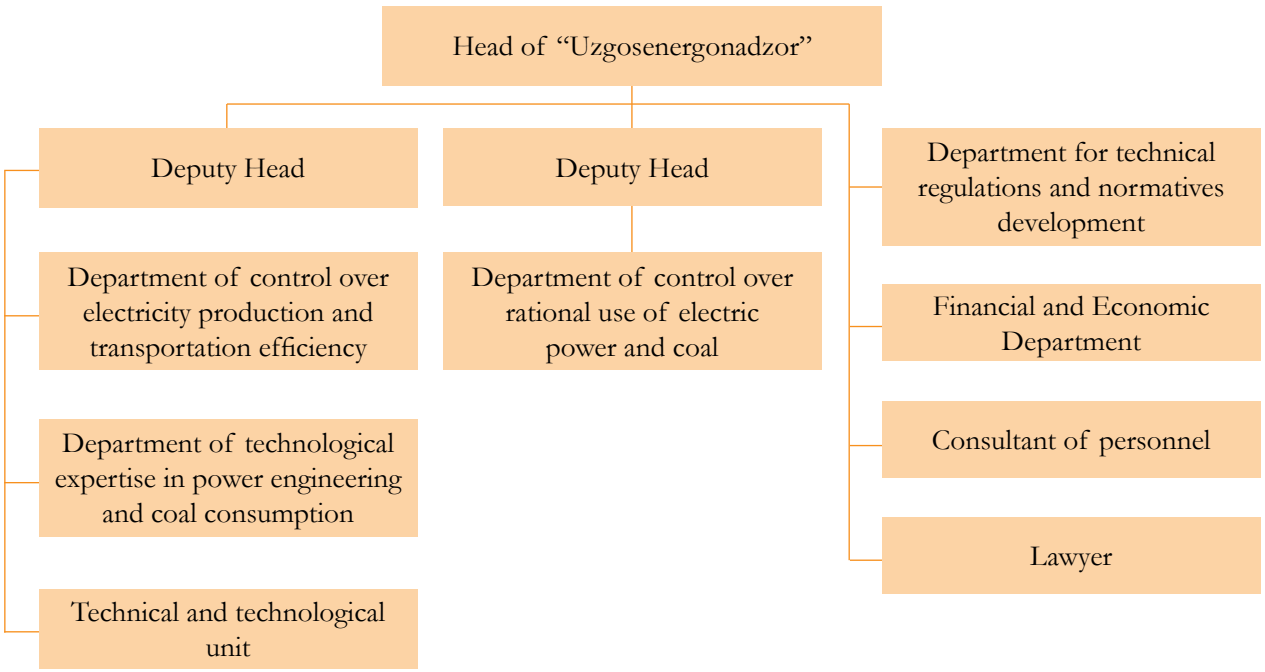
The implementation of energy saving measures in the power engineering sector will allow the increase of the level of electricity production by 20 per cent in 2010 without fuel consumption growth. About 0.570 Mtoe are to be saved thus reducing the level of CO_2 emission by generating faculties by 1 424.2 $ktCO_2$ (JSC "Uzbekenergo", 2009).

Agency for Technology Transfer

There are other organizations in Uzbekistan specialized in the field of energy saving and renewable energy technologies including this agency which deal with the:

- analysis of advanced international experience in the development and application of energy efficient and renewable energy technology;
- creation of database on energy efficient and renewable energy technologies;
- organization of international seminars and workshops on EE and renewable energy; and
- preparation of publications on EE and renewable energy technologies.

Figure 2-7 | The structure of central administration of "Uzgosenergonadzor"



Source: Uzgosenergonadzor, 2009

R&D institutions

A company called "Kurilishgelioservice" housed at the Physical Technical Institute produces solar collectors for all-year-round hot water supply. This is an efficient system which produced hot water supply twice cheaper than foreign devices of the same productivity.

Energy Centre

There are several energy centres in Uzbekistan. As a rule, they have special licenses from "Uzbeknefte gasinspectsia" and "Uzgosenergonadzor." The Energy Centre is one of the leading organizations for energy savings services in the country. The Centre provides full-cycle energy savings services from initial energy audit and estimation of available energy saving potential to practical realization of energy saving measures and project management for industrial and residential energy consumers. It is equipped with modern devices supplied by the EU "TACIS" programme.

International organizations

Many international organizations, banks of development and foreign companies work to promote EE in Uzbekistan including the World Bank, ADB, EBRD, UNDP, European Union, GEF and others. These organizations deal with energy savings through:

- technical modernization or introduction of advanced energy producing and energy consuming equipment;
- implementation of EE projects within the policy of climate change mitigation; and
- direct implementation of EE projects (mostly pilot projects and projects in the field of information and education).

Selected EE programmes and projects in Uzbekistan

Increasing EE in Public Buildings in Uzbekistan 2009

ECO Ltd, a London-based consultant firm, has supported the development of this project aimed to

develop a project document (a proposal) for GEF funding. The proposal was consequently approved in August 2009. ECO's experts had advised project management on appropriate experts and terms of reference, outreach to stakeholders in order to collect and incorporate findings, the design of effective project activities within a sustainable institutional framework, and the development of the results framework and appropriate indicators for monitoring.

Capacity Building for CDM in Uzbekistan 2006 to 2009

This UNDP project aims to develop public and private sector capacities to access carbon finance, which in turn will help reduce GHG emissions, boost EE and use of renewable energy, and support Uzbek economy to develop in a more environmentally friendly manner. The project which was developed following a request from the Uzbek government supported the creation of a legal and institutional framework for carbon finance and building in-country capacities for identification, implementation of, and resource mobilization for GHG reduction projects eligible for CDM and other carbon market mechanisms. This project is a part of the UNDP regional programme for Kyoto Protocol capacity building in Eastern Europe and CIS.

Along the same line, the World Bank had organized a number of seminars on the CDM in 2007. A memorandum of understanding was signed between the World Bank and the Uzbekistan Government for an assistance programme to help in identifying and developing project proposals for EE and renewable energy projects. The implementation of which could take place within CDM.

UNDP Country Programme for 2005 to 2009

UNDP and the Government of Uzbekistan had signed an Action Plan for the implementation of the Country Programme for 2005 to 2009 stipulating that EE measures in Uzbekistan would be conducted in parallel with UNDP measures in the field of renewable energy sources utilization. UNDP provides financial and consultative support in improving EE in a number of manufacturing industries, in transportation, and in the building sector including the development of the National Strategy of Renewable Energy Resources.

Technology transfer for local production of water-heating solar panels 2003

This UNDP project financed by the Government of Denmark had a goal to create an effective instrument for solving the lack of technology and increasing public understanding of advantages and benefits of renewable energy technologies. As for technology transfer, the project had successfully addressed the task of organizing local production of solar collectors by using European technologies handed to two Uzbek companies.

EBRD financing for the modernization of Syrdarinskaya thermal power plant 2002

In 2002, EBRD provided financing for the modernization of two units of Syrdarinskaya thermal power plant with each having 300 MW of installed capacity. These resulted to decrease in specific fuel consumption per unit of electricity produced by 35 goe/KWh.

ADB Energy Efficiency Initiative

Other financial institutions have also been taking part in EE project implementation in Uzbekistan. ADB launched Energy Efficiency Initiative in July 2005 with the aim of investing US$1 billion per year on clean energy development programmes from 2008 to 2010, to catalyze capital flow to EE and renewable energy projects in China, India, Indonesia, Pakistan, Philippines and Viet Nam, as initial priority countries. An additional US$3 million grant was provided to expand the initiative in Afghanistan, Bangladesh, Cambodia, Lao People's Democratic Republic, Mongolia, and Uzbekistan in November 2008. This gives indirect energy savings effect in the power engineering sector of Uzbekistan.

JICA support to Tashkent Thermal Power Plant Modernization Project 2002

Meanwhile, energy infrastructure improvement and training programmes are priority areas of Japan International Cooperation Agency (JICA) in Uzbekistan. JICA provides financial, technical and consultative support to the Government for energy project implementation. The US$250 million Tashkent Thermal Power Plant Modernization Project which was started in 2002, for instance, is a loan from JICA (JICA, 2009).

Main barriers to EE promotion in Uzbekistan

A number of barriers to the development of energy savings policy are taking place in the country including:

- the dominating share of energy intensive industries and raw materials in primary energy mix;
- the high level of energy distribution losses because of obsolete equipment;
- inefficient functioning of district heating systems ;
- low heat power and hot water tariffs for households due to state subsidies;
- low level of secondary energy resources utilization;
- limited use of renewable energy potential; and
- insufficient coordination among government bodies involved in EE policy.

SOUTH ASIA

EE policies, institutions, actors, programmes and projects for the following South Asian countries - Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka - are discussed.

BANGLADESH

Between 2000 and 2007, Bangladesh registered an increase in GDP measured in purchasing power parity from US$199 billion to US$294.1 billion (IEA, 2009). TPES per capita has also increased during the same period, from 0.13 TOE per capita to 0.16, while GDP energy intensity was maintained at 0.09 TOE/000. The country's energy intensity is the lowest among its South Asian neighbors which could be attributed to the low standards of living (GDP per capita in Bangladesh was US$1 854 compared to US$3 581 in neighboring India). Nevertheless, prospects for EE in the country are positive given its policy direction towards the more efficient consumption of energy.

EE enabling legislation and policies

National Energy Policy of Bangladesh (draft, 2008)

The policy, which was in its draft form in 2008, contains the following provisions in addressing EE:

- CFL Standards including other energy efficient appliances with appropriate power factor is to be introduced;
- Use of power factor improvement plants is to be mandatory for all new consumers using induction motors in industries, bulk commercial consumers and irrigation pumps. Existing consumers of these categories are also to be encouraged to install such plants;
- Attempts are to be made by the utilities to improve efficiency of operating plants to the extent possible through rehabilitation. Replacement of power plants shall be made if this is more economical than rehabilitation;
- High efficiency electrical appliances are to be used. Manufacturers /importers are to manu facture/import high efficiency appliances like fluorescent lamps with efficient ballast, electronic regulators for fans, high efficiency electric motors, ACs with a good EE Ratio, pumps with capacitor, CFL with appropriate power factor and harmonics;
- Replacement/modification of existing appliances is to be completed within reasonable time frame; and.
- Exemption of tax and duty may be considered for importing materials for producing energy efficient appliances

EE for Sustainable Environment & Growth

The action and results of EE for Sustainable Environment and Growth include a proposed roadmap for introducing a national energy labeling scheme for electrical appliances and developing code for energy efficient buildings to address the absence of an EE labeling programme for appliances and energy performance monitoring programme in Bangladesh (Khan, 2009).

Major actors for EE promotion

Power Division of Ministry of Power, Energy & Mineral Resources

The Division was established in 1998 under the Ministry of Power, Energy and Mineral Resources. It is entrusted with the responsibility of overall management of the power sector in Bangladesh including all matters and policies relating to the power sector, and the formulation and application of a national power policy.

Bangladesh Energy Regulatory Commission

The Commission was established in 2003 through a legislative act which also laid out its functions including: (1) determination of efficiency and standard of machinery and appliances; (2) initiation of energy audits; (3) formulation of codes and standards; and (4) motivation to adopt energy efficient technology and appliances (Bangladesh Energy Regulatory Commission homepage).

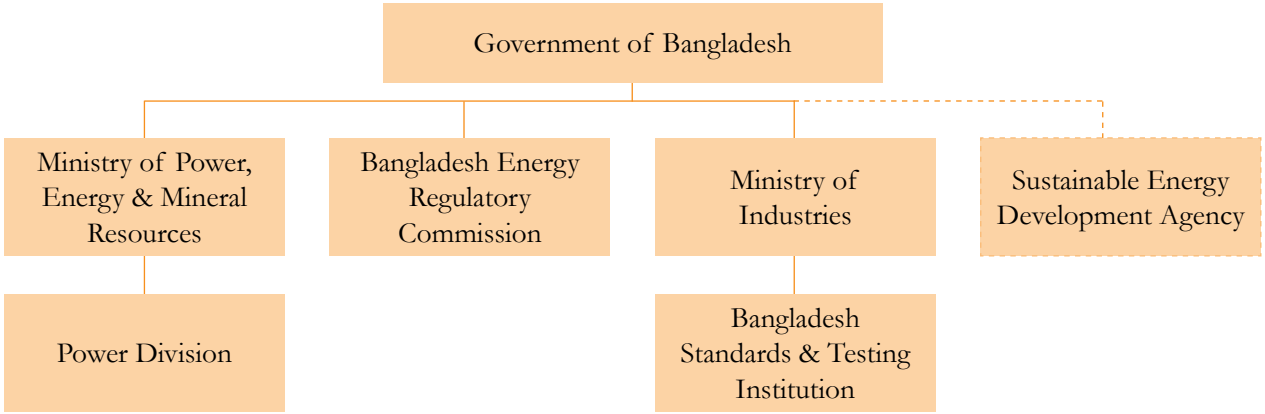
Bangladesh Standards & Testing Institution

The Institution, under the Ministry of Industries, is the only national standards body in Bangladesh. It is constituted under an ordinance in 1985 to prepare standards for all articles, products, methods and services. It is entrusted with the responsibility of formulating national standards of industrial, food, and chemical products keeping in view regional and international standards. It is responsible for the quality control of products which are ensured as per specific national standards made by the technical committees. It is also responsible for the implementation of metric system and to oversee the accuracy of weight and measures in the country (Bangladesh Energy Regulatory Commissionhomepage). Furthermore, the Institution is responsible for the formulation of specifications for EE standards, rating, labeling and testing.

Sustainable Energy Development Agency

The Renewable Energy Policy of Bangladesh 2008 mandated the establishment of this agency, an independent institution to serve as a focal point for sustainable energy development and promotion. Sustainable energy, in this context, is comprised of renewable energy and EE. Its board members consist of stakeholders from business community, academics, Bangladesh Solar Energy Society, NGOs, financial institutions, and implementing agencies.

Figure 2-8 | EE Institutional Framework of Bangladesh



Selected EE programme in Bangladesh

Renewable Energy and EE Programme

The Power Division of the Ministry of Power, Energy and Mineral Resources is the lead executing agency of this GTZ-sponsored programme. The programme supports the government by providing policy and strategy development advice to public institutions and preparing energy providers for technical innovations. Stakeholders such as trade associations and civil society organizations are informed about the technical and financial aspects of projects to introduce renewable energy and enhance EE. The programme supports the use of energy-saving appliances and production processes and promotes the dissemination of technology based on renewable energy such as solar energy systems and biogas plants.

Main barriers to EE promotion in Bangladesh

Sarkar (2002) identified the following major challenges and barriers in promoting EE in Bangladesh:

- Pay-back period criterion: While EE investments that may be recovered in a short period of time are likely to be supported and implemented by management, those which require five years or longer may get the approval of very few managers. As it stands, most EE retrofit projects require comparatively longer period to recover investment costs and are therefore not regarded as "high priority" issues "requiring urgent action."
- Information, transaction costs and limitations in access to foreign financial support: Access to and the relative costs of external financing in Bangladesh are important barriers that prevent potential investments. Information and transaction costs should be considered as these are often important impediments to EE investments;
- Possible disruption of production and the related "transition costs": Implementation of any measure of industrial manufacturing process modification may imply a temporary halt to production. Factory managers may therefore prefer to avert such extra costs or complications inherent to introducing efficient technologies;
- Unstable economy with high inflation and unstable exchange rates and taxation: Direct or indirect taxation in Bangladesh is sometimes high especially for imported goods. High taxes may increase the first cost differentials between efficient and inefficient products, and thus add further disincentive to EE investments;
- Lack of skilled EE experts and/or energy managers: Lack of human resources development in the area of EE affects energy conservation related activities in industries, especially in small scale industries;
- "Invisibility" of the impacts of EE measures: The rate of return on EE investments is often seen as too low and their influence on product cost or operational expenses may be regarded as marginal. Investors are often observed to prefer items that not only increase the quality of the product, but also increase productivity or contribute to comfort. Vendors of energy efficient technologies face the problem that energy savings cannot always be easily measured. The "invisibility" of these impacts makes it sometimes difficult for vendors to convince potential clients in the industrial sector.

BHUTAN

Specific energy statistics for Bhutan remain dearth as of 2010. Available data, however, showed that 66% of total Bhutanese households have access to electricity and the government is expecting to close the remaining gap by 2020. Bhutan has no commercially viable oil, natural gas or coal reserves; hence it is dependent on fuel imports to fulfil the country's primary energy requirements. But, it has significant hydropower potential (estimated at 30,000MW, 50% of which are economically viable);. The country, in fact, has been exporting surplus electricity to India. Twenty five percent of total energy

consumption in the country is attributed to industry. Despite the apparent energy sufficiency in Bhutan, EE has already started to be promoted.

EE enabling legislation and policy

Bhutan has no specific legislation on EE. The government does not recognize the need to embark on EE improvement and measures but awareness campaigns on the importance of EE are being done using various media.

Major actor for EE promotion

The Department of Energy is a subset of the Ministry of Economic Affairs. There are three divisions in the Department: Planning and Coordination, Renewable Energy, and Hydro-Met Services. However, it is proposed that the Renewable Energy Division is moved into a separate Department with a specialized section on energy conservation below its structure.

Selected EE programmes and projects

Awareness campaigns for standard setting and labeling programs and pilot projects on CFLs are highlighted in Bhutan's 9th Five Year Plan (2002-2007)

Main barriers to EE promotion in Bhutan

There exists an opportunity to promote EE in Bhutan considering that it has limited industry. To maximize EE efforts, however, the following challenges need to be hurdled:

- Absence of EE enabling framework;
- Absence of EE institution;
- Inadequate resources (including competency) to implement EE measures;
- Inadequate infrastructure; and
- Inadequate awareness on the importance of EE.

INDIA

The Indian economy has more than doubled between 2000 and 2007 (see Table 1). As a consequence, energy demand had also increased and is expected to more than double by 2030. This increase has been predicated by the pressing need to develop innovative ways to conserve energy. Throughout the region, India has the highest electricity consumption per capita, increasing from 404 KWh in 2000 to 543 KWh in 2007 (see Table 1). The Indian Government has recognized the necessity to improve on EE as it started to adopt significant measures, including legislative ones, to promote and implement conservation across sectors. Among the countries in the region, India has the most advance EE legislation and the most equipped institution in charge of EE.

EE enabling legislation and policy

National Mission for Enhanced EE 2009

This Mission is the second of eight Missions under India's National Action Plan on Climate Change. The draft mission document of the National Mission on Enhanced EE was approved by Prime Minister Manmohan Singh's Council on Climate Change in August 2009. This mission will help to save about 5 per cent of annual energy consumption by 2015 and nearly 100 $MtCO_2$ every year. It enables about Rs75 000 core worth of transactions in EE. This Mission involves the following schemes:

1. Perform Achieve and Trade

This scheme is a market-based mechanism to enhance EE in DCs (large energy-intensive industries and facilities). The scheme includes the following project steps:

- Goal setting: Set specific energy consumption target for each plant depending on level of energy intensity of that plant;
- Reduction phase: Within a three-year period (2009 to 2012), DCs try to reduce their energy intensity according to their target;

- Trading phase: DCs exceeding their target consumption will be credited tradable energy permits which can be sold to DCs who failed to meet their targets and have to compensate this failure by buying permits;
- The energy consumption reported by designated consumers is based on audit by any of the Bureau of Energy Efficiency accredited agencies.

2. Market Transformation for EE

Accelerated shift to energy efficient appliances in designated sectors will be enabled through innovative schemes such as DSM measures and supported with CDM financing wherever possible. The initiative includes the following activities:

- National CDM Roadmap;
- Programmatic CDM: Bureau of Energy Efficiency is exploring under-taking CDM Programme of Activities for the following sectors: lighting (Bachat Lamp Yojana), municipal DSM, agricultural DSM, SME sector, commercial building sector and for distribution transformers;
- EES&L: Step-by-step notification for mandatory labeling for A&E for domestic sectors, hotel equipment, office equipment, industrial products, and transport equipment;
- Public procurement: Amendment of procurement rules to explicitly mandate procurement of energy efficient products for all public entities;
- Technology programme: Replacement of inefficient appliances by efficient products such as efficient lighting, ballasts, AC, and refrigerators. Reduction of transmission and distribution losses;
- Energy Conservation Building Code: Mandate maximum energy consumption norms (per unit of area) for new commercial buildings and existing buildings (through retrofit);
- ESCO Promotion: Assuring ESCO quality through accreditation. Promoting their capacity through a set of 1200 bankable efficiency retrofit demonstration projects;
- Capacity building and information: Creating a pool of trained manpower in states, government agencies, banks and financial institutions. Continuing the training of energy auditors and energy managers; and
- Policy transparency.

3. EE Project Financing

The initiative focuses on the creation of mechanisms that would help finance DSM programmes in all sectors by capturing future energy savings. The initiative includes the following activities:

- Fiscal instruments including tax exemptions for the profits and gains made from EE projects by ESCOs and Venture Capital funds, and VAT reduction for energy efficient equipment (e.g. CFLs);
- Revolving fund to promote carbon finance; and
- Partial Risk Guarantee Fund to provide commercial banks with partial coverage of risk exposure against loans made for EE projects. The fund will charge a small fee on all projects seeing the risk guarantee.

4. Power Sector Technology Strategy

This strategy is aimed to enhance EE in power plants through:

- Adoption of energy efficient generation technologies in new plants including supercritical boilers;
- Enhancement of EE in existing plants;
- Roadmap for Integrated Gasification Combined Cycle demonstration plants;
- Development of know-how for advanced super-critical boilers;
- Road map for fuel shift.

5. Other initiatives

The following activities laid out at India's National Mission for Enhanced EE will supplement the overall plan.

- Set up EE Services Ltd.: A public sector company is planned to be set up to facilitate

the progress and to address all the issues and barriers which impede investments in EE projects. This company will be an implementing agency while Bureau of Energy Efficiency will concentrate on its quasiregulatory role. In addition to being an implementing body, this company will also function as consultancy organization, resource centre, and an ESCO.

- Strengthening of State Designated Agencies : The scheme seeks to build institutional capacity of the newly created agencies to perform their regulatory and facilitative functions in the respective states.
- BEE Strengthening: Government funding for infrastructure creation that is necessary for BEE to implement eight new projects/schemes through the country with an allocation from the XIth plan.
- Awareness Programmes: Information campaigns in schools, industry, commercial, agriculture and domestic sectors; national painting competitions; energy awards; publication of manuals and codes for EE; etc.

Integrated Energy Policy 2008

India has adopted an Integrated Energy Policy to fuel its economic growth and meet larger human development goals by choosing fuels that are socially and economically desirable. This policy, which received Cabinet approval in 2008, envisages an energy mix that focuses on augmenting India's domestic energy resource base and increasing efficiency. The policy initiatives for EE and DSM as stipulated in the Integrated Energy Policy include:

- Regulatory commissions can allow utilities to factor EE/DSM expenditure into the tariff;
- Each energy supply company/utility should set-up an EE/DSM cell;
- BEE can facilitate this process by providing guidelines and necessary training inputs;
- Implementing Time-of-Day Tariffs;
- Facilitating grid interconnection for cogenerators;
- Improving efficiency of industrial, municipal and agricultural water pumping;
- Instituting an Efficient Motors Programme;
- Instituting an Efficient Boiler Programme;
- Promoting solar hot water systems;
- Promoting variable speed drives;
- Undertaking Efficient Lighting Initiative;
- Improving cooking efficiency;
- Making energy audits compulsory for all loads above 1 MW; and
- Reaping daylight savings

The Energy Conservation Act 2001

The Act which came into effect in March 2002 was passed to provide for the efficient use of energy and its conservation. Among its main concerns are:

- Establishment of the Bureau of Energy Efficiency in the Ministry of Power to promote energy conservation in all sectors of the economy;
- Clarification of the authority of management of central government, the Bureau, and state governments;
- Designation of energy intensive industries;
- Establishment of Energy Conservation Fund by the State Government; and
- Penalty for noncompliance such as prohibition of manufacture or sale or purchase or import of equipment or appliance not conforming to energy consumption standards.

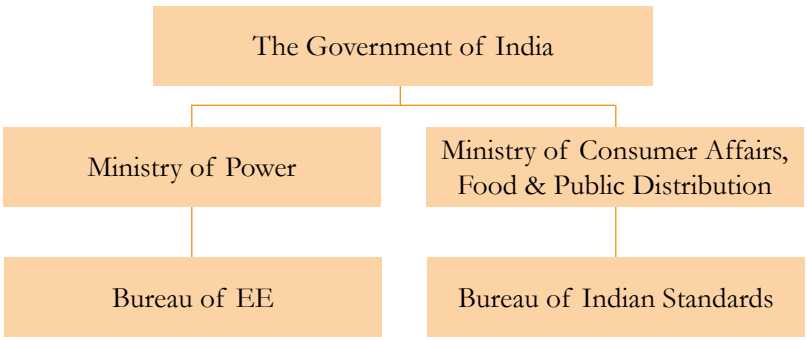
The important features of the Act include EES&L, DCs, and Energy Conservation Building Codes.

Major actors for EE promotion

Ministry of Power

The Ministry has the primary responsibility to implement reforms in the power sector under India's Energy Conservation Act 2001. The Ministry, with the help of central- and state-level departments, controls electricity generation, transmission, and distribution network. The Ministry has identified S&L as one of its major thrust areas.

Figure 2-9 | EE Institutional Framework of India



Bureau of Energy Efficiency

The Bureau was established cognizant with the Energy Conservation Act 2001 in March 2002 by integrating the staff of Energy Management Centre. As an autonomous body under the Ministry of Power, it is responsible for promoting EE through various regulatory and promotional instruments and developing policy and strategies with a thrust on self regulation and market principles. The Bureau has the mandate to implement the EES&L programme in India. Moreover, the Bureau plays the role of a facilitator in the overall process of programme design, process and procedures, implementation and enforcement mechanisms. To coordinate with the manufacturers and manufacturing associations, the Bureau has set up Steering Committees for all selected appliances and equipments. Technical Committees are also set up to deal with technical specifications of the labeling programmes. These are comprised of technical persons from BEE, BIS, manufacturers and manufacturing associations. There are separate Technical Committees for each appliance and equipment.

The organizational relationship among the Ministry of Power, the Bureau of Energy Efficiency and the Technical Committees is shown in Figure 2-10.

Bureau of Indian Standards

This Bureau is a statutory body set up under the aegis of Ministry of Consumer Affairs, Food & Public Distribution. The Bureau is a body corporate and responsible for formulating National Standards. It works through committees of technical experts and stakeholders such as manufacturers, government agencies, consumer societies, and testing facilities to draft these standards. The Bureau works together with the Bureau of Energy Efficiency to implement India's EES&L programmes. It also supports the Bureau of Energy Efficiency in its initiatives in formulating EE standards for equipment such as storage water heaters, refrigerators, and air-conditioners.

Selected EE programmes and projects in India

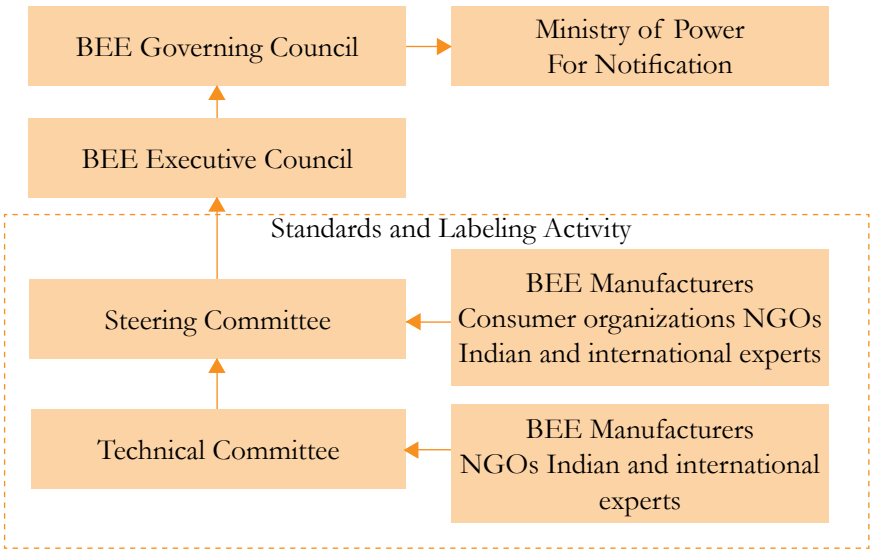
Designated Consumers

This programme focuses on EE improvement in commercial sector and organized sectors such as energy intensive industries through establishment of energy management system, capacity building of energy professionals, implementation of energy audits, establishments of specific energy consumption norms and support to consumers on providing information on authentic energy data (Bureau of Energy Efficiency, The Action Plan for EE).

EES&L Programme

Launched in May 2006, the scheme was initiated as EE S&L of aA&E. Under this programme, manufacturers test and certify end use equipment and appliances as to its compliance with EE standards.

Figure 2-10 | Organizational Relationships and Implementation Process of Indian EES&L



Based on their performance, the equipment and appliances are given STAR rating from 1 to 5 in the increasing order of efficiency. Meanwhile, the Bureau has also finalized and started the online e-filing for registration and approval of STAR labeling for manufacturers. This automated tracking system will eventually increase productivity (Bureau of Energy Efficiency, The Action Plan for EE).

Energy Conservation Building Code

This Code was launched by the Government of India in May 2007 and is intended for new commercial buildings having a connected load of more than 500 kW. The Code defines the norms of energy performance and takes into consideration the climatic regions of the country where the building is located. The major components of the building which are being addressed through the code include: envelope (walls, roofs, and windows), lighting systems, HVAC System, water heating and pumping system, and electrical distribution system. The Ministry of Environment and Forests under its Environment Impact Assessment (EIA) has made the Code compliance mandatory for those obtaining environmental clearances for large construction projects (Bureau of Energy Efficiency, The Action Plan for EE).

Figure 2-11 | EE Label for Appliances in India

EE in Existing Buildings

In order to achieve EE in existing buildings, the Bureau of Energy Efficiency developed a scheme to promote EE in government establishments. To implement these EE measures, the Bureau undertook a process of short listing ESCOs through an open invitation and evaluation process. Shortlisted ESCOs were accredited by the Securities and Exchange Board of India based on the approved methodology which involved an assessment of business risk (including track record and market position), organizational set up, and financial capability of the organizations.

For EE activities in commercial buildings, the Bureau of Energy Efficiency has developed a Star Rating

Programme for office buildings which is based on the actual performance of the building measured in terms of specific energy usage. This programme would rate office buildings on a one to five star scale, with 5-Star labeled buildings being the most energy efficient.

A commercial building energy benchmarking initiative has also been taken up to identify a roadmap for developing a framework for creating a national database. The goal is to establish a framework to standardize energy data collection including baseline setting for "typical" commercial buildings, energy performance target setting and monitoring, and use of information for identifying exemplary buildings and those in need of intervention to improve EE. This information can help users and other stakeholders to evaluate the EE of buildings and track comparable improvements (Bureau of Energy Efficiency, The Action Plan for EE).

Bachat Lamp Yajana

The Ministry of Power, through the Bureau of Energy Efficiency, is coordinating voluntary efforts under the Bachat Lamp Yajana scheme to provide high-quality CFLs to domestic consumers with a subsidy to remove the barrier of high CFL price in India. It targets the replacement of about 400 million incandescent bulbs leading to a possible annual reduction of about 6 000 MW of electricity demand and 24 $MtCO_2$ emissions (Bureau of Energy Efficiency, The Action Plan for EE).

Professional Certification and Accreditation

The Bureau of Energy Efficiency has established a proper energy management system in India by conducting national certification examinations for energy managers and energy auditors. The Bureau has also prepared guidebooks for energy professionals.

Promoting EE in Public Procurement

An Enabling Policy Framework with guidance from the Ministry of Finance, Ministry of Power, and Central Vigilance Commission is being developed which includes possible incentive regime of awarding and recognizing public sector EE procurement initiatives. It will also target the up-scaling of EE S&L programme to provide unambiguous guide for EE products (Bureau of Energy Efficiency, Schemes for promoting EE).

Indian Industry Programme for Energy Conservation

This is a voluntary programme planned to support the petrochemical and refinery sectors in fulfilling the mandatory provisions of the Energy Conservation Act 2001 such as capacity building of energy managers, fixation of specific energy consumption norms, exposure to energy performance codes to achieve optimized EE level in utility equipment, sharing of best practices, interaction with other sectors of the Indian industry as well as energy efficient equipment manufacturers, experts, energy auditors, financial institutions, etc. This programme of sharing best practices and undertaking specific energy consumption targets has full acceptance in eight sectors (aluminium, cement, chlor-alkali, fertilizer, pulp & paper, petrochemicals, refinery and textile). Best practices have been recorded and published through CDs and also incorporated in the Bureau of Energy Efficiency website.

National Energy Conservation Awards

The National Energy Conservation Awards is one of the innovative schemes initiated by the Ministry of Power to promote energy conservation. These awards, first given in 1991, institutionalize EE movement in the country by identifying and giving recognition to energy conservation efforts undertaken by firms and industries. The Bureau of Energy Efficiency coordinates the awards.

Main barriers to EE promotion in India

In spite of efforts to promote EE, several technical, financial, market, institutional, and policy barriers have constrained the implementation of EE programmes in

India. Shekhar (2002) identified the following major barriers:

- Lack of awareness among industry managers on the potential gains from improved efficiency. Industries as well as government are yet to take into consideration factors such as tax credits, depreciation benefits, electricity price escalation, life cycle savings of the investment and the timely release of money;
- Shortage of education and training: The widespread educational opportunities in EE are not available. In addition, the appropriate training facilities, trainers and auditors are lacking;
- Lack of standardization of A&E: The slow rate of progress in achieving higher standards of EE in A&E is also adversely affecting the adoption of energy saving measures;
- Lack of financing: The non-availability of sufficient credit facilities and the difficulties in obtaining required finances for energy saving projects are strong deterrents to investments in EE in India;
- Lack of effective coordination: In India, the lack of effective national-level coordination and promotion of energy conservation activities have been major constraint to achieving EE.

MALDIVES

Specific energy statistics for Maldives are lacking as of 2010. Maldives is entirely dependent on fossil fuels in meeting its energy demand. The island country has no conventional energy resources that it can utilize to meet its energy needs. Despite this, options to conserve energy through adopting energy efficient technologies and measures have started to be introduced in Maldives.

EE enabling legislation and policy

At present, Maldives has no law, code or standard on EE. EE standards and labeling program for refrigerating equipment is still at proposal stage in the recently developed HCFC Phase-out Management Plan. The newly developed Maldives Building Code, however, includes implicit actions on building efficiency.

Major actor for EE promotion

The task to carry out EE actions has been assigned to the Climate Change and Energy Department of the Ministry of Housing, Transport and Environment.

Selected EE programme and projects in Maldives

Despite the absence of EE enabling policy support, the island country of Maldives are promoting EE voluntarily through:

- Awareness programmes and workshops;
- Energy audits for selected offices;
- Public information on the advantages of using efficient appliances; and
- Requesting government ministries and institutions not to lower the temperature setting of air conditioners below 25 degree Celcius.

Main barriers to EE promotion in Maldives

The following challenges in promoting EE in Maldives can be listed:

- Absence of proper institutional mechanism to develop and monitor EE programmes;
- Absence of laws, codes and standards for EE;
- Lack of human resources;
- Lack of funds to promote, implement and stimulate investment in EE.

NEPAL

At 0.23 TOE/000 in 2007, Nepal has the highest GDP energy intensity among South Asian countries. EE efforts in the country are still at its infancy although implicit regulations for energy conservation exist. Nepal has yet to produce an enabling legislation and establish a particular EE institution so as to consider EE as a national policy.

EE enabling legislation and policy

Energy Strategy 2010

The Strategy is in its draft stage with plans to approve it by the end of 2010. It proposes the use of efficient appliances, captive plants for industrial use and CFLs for lighting use.

Nepal Electricity Crisis Mitigation Plan 2009

This Plan has the following components: replacement of incandescent and inferior CFLs by quality CFLs; promotion of the use of quality CFLs; increased public awareness for use of energy efficient lamps and appliances; and reduction of evening peak.

Nepal Standard Act 1981

This Act designates the Nepal Bureau of Standards and metrology to act on the country's standards and labeling of appliances.

Industrial Policy 1974

This policy is geared for economic development through production of quality and efficient product.

Major actors for EE promotion

Ministry of Energy

The Ministry is in-charged with formulation of plans and policies.

Water and Energy Commission Secretariat

The Secretariat serves as advisory body to the Ministry of Energy.

Nepal Electricity Authority

This is the implementing agency of various energy projects.

Department of Electricity Development

The Department acts as promoter and facilitator.

Department of Industry

The Department is tasked to oversee EE and energy audits in the industrial sector.

Nepal Bureau of Standards and Metrology

The Bureau sets up the standards for energy appliances.

Selected EE programmes and projects in Nepal

Project for EE through loss reduction

This Nepal Electricity Authority project involves rehabilitation of around 22 feeders and distribution lines with unacceptable losses.

Project for the Introduction of CFLs

This project involves the replacement of incandescent lamps with one million CFLs of 9, 12, and 20 watts.

Project for solar-powered street lamps

Around 1200 street lamps will be replaced by solar-powered lamps to reduce evening peak by 1 MW and curtail energy consumption by 750 MWHr. The project has been started in Kathmandu, Patan, Bhaktapur, Durbar square, Pashupatinath and Swayambhu.

Main barriers to EE promotion in Nepal

Nepal is facing challenges to make its EE institutions work including:

- Absence of legal framework;
- Absence of modern testing laboratories;
- Low level of public awareness on EE;
- Lack of capable human resources to dealt with EE technicalities; and
- Financing.

On top of these challenges, Nepal is planning to establish its energy conservation center to institutionalize EE efforts in the country. It is also proposing for the creation of Nepal productivity and Energy Conservation Center. It has also started drafting its EE Policy.

PAKISTAN

Pakistan has started to work towards an energy efficient economy. Between 2000 and 2007, the country's TPES per capita had increased from 0.46 to 0.51 which placed it second to India. Energy intensity in the country, which was reduced by 0.02 from 2000 to 2007, is second after Nepal. Policy to conserve energy has been in placed since 2005 with a specific legislation being processed. Institutions handling EE are also in place with the National Energy Conservation Centre in the forefront. Projects, mostly funded by international donors, to promote EE are also being carried out.

EE enabling legislation and policy

EE Sector Roadmap 2009

The Government of Pakistan with assistance from ADB has adopted the EE Sector Roadmap and an associate investment plan in April 2009 (ADB, 2009). The Roadmap defines the overall approach, elements, impacts, and timelines under which the respective roles of all relevant stakeholders can be coordinated, sequenced, financed, implemented, and monitored. The main elements include policy, legislation, investment requirement, costing and financing, planning, project implementation, capacity building, market facilitation, etc.

National Energy Conservation Policy 2005

The Government of Pakistan has developed a policy framework to guide EE actions and investments through the National Energy Conservation Policy 2005 which enumerates broad guidelines to enhance end-use efficiency in various energy consuming sectors of the economy. It is likely to create an enabling environment to support energy security plans of the government and change the course from current wasteful practices to sustainable energy and environment patterns in the future. The Policy has four strategic goals.

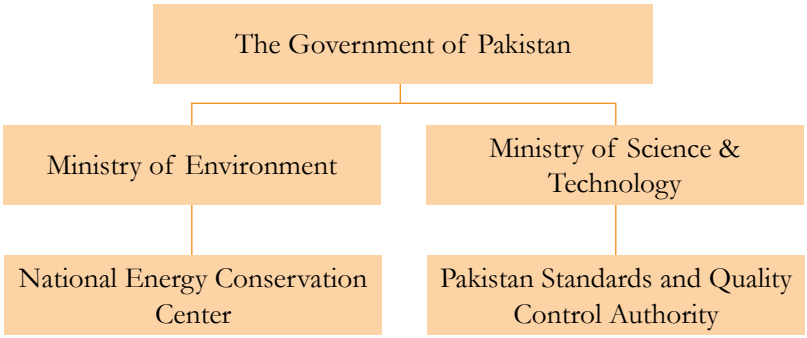
- Sustainable Development: Energy conservation, as a least cost supply option, will help in meeting the requirements of rising levels of energy consumption without putting corresponding additional burden on environmental resources.
- Improve Economic Productivity and Poverty Alleviation: Cost-effective EE measures will improve Pakistan's economic performance and the value the economy derives from the use of energy resources. EE measures can result in profitable business opportunities and will become a means for poverty alleviation.
- GHG Mitigation and Climate Control: EE measures will reduce CO_2 emissions and help Pakistan meet its international climate change responsibilities. Efficient use of energy in various sectors of economy will reduce adverse local environmental effects which are otherwise attributed to energy inefficiency and wasteful energy use practices.
- Gender Mainstreaming: A unit of energy conserved is a unit of energy produced, which in turn creates a room for energy supplies for rural areas. Provision of energy to rural areas serves the goals of gender equality and mainstreaming.

Energy Conservation Act, *planned*

The Government of Pakistan intends to enact the Pakistan Energy Conservation Act to:

- provide legal backing to the National Energy Conservation Centre;
- create a national functional focus on energy conservation activities;
- provide for a legal basis for prescribing and enforcing EES&L requirements;
- provide for a platform to harmonize and synchronize various policies of the Government with EE focus; and
- institute national energy conservation and management awards.

Figure 2-12 | EE Institutional Framework of Pakistan



Major actors for EE promotion

The National Energy Conservation Centre

The Centre is an attached department to the Ministry of Environment of Pakistan. It was established in 1987 and serves as the national focal point for EE activities in all sectors of the economy including industry, agriculture, transport, building, and domestic. The strategy adopted by the Centre for promoting EE spans a whole spectrum of activities, starting from identification of energy conservation opportunities including technology demonstration, undertaking pilot projects, information and outreach, training and education, and development of plans and policies for EE promotion (National Energy Conservation Centre homepage).

The Pakistan Standards and Quality Control Authority

The Authority, established in December 2000 under the Ministry of Science and Technology, is Pakistan's national standardization body. Working with 81 scientists and engineers and 254 supporting staff as self-finance organization, the Authority not only formulates Pakistan Standards, but also promulgates them. It was also 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 Authority is to foster and promote standards and conformity assessment as a means of advancing the national economy, to promote industrial efficiency and development, to ensure the health and safety of the public, protecte consumers, to facilitate domestic and international trade, and to further international co-operation in relation to standards and conformity assessment (Pakistan Standards and Quality Control Authority homepage).

Selected EE programmes and projects in Pakistan

Renewable Energy and EE Programme 2009 to 2011

Sponsored by GTZ with duration from 2009 to 2011, the Programme's overall objective is to improve and enhance the capacities of the private sector as well as of state authorities with regard to the renewable energy promotion and EE improvement. The programme provides expert contributions and policy advice regarding: (1) Application and market development of solar thermal systems, in particular solar water heaters for domestic applications; (2) Improvement of EE of gas boilers and heaters; (3)Training and certification of energy managers; (4) Development and implementation of energy management systems in the textile industry; (5) Development and implementation of economic instruments and financial incentives for emerging markets for this programme; (6) Development and implementation of EES&L for electrical and gas-

fuelled household devices; (7) Rural electrification based upon solar PV systems; and (8) Initiation of CDM projects (Renewable Energy and EE Project Summary).

Promotion of Energy Efficient Cooking, Heating and Housing Technologies 2009 to 2012

This US$1 million UNDP/GEF project which runs from 2009 to 2012 is intended to curb degradation of Pakistan's Northern Areas and Chitral forest and decrease CO_2 emissions resulting from excessive use of timber and fuel wood for house construction and household energy use. This will be achieved through promotion and assistance to local communities to reduce dependence on forest products by installing and adopting energy efficient housing and technological products such as fuel efficient stoves, water warming facility, floor installation, and roof-hatch window in improving their built environment and socio- economic conditions (UNDP Project Document).

ADB EE Investment Programme

The Multitranche Financing Facility will finance a time-slice of EE investment programme in tranches. The proposed projects which will utilize internationally successful and commercially available technologies include: (1) national CFL Project, (2) loss reduction in gas transmission and distribution networks, (3) replacement of inefficient thermal power generation units, (4) public buildings EE retrofits, (5) financing of industrial EE investments, and (6) domestic gas appliance upgrades and replacements (ADB, 2009b).

Main barriers to EE promotion in Pakistan

Pakistan needs to traverse vast grounds before reaching the point where EE is endorsed as a culture. However, the first step towards this is the adoption of EES&L. In achieving this first milestone, the underlying challenges and barriers need to be hurdled:

- Weak EE policy framework at central, provincial and local levels;
- Existing laws and regulations do not provide enough legal backing for enforcement of EE S&L requirements;
- Capacity constraints for testing energy consumption and efficiency;
- A general lack of public awareness about the importance of EE;
- Unavailability of statistics on energy consuming products and their level of efficiency;
- Low level of per capita income, thus non-affordability of comparatively expensive energy efficient products;
- Lack of awareness on "first cost versus recurring cost" concepts;
- Low level of product development and design capabilities with appliance manufacturers;
- Low level of awareness regarding international best practices;
- Absence of monetary incentives and governmental patronage to drive the transformation;
- Lack of co-ordination among various governmental agencies; and
- Lack of human resource and technical expertise to improve EE.

SRI LANKA

Like its South Asian neighbours, Sri Lanka had experienced growth in GDP from 2000 to 2007 which corresponds to increase in TPES and electricity consumption (see Table 1). Although EE legislation is absent, the government has encouraged EE as a national policy complete with a specific institution dealing exclusively with EE. Nonetheless, the strengthening of capacity (legislative, institutional, and human) in Sri Lanka to promote and implement EE effectively is still apparent.

EE enabling legislation and policy

National Energy Policy and Strategies

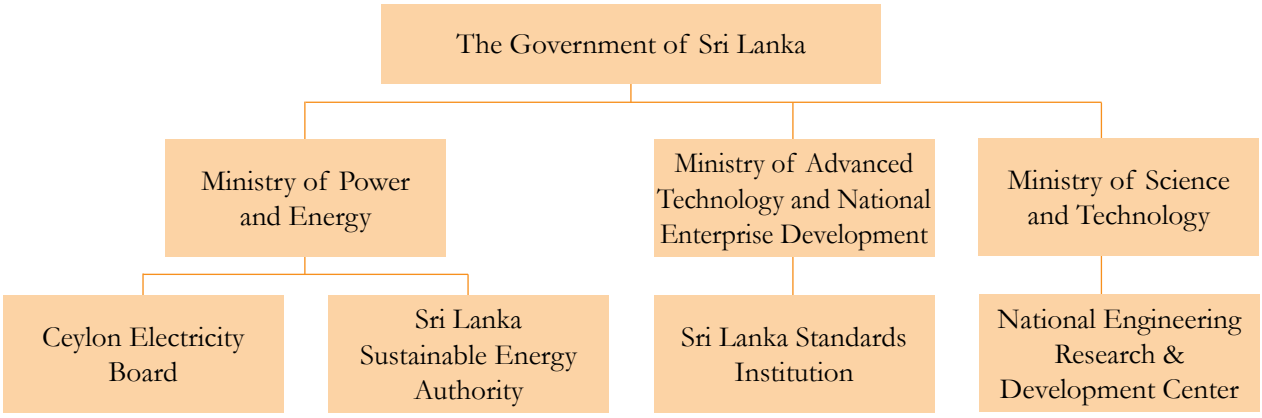
In Sri Lanka, efficient management and operation of energy sector utilities are vital to ensure minimum cost of supply to consumers. Efficient utilization of

energy from utilities (supply-side management) to final consumers (demand-side management) not only saves valuable resources but also reduces the overall cost of energy. Sri Lanka's National Energy Policy and Strategies provides a meaningful energy conservation plan including:

- Encouragement of supply side and end-use EE through financial and other incentives/disincentives in respect to energy end-use mandatory measures such as appliance energy labeling, building codes and energy audits;
- Promotion and facilitating private sector participation in providing expert services on EE;
- Acquisition of financial resources required to continuously improve efficiency in energy conversion, transmission and utilization from, within and outside the energy sector by levying appropriate energy charges and formulating long term funding programmes with financiers;
- Entrusting the coordination of EE activities to the Energy Conservation Fund - in this case, the Energy Conservation Fund Act will be amended to accommodate these new responsibilities;
- Optimal use of existing petroleum distribution infrastructure;
- Bringing down power generation and network losses to lowest possible levels and improving capacity through necessary generation, transmission and distribution investments and efficient management of the supply systems;
- Encouraging electrification of viable sectors of the railway network and inter-modal shift in passenger and goods transport towards more energy efficient systems;
- Shifting towards larger-capacity vehicular transport modes, which are less energy intensive per passenger kilometer or freight-tonne kilometer – in this case, railway transportation will receive priority over road transportation;
- Promotion of a better coordination of road and rail transport as a key implementation strategy to achieve greater efficiency of the transport sector; and
- Formulation of a strategic plan for street lighting for the country to ensure proper management of street lighting which will enhance the safety of motorists and pedestrians and also contribute to energy conservation with better aesthetic sense.

Major actors for EE promotion

Figure 2-13 | EE Institutional Framework of Sri Lanka



Ministry of Power and Energy

The Ministry of Power and Energy, through the Ceylon Electricity Board and Sri Lanka Sustainable Energy Authority, is tasked to provide electricity for the people of Sri Lanka and to meet the demand for energy services with affordable, reliable, diverse, safe and environmentally acceptable choices. The Ministry also deals with following objectives and functions (Ministry homepage):

- Implementation of policies, plans and programmes in matters relating to power and energy;
- Investigation, planning and development of electricity facilities throughout the Island including hydropower, thermal power, mini hydro, coal power, etc.;
- Rural electrification;
- Development of a sound, adequate and uniform electricity policy for the control, regulation and utilization of national power resources;
- EE, demand management, etc.;
- Investigation, planning, implementation and co-ordination of energy matters; and
- Renewable energy development.

Sri Lanka Sustainable Energy Authority

Established under Act No.35 of 2007, the Authority was converted from the Energy Conservation Fund and functions under the purview of the Ministry of Power & Energy. It has the vision to make an energy secure Sri Lanka. Its mission is to guide the country in all its efforts not only to develop indigenous energy resources, but also to conserve energy resources through exploration, facilitation, R&D and knowledge management by protecting natural, human and economic wealth and embracing best sustainability practices. The Authority is mandated to develop and implement the country's policy for renewable energy development, demand-side EE improvement and energy conservation. It is also tasked to implement EES&L programmes for appliances, specify consumption limits, and to control manufacture, import and sale of appliances which show lower energy efficiencies than the specified limits (Sri Lanka Sustainable Energy Authority homepage).

Sri Lanka Standards Institution

This is the National Standards Body of Sri Lanka functioning under the Ministry of Advanced Technology and National Enterprise Development. It operates EE labeling scheme for electrical appliances based on the relevant Sri Lankan Standards for EE rating of appliances.

National Engineering Research & Development Centre

The Centre functions under the Ministry of Science and Technology and carries out tests on energy performance.

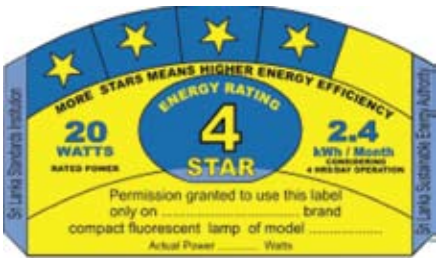
Selected EE programmes and projects in Sri Lanka

Demand Side Management Programme (DSM)

The following two important World Bank-funded DSM projects are under implementation to further strengthen the ongoing DSM activities in Sri Lanka:

- Energy Efficient Building Codes: An energy efficient building code is being developed for mandatory compliance to reduce electricity demand of new construction by 40 per cent and in existing buildings by 30 per cent.
- Load Research & DSM Capacity Building: Under this project, a comprehensive load research programme will be conducted to establish an end-use databank that can be used for DSM programme design, distribution planning, and market-based tariff design. The capacity building exercise will enhance the present capabilities in DSM programme design, implementation, monitoring and evaluation.

Figure 2-14 | EE Label for CFLs in Sri Lanka



EE Labeling

Appliance EE has been considered a priority area because of its large saving potential. In 22 July 2009, the Government lunched CFL MEPS and labeling programme for CFLs. All manufacturers, importers and agents of CFLs are compelled to follow the requirements including prohibition for manufacture, import and sales of CFLs which does not conform to MEPS. Every CFLs in the local market are required to bear EE labels (Sri Lanka Sustainable Energy Authority homepage).

Fund Management Programme

The programme has been targeted to develop facilitation mechanisms for funding energy conservation and renewable energy projects. Two projects concerning EE have been initiated.

- Sustainable Guarantee Facility seeks to address the difficulty faced in fund mobilization. It was officially launched by the Minister of Power & Energy in June 2005 to improve end-use energy utilization efficiency in bulk energy consumers.
- Energy Conservation & Efficiency Improvement Project: The Sri Lanka Sustainable Energy Authority took serves as a conduit for energy conservation projects from international donor agencies to support bulk energy users to find the necessary fund for investments in EE projects (Sri Lanka Sustainable Energy Authority homepage).

Energy Productivity Improvement

Through this programme, measures are taken to increase the productivity of various energy consuming sectors in Sri Lanka. The activities carried out in 2005 were focused on transport sector through road efficiency improvement (Sri Lanka Sustainable Energy Authority homepage).

National EE Award

The objective of the national award is to bestow national recognition to energy consumers in the subsectors of manufacturing, services and healthcare who have made systematic and serious attempts for EE promotion and have achieved substantial results and benefits during a review period. The Award promotes EE awareness among energy consumers as an increasingly important element in competitiveness. It also allows for the understanding of the requirements for excellence in energy conservation and management, and sharing of information on successful energy saving measures and the benefits derived from implementation of such measures (Sri Lanka Sustainable Energy Authority homepage).

Main barriers to EE promotion in Sri Lanka

The following are the key barriers to EE improvement in Sri Lanka:

- Weak policies and implementations;
- High initial cost (intellectual property rights, high import tax, limited markets for technologies);
- Imperfect information;
- Poor management awareness;
- Low technical capacities;
- Lack of financing;
- Low price of electricity; and
- Lack of EE standards.

SOUTH-EAST ASIA

EE policies, institutions, actors, programmes and projects for the following South-East Asian countries - Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam - are discussed.

CAMBODIA

The energy policy of Cambodia encourages the efficient use of energy. The Cambodian power sector has been rehabilitated since 1995 to address problems with regards to electricity access among others. In 2010, only 20 per cent of Cambodian households have access to electricity. In the rural areas, almost 90 per cent of households have no power source. This could somehow explain the low energy intensity in the country (0.12 TOE/000 in 2007).

EE enabling legislation and policy

Electricity Law

The Cambodian Electricity Law created the Electricity Authority of Cambodia as an independent regulatory authority which establishes the following:

- Principles for operations in the electric power industry (including licensing in the provision of electric power services);
- Favorable conditions for capital investments and the commercial operation of the electric power industry;
- Basis for the regulation of supply of electric power services; and
- Basis for the protection of the rights of consumers in the short term and in the future.

Energy sector development policy

The Royal Government of Cambodia has formulated an energy sector development policy in October 1994 to:

- provide an adequate supply of energy throughout Cambodia at reasonable and affordable price;
- ensure a reliable, secure electricity supply at prices, which facilitate investment in Cambodia and development of the national economy;
- encourage environmentally and socially acceptable development of energy resources needed for supply to all sectors of the Cambodian economy; and
- encourage the efficient use of energy and minimize detrimental environmental effects resulting from energy supply and use.

The energy security policy in Cambodia forms part of the overall national energy policy that promotes not only energy sector growth and development but also overall economic growth and development. The Cambodian government recognizes the paramount importance of energy security. On energy supply side, the policy is aimed at increasing indigenous energy reserves and resources, and geared for their optimal utilization to diversify fuel supply, to promote the increase in power supply, to develop gas transport infrastructure, and to invest in energy development. On the demand side, the government promotes EE to reduce demand, calls for the development of alternative transport systems to reduce the impact of the transport sector in the overall energy consumption, and integrates environmental concerns with development of energy.

Major actors for EE promotion

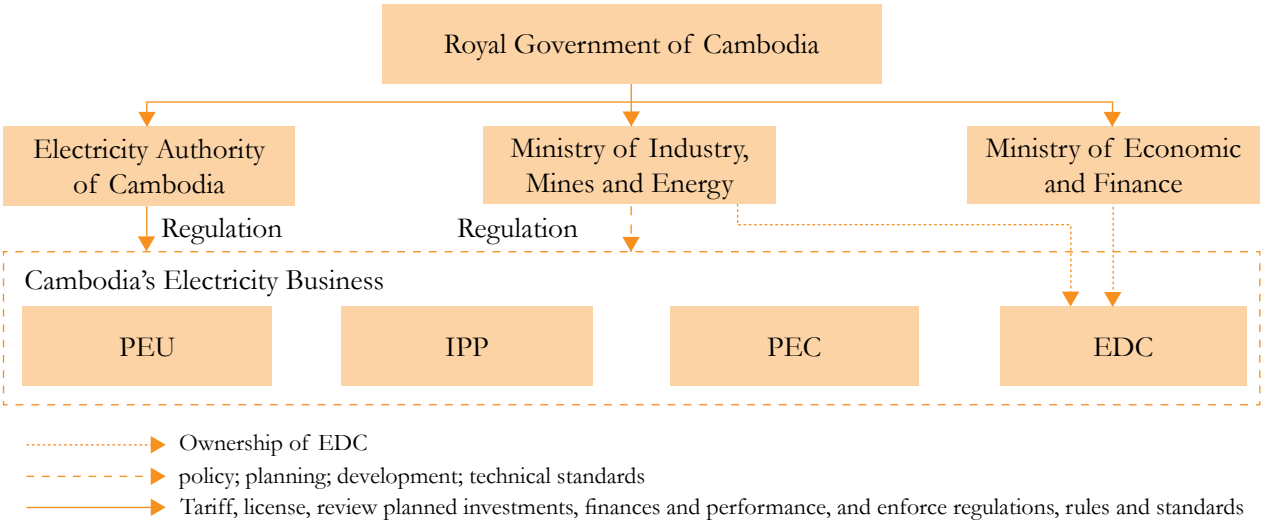
Ministry of Industry, Mines and Energy

The Ministry is Cambodia's central energy policy-making body with the overall responsibility for energy policy formulation, strategic planning and technical standards. It is responsible for setting and administrating government policies, strategies and planning in the power sector. The Ministry ensures that it communicates with the Electric Authority of Cambodia on a regular basis and provides it the information on policies and strategies.

Electricity Authority of Cambodia

This is Cambodia's Regulatory Agency established

Figure 2-15 | EE Institutional Framework of Cambodia



through the Electricity Law. The Authority performs the following duties: licensing, tariff setting, solving disputes between producers/suppliers and consumers, setting-up uniform accounting standards, enforcing regulations, and reviewing plans and financing performance. The Authority is also responsible for regulating the provision of electric power services.

Electricité du Cambodge

Electricité du Cambodge is a limited liability company owned by government. It supplies electricity to Phnom Penh and fourteen provincial towns. The Electricity Authority of Cambodia granted its consolidated license.

Private electricity operators/companies

These include independent power producers, provincial electricity companies, and rural electricity enterprises.

Selected EE programmes and projects in Cambodia

Cambodia EE Project UNDP/GEF (2005)

This UNDP/GEF-funded project was aimed at improving and widening the scope of Cambodia's limited EE initiatives, and facilitating the removal of barriers to widespread application of EE technologies and energy conserving practices in the country (Vuthy, 2005).

ADEME- ENERTEAM (2002)

The project is supported by the French ADEME to help in developing EE activities in the building sector of Cambodia by building capacities for future EE activities, creating awareness through some practical measures, and providing technical assistance (including training programmes).

UN-ESMAP in association with Energy Conservation Center of Japan (2002)

The collaboration was aimed at conducting a pre-feasibility study on the potential for development and establishment of National Sustainable Energy Center in Cambodia.

Energy Sector Management Assistance Programme/ World Bank (ESMAP/WB) Funding (1997 to 1999)

Supported by the World Bank, the Office of EE was established by the Ministry of Industry, Mines and Energy in 1997. The general objective of ESMAP-WB activities in Cambodia is to increase the efficiency of the power sector in order to make it attractive for private sector investments. Attention was focused

Figure 2-16 | Action Plan for Energy Efficiency Programme in Cambodia

Sector	Action Plan	Energy Use 2005		Energy Saving Targets for APS compared to BAU in 2030		Time to be Implemented		
						Short-Term	Medium-Term	Long-Term
		(MTOE)	(%)	(%)	Other Indicators	2010 - 2015	2015 - 2020	2020 - 2030
Transportation		**0.4**	**43.2%**	10%				
	Develop & promote public transport systems, e.g. railways & waterways				Increase km of railways			
	Study on ECO-Car project, to enhance fuel consumption for automobile			10%	Low fuel-consumption rating			
	Implementing alternative fuels for transport, e.g. biofuels and ethanol			10%	B10 & E20 Fuels			
	Improvement of transport and communication system							
Others		**0.5**	**51.7%**	15%				
	Establish standard and labeling for appliances			10%	Energy labelling 10 appliances			
	To promote high energy efficiency lighting and cooking stoves			15%	Increase percentage uses			
	Establish Building Code for new and exisiting buildings				Building Code			
	Promoting uses of indigeneous & alternative fuels, e.g. soalr, wind, biomass, biogas & biofuels			10%	Increase percetange use of alternative fuels to total energy			
Industrial		**0.1**	**5.1%**	15%				
	Introduction of energy efficiency & saving technologies and equipments to designated factories			10%	Benchmarking, SEC, Selected proven technology			
	Introduction of Energy Management System into designated factories			10%	1000 EMS Factories			
	Development of energy database for designated factories				Database by 2013			
	Technical assistance in energy auditing for industries			15%	Auditing for all designated factories			
	Program for energy saving plan by medium-large factories			10%				
	Promotion of energy-efficiency awareness for industries							
	Other Actions for EE&C							
	Passing of Energy Efficiency & Conservation Law							
	Institution of other legal, tax and financial framework for EE&C							
	Development of National Energy Master Plan							
	R & D and transfer of EE&C technology and renewable energy							
	Capacity building and training courses for designated factories & buildings on EE&C							
	Research & Development of Bio-Fuels							
	Promotion of energy-efficiency awareness for public							
	Introduction of Energy Services Company (ESCO) business							

Source: Leng Vuthy (2010)

on capacity building and strengthening in Ministry of Industry, Mines and Energy and Electricité du Cambodge capabilities in efficiency. The programme implemented the three following actions:

- EE promotion in the garments industry;
- Promotion of EE lighting and initial consideration of standards in the electricity sector; and
- Workshops on EE and dissemination of information (Vuthy, 2005).

Main barriers to EE promotion in Cambodia

The major challenges and barriers in terms of promoting EE in Cambodia involve:

- Lack of awareness on EE;
- Lack of EE policies. Although the government has adopted electrical standards, there is no existing specific EE regulation. The government is currently developing its construction and building standards alongside road vehicles pollution control mechanisms and safety/ security verifications;
- Lack of government programmes and supporting funds or incentives; and
- Weak institutional capacity for planning, implementation and maintenance of EE policies and programmes

INDONESIA

Indonesia is the most populous country in the subregion (at 225 million in 2007). The country's energy consumption had risen in the same time as its economy grows. It targets to achieve energy elasticity of less than one in 2025 as set in the Presidential Regulation No. 5/2006 on National Energy Policy, and reduce energy intensity at 1 per cent per year from 2005 until 2025 as stated in the country's National Master Plan of Energy Conservation. This is in line with Indonesia's thrust to further reduce its energy intensity. Between 2000 and 2007, the country registered a decrease in GDP energy intensity from 0.25 to 0.23. The country is third in terms of this indicator in the subregion (after Brunei Darussalam and Malaysia).

EE enabling legislation and policy

Government Regulation No. 70/2009 on Energy Conservation 2009

Recently, Government Regulation No. 70/2009 on Energy Conservation was issued in November 2009. This Regulation stipulates EE and labeling, incentive and disincentive, mandatory for big energy consumer (> 6 Mtoe) to conduct energy management. The evolution of the National Energy Conservation Policy and Regulations of Indonesia is depicted in Figure 2-17.

Presidential Instruction No.2/2008

In 2008, the Government issued Presidential Instruction No.2/2008 on Energy and Water Efficiency which instructs the establishment of a National Team on Energy and Water Efficiency, and an Energy and Water Efficiency Task Force in government offices.

Law No. 30/2007

In 2007, the Indonesian Government issued Law No. 30/2007 on Energy which strengthens its policy on EE promotion. With this Law, the Government is currently preparing a Draft of Government Regulation on Energy Conservation to regulate and accelerate the implementation of EE in Indonesia. This Law serves as an umbrella for energy development as well as energy utilization such as promoting the implementation of EE activities in Indonesia. Under the Energy Law, some government regulations are prepared to drive energy development and utilization. Among these is the Government Regulation on Energy Conservation.

Policies and Regulations Related to EE

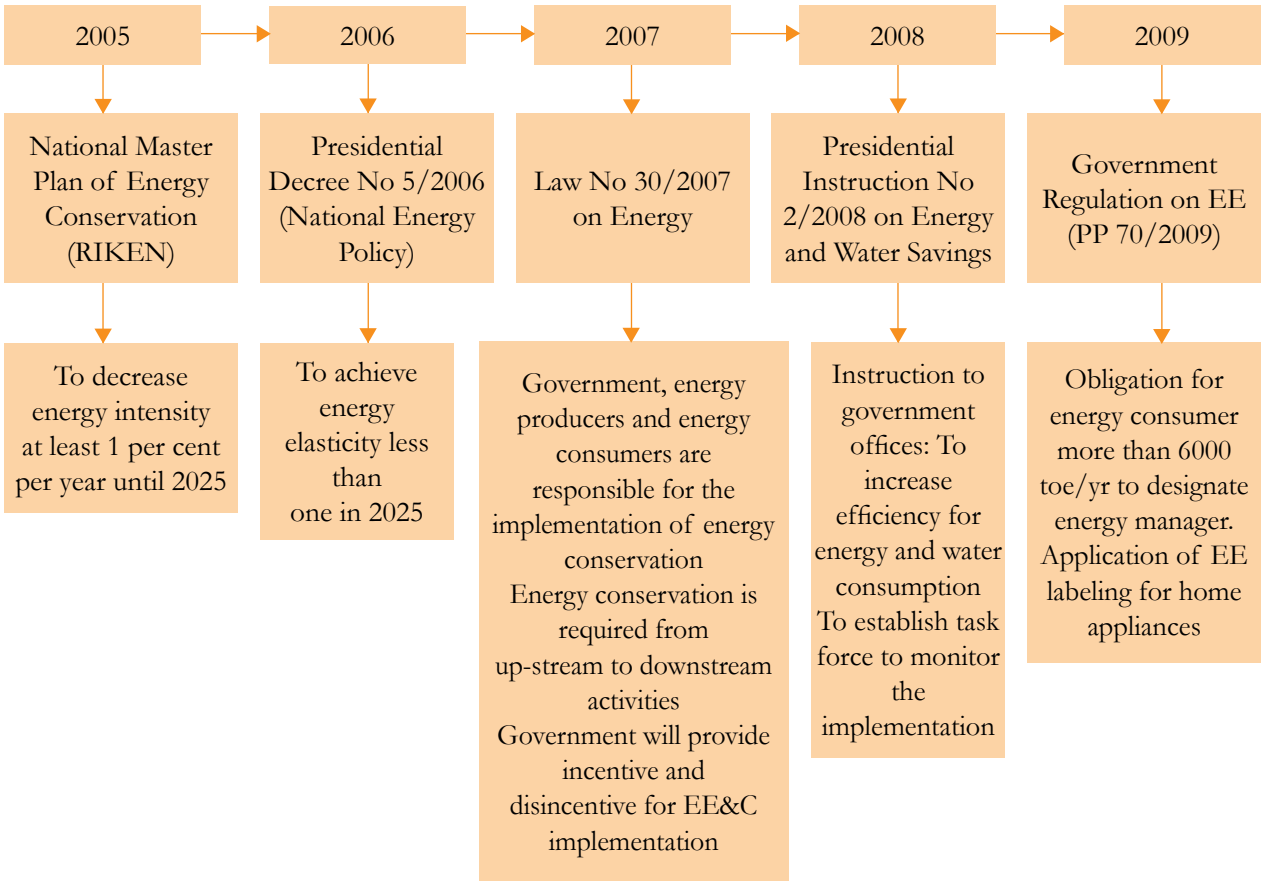
- National energy policy, Ministerial Decree: No. 0983 K/16/MEN/2004;
- Green energy policy, Ministerial Decree: No. 0002/2004;
- Regulation on Electricity Supply and Utilization, Government Regulation No. 03/2005;
- Presidential Instruction No.9/1982, Energy Conservation;
- Presidential Decree No.43/1991, Energy Conservation;
- Ministerial Decree No. 100/K/148M.PE/1995, Master Plan of National Energy Conservation ; and
- Presidential Instruction No 2/2008 (Energy and Water Savings).

National Energy Policy 2006

Recognizing the problems of energy supply and utilization, the Government of Indonesia under Presidential Regulation No 5/2006 has formulated the National Energy Policy setting up targets to achieve energy elasticity of less than one in 2025, and to gain optimum energy mix in 2025 with the following composition: oil to be less than 20 per cent, gas to be at least 30 per cent, coal at least 33 per cent, new and renewable energy to be at least 17 per cent. Generally, the policy was formulated to create sustainable energy development.

The Government of Indonesia, through a presidential decree, has adopted its first general energy policy in the 1982 as a consequence of the reverse oil shock that started in the early years of that decade. This

Figure 2-17 | Evolution of the Energy Conservation Policy and Regulations of Indonesia



was revised in 2003 and renamed "National Energy Policy" envisioning a guaranteed and sustainable energy supply to support Indonesian national interest. The 2003 Policy was issued as a President Regulation in 2006.

The Policy also seeks to (1) increase the added values of energy sources, (2) manage sustainable sources of energy in an ethical and sustainable manner, (3) focus attention to conservation of environmental functions, (4) provide affordable energy for low income people and less developed areas, and (5) develop domestic capacities. To achieve the targets stated in National Energy Policy, the Indonesian government has formulated a number of programmes including energy intensification, diversification and energy conservation.

- Energy Intensification aims to intensify exploration activities through continuing surveys and exploration for energy, either from domestic or foreign sources to increase energy reserves, in particular oil, natural gas and coal.
- Energy Diversification is directed towards diversifying the utilization of energy (renew able or non-renewable) in the framework of economic optimization of energy supply and in order to decrease the rate of depletion of hydrocarbon resources so that the maximum net benefit is obtained while sustainable development is implemented.
- Energy Conservation will be applied in all stages of utilization, beginning with energy use at its source up to its end-use on both the

upstream and the downstream sides. Upstream energy conservation includes increasing efficiency of energy source extraction, while downstream conservation includes increasing efficiency of energy end-use in all sectors.

National Master Plan for Energy Conservation (issued in 1995, revised in 2005)

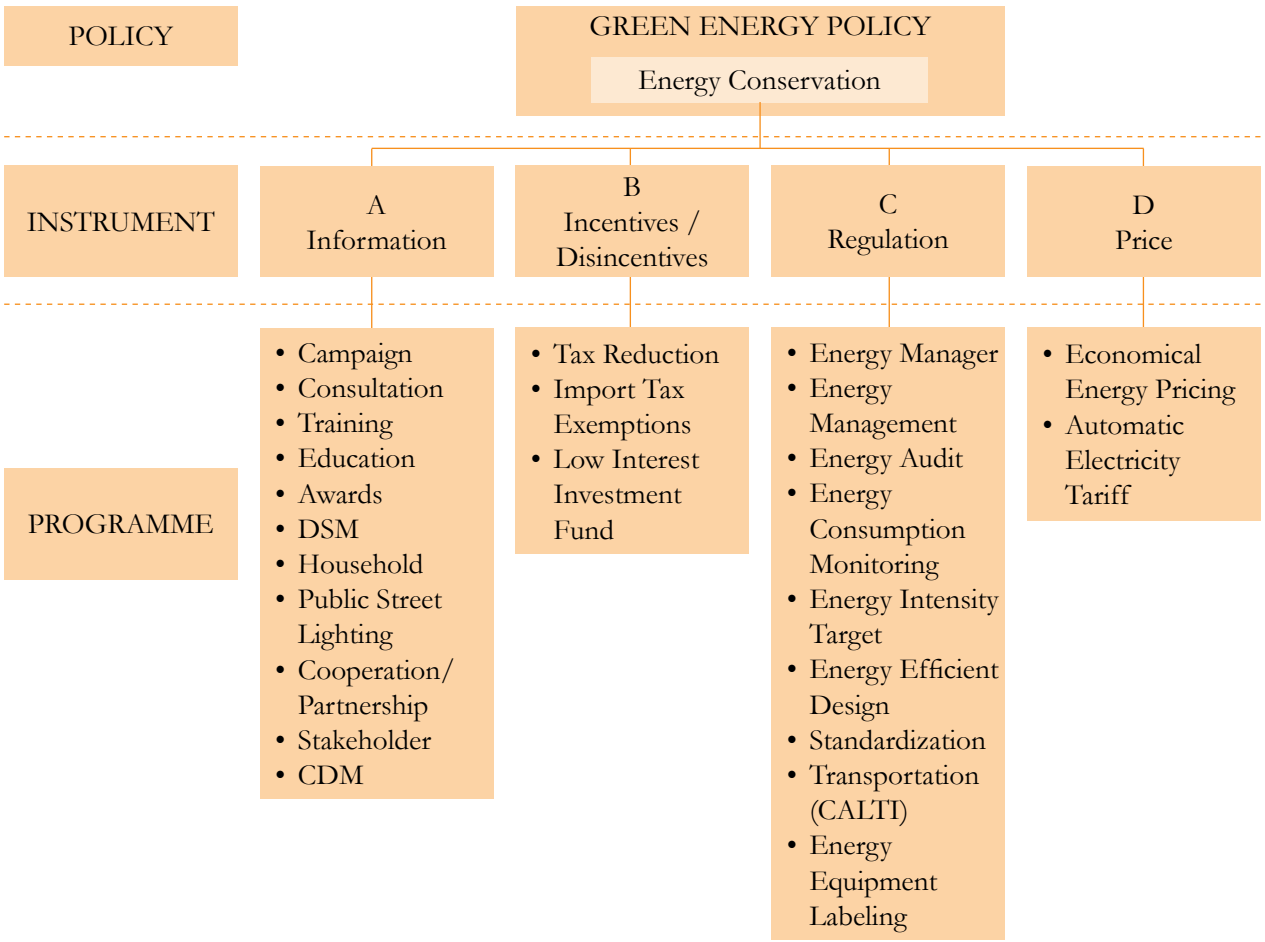
According to the "Legal framework for improvement of energy efficiency and conservation in Indonesia," the Master Plan was first issued in 1995 and revised in 2005 as a guideline for central and regional governments to participate in energy conservation activities, such as:

- Appointing energy manager for certain energy consumer;
- Planning and implementing energy conservation programmes;
- Conducting periodic energy audits;
- Periodic reporting of the implementation of energy conservation programmes; and
- Reducing energy intensity by 1 per cent per year.

Blueprint for National Energy Management 2005 to 2025

The Blueprint identifies short- and long-term development objectives in the electricity sector. In addition to targets on increasing electrification levels, infrastructure expansion, reduction of subsidies and improvement in efficiency, the Blueprint establishes targets for electricity production from various renewable energy sources. The target is set at 15 per cent of the country's electricity demand by 2025 to come

Figure 2-18 | Energy Conservation Policy of Indonesia



from renewable energy sources. The Blueprint further sets to effectively use limited energy source for improving national life and fiscal structure, and to achieve energy elasticity to GDP of less than one by 2025.

Renewable Energy and Energy Conservation (Green Energy) Policy 2003

The Minister of Energy and Mineral Resources introduced the Green Energy Policy in December 2003 to increase the use of energy conservation measures through investment and financing, incen tives, energy pricing, standardization and certification, capacity building, information system, R&D, and institutional components.

Major actors for EE promotion

National Economic Development Agency

The National Economic Development Agency through the Bureau for Electricity, Energy Development and Mining prioritizes renewable energy projects, special rural electrification projects, determines government support, and appoints government project partners.

National Energy Council

The Council was established by Law Number 30 of 2007 and a Presidential Regulation. As a national independent and permanent institution, it is assigned to (1) design and formulate national energy policy, (2) establish national general plan for energy, (3) create solutions in conditions of energy crisis and emergency, and (4) supervise implementation of cross sectoral policy on energy. The Council is assisted by the Secretariat General.

Ministry of Energy and Mineral Resources

The Ministry, formerly Ministry of Mines and Energy, supervises state-owned utilities and ESCOs.

Directorate General for Electricity and Energy Development

The agency, a body under the Ministry of Energy and Mineral Resources, has been responsible for developing and establishing national energy standards. In 1995, it completed a master plan for energy conservation which include an import tax reduction on high-efficiency equipment and soft loans for companies implementing EE improvements.

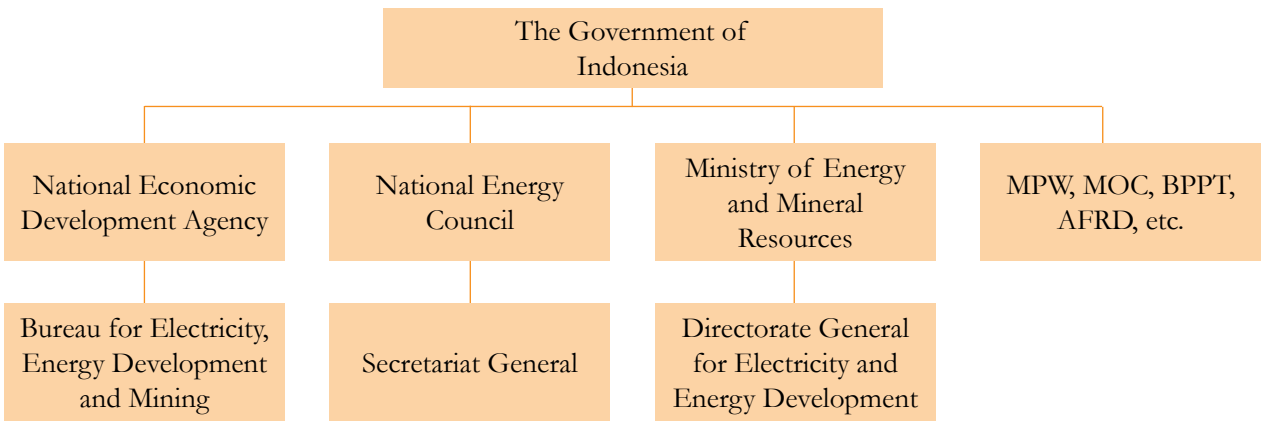
Ministry of Public Works

The Ministry is responsible for hydropower power resource surveys and, in a few cases, the operation of hydropower plants.

Ministry of Cooperatives and Small Enterprises Development

The Ministry is responsible for enhancing the role of cooperatives in rural electrification, and in some cases, for initiating electrification projects.

Figure 2-19 | EE Institutional Framework of Indonesia



BPP Teknologi

BPP Teknologi is a non-departmental government agency established in 1978 for the assessment and application of technology. Reporting directly to the Indonesian President, it is not only responsible for technology R&D, demonstration and testing, but also in project development in the pilot and pre-commercial phase.

Indonesian Agency for Forestry Research and Development

The Agency, which is linked with the Ministry of Forestry, undertakes research and studies in the field of utilization of wood and biomass.

Selected EE programmes and projects in Indonesia

Demand Side Management

Indonesia's major DSM programmes include the Light Programme, Caring Programme, Street Lighting Programme, and Partnership Programme. Light and Caring Programmes emphasize on the use of 8-W energy-saving lamps instead of the 40-W bulb lamps. Street Lighting Programme aims to increase the efficiency of street lighting system, to reduce the expenses of the provincial government, and to reduce peak power occurrences. The Partnership Programme seeks to achieve an efficient solution of energy utilization through auditing, implementation, and evaluation (COGEN, 2005).

Standardization Programme

The Government has developed technical specifications for energy equipment to encourage manufacturers to improve the efficiency of their products.

Clearing House for Energy Conservation

To provide up-to-date information to stakeholders, the Government has established the Clearing House of Energy Conservation. However, the clearing house did not operate well because of lack of financial support. Currently, the Government is strengthening the clearing house with help from Danish Government.

Labeling programmes

The Indonesian Government has encouraged EE implementation by issuing EE standards for A&E, building, and lighting products. Unfortunately, due to lack of EE awareness, these standards have not been properly implemented. Although a labeling programme was already launched (see Figure 2-20 for a sample of the label), it is yet to be implemented.

Figure 2-20 | EE Label in Indonesia

International Energy Cooperation

The Government of Indonesia has cooperated with other countries and donor agencies to support some EE programmes including:

- Netherlands: Under the Joint Energy Working Group, the Netherlands assists Indonesia in capacity building particularly in industrial sectors by providing training related to EE;
- Japan: In 2007, JICA has organized a study on Energy Conservation and Efficiency Improvement focused on the energy manager system, labeling, and DSM;
- Denmark: The Government of Denmark provides grant for Indonesia on the project EE in Industrial, Commercial, and Public Sectors which emphasized on developing building code for low energy building, empowering clearing house of energy conservation, and optimizing energy use in industries and buildings;
- United Nations Industrial Development Organization (UNIDO): GEF through UNIDO assists Indonesia in a project to promote EE

in industries through system optimization and energy management standards. This project is concentrated on implementing energy management standard ISO 50001;
- UNDP: GEF also provides grant for Indonesia through UNDP under the Barrier Removal to the Cost-Effective Development and Implementation of EE S&L(BRESL) Project which facilitates the transformation of the manufacture and sale of energy-efficient A&E through a regional initiative in Asia;
- ASEAN: Under PROMEEC, Indonesia is being assisted in increasing capacity building to promote EE in major industries and buildings.

Main barriers to EE promotion in Indonesia

Some barriers faced in implementing EE in Indonesia include weaknesses on, and in many cases, absence of:

- institutional framework to coordinate EE initiatives,
- mandatory policy and regulation to support EE implementation,
- human resources capability;
- financial support to accelerate EE activities (such as tax incentive, low interest rate, etc.), and
- public awareness on EE effort due to low energy price.

To overcome these barriers, some measures have been created, as follows:

- Establishment of National Team Work on EE to strengthen the coordination among institutions;
- End-user activities such as designating energy managers in large industries, implementing energy audits, S&L system for electric home appliances;
- Voluntary measures such as energy audit in medium and small industries, utilization of electric efficient appliances in households, pilot projects;
- Providing financial support with low interest rates for EE projects, decreasing custom duty for EE equipment, tax incentives;
- Strengthening of Clearing House on EE, the application of labeling system on EE equipment and appliances, benchmarking programme, technical training for consumers;
- Improving human resources through training/workshop/seminar, study visits, EE competitions, mandatory energy managers; and
- Raising awareness of end users through electronic or print media and public advertisement

MALAYSIA

After Singapore and Brunei Darussalam, Malaysia's GDP per capita is the highest in the subregion (see Table 1). The country's energy intensity stood at 0.25 TOE/000 in 2007 rising by 0.01TOE/000 compared with the 2000 figure. EE is a component of the country's energy policy. For instance, in the country's Ninth Plan period (2006 to 2010), focus on energy saving is featured in the industrial and commercial sectors. EE features such as efficient lighting and AC systems, and a comprehensive energy management system are encouraged. The industrial sector is also encouraged to implement EE measures including improvements in plant, equipment, processes.

EE enabling legislation and policies

The Ninth Malaysia Plan (2006 to 2010)

For this period, Malaysia focuses on energy saving features in the industrial and commercial sectors to promote EE. EE features such as efficient lighting and AC systems, and a comprehensive energy management system are encouraged. The industrial sector is also encouraged to implement EE measures including improvements in plant, equipment, processes, and end use (Chapter 19 of the Plan).

The Third Outline Perspective Plan (2001 to 2010)

The Plan, which constitutes the second decade of

development under Malaysia's Vision 2020, focuses on building a resilient and competitive Malaysia. During this period, efforts are made to raise the quality of development and generate high sustainable growth. It gives an overview for EE measures including enforcement of EE Regulations, DSM implementation, incorporation of EE provision into Building By-laws, and development of Malaysian standards for efficient lighting, AC and building envelope design.

Efficient Management of Electrical Energy Regulations 2008

The Regulations was issued on 15 December 2008 to enhance Malaysia's EE. It required users with total electricity consumption of 3 million kWh or more over six consecutive months to appoint electrical energy managers and implement efficient electrical energy management

Energy Commission Act 2001

The Act provides for the establishment of the Energy Commission with a mandate to regulate energy supply activities in Malaysia and enforce energy supply laws. The Commission was created on 1 May 2001.

Major actors for EE promotion

Kementerian Tenaga Teknologi Hijau Dan Air (Ministry of Energy, Water and Green Technology

The Ministry is tasked for the development and enforcement of relevant policies, programmes and laws on energy (including renewable energy resources), water and sewerage (including water tariff), and communications. The Ministry's main thrust is to facilitate and regulate the growth of industries in these sectors to ensure the availability of high quality, efficient and safe services at a reasonable price to consumers throughout the country. The regulatory function of the Ministry is undertaken through its regulatory bodies: the Energy Commission, and the Communications and Multimedia Commission (Ministry of Energy, Water and Green Technology homepage).

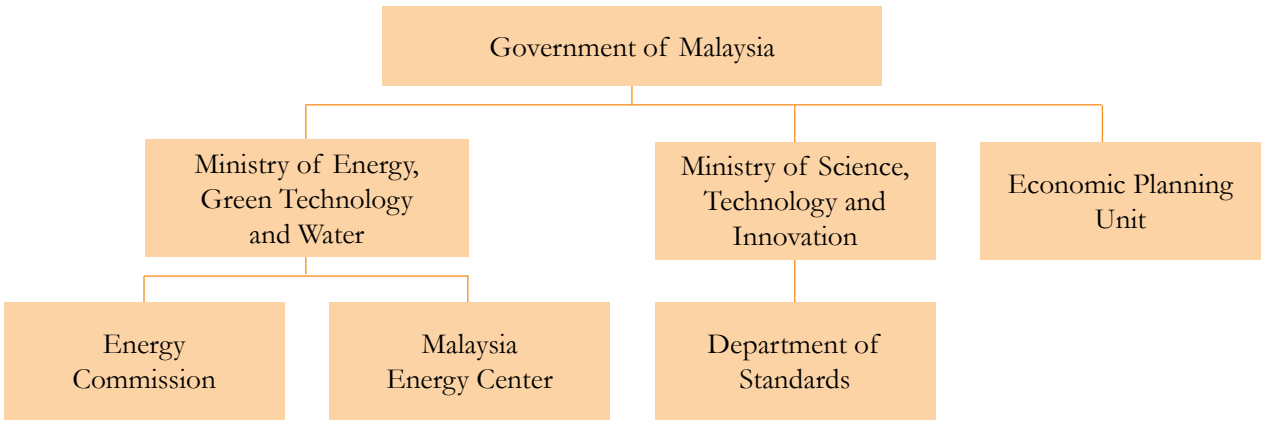
Energy Commission

The Commission is responsible to regulate energy supply activities, enforce supply laws, and promote further development of the energy industry. The Commission is also responsible on matters relating to EE.

Pusat Tenaga Malaysia (Malaysia Energy Centre)

The Centre was established to fulfil the need for a national energy research centre that will coordinate various activities, specifically energy planning

Figure 2-21 | EE Institutional Framework of Malaysia



and research, EE, and technological research, development and demonstration. It also acts (1) as an agent for public and private energy sectors; (2) guardian or repository of a national energy database; (3) coordinator and lead manager in energy research, development and demonstration projects; (4) think-tank on energy via consultancy services; and (5) promoter of national EE and renewable energy programmes. It serves as a one-stop focal point for linkages with universities, research institutions, industries and other various national and international organizations on energy matters (Malaysia Energy Centre homepage).

Economic Planning Unit

This is the agency responsible for policy design for the Malaysian government including EE policies and plans.

Department of Standards Malaysia (Standard Malaysia)

The Department is an agency under the ambit of Ministry of Science, Technology and Innovation. Standard Malaysia took over the statutory roles in standardization and is also entrusted with responsibilities of accreditation (Standard Malaysia homepage).

EE programmes in Malaysia

Energy Efficient Comparative and Endorsement Labeling Programmes

Standard and Research Institute Malaysia has developed Malaysia's EE labeling programmes by initiating a working group under Industrial Standard Committee to develop standards for appliances (fans, refrigerators and ACs). This working group was later upgraded to a Technical Committee on Performance of Households and Similar Electrical Appliances mandated to develop energy performance standards. On the other hand, the End-Use Energy Rating Work Group and its Sub-Work Groups advise government agency on technical contents, technical and policy aspects of the design and implementation of energy

Figure 2-22 | Energy labels in Malaysia

labeling and MEPS. The Technical Committee is also responsible to the establishment and maintenance of testing standards for appliances and energy using equipments that will be affected by the energy labeling and MEPS directives (Taha, 2003).

Capacity Building on EE and DSM (EE/DSM) Project

The EE/DSM Project is a three year project co-funded and technically supported by Danish International Development Agency (DANIDA) starting in February 2002. The objective is to hence the existing capacity of the Energy Commission to manage and co-ordinate initiatives to achieve national EE targets by co-operation with government institutions and implementing agencies. This programme focused on efficiency of electricity use in the industrial sector, buildings sector, as well as the end-use product sector.

Malaysian Industrial EE Improvement Project

The Project was formulated during 1998 to improve EE in Malaysia's industrial sector by removing barriers to efficient industrial energy use and creating a sustainable institutional capacity to promote EE sources. It consisted of eight components including energy use benchmarking, energy auditing, energy rating, EE promotion, ESCO support, energy technology demonstration, local energy efficient equipment manufacturing support, and financial institutions participation. The project initially focused on eight energy-intensive industrial sectors: iron and

steel, cement, wood, food, glass, pulp and paper, ceramics and rubber. Three other sectors were added later:oleo-chemical, plastics and textiles (van dan Akker, 2008).

Main barriers to EE promotion in Malaysia

Van den Akker (2008) has identified barriers that hamper EE implementation in Malaysia including:

- Limited awareness of EE techniques and their economic benefits;
- Limited access to information on EE technologies and performance benchmarks for EE technologies;
- Preference of industries to focus on investments in production improvements rather than on efficiency;
- Insufficient energy policies and/or programmes (such as S&L);
- Few EE technology demonstration projects either by industry or government;
- Inadequate and low-quality local energy support services;
- Lack of trained industry and financial sector personnel on energy management;
- Lack of prepared and interested financiers for EE investments as well as appropriate financing mechanisms; and
- Insufficient financial resources for the adequate staffing of the implementing agencies involved as well as for the implementation of EE measures.

MYANMAR

The economic growth of Myanmar between 2000 and 2007 had been impressive (see Table 1). Although TPES has increased (during the same period), GDP energy intensity has considerably been halved from 0.23 to 0.14. Energy policy in Myanmar is fourfold: (1) maintaining the status of energy independence, (2) promoting wider use of new and renewable energy sources, (3) promoting energy efficiency and conservation, and (4) promoting use of alternative fuels in household.

EE enabling legislation and policy

Myanmar still lacks an explicit law on EE and conservation. However, existing building regulation implicitly contribute to EE. Myanmar is currently preparing its EE and conservation master plan.

Major actors for EE promotion

National Level Committee

The focal point for all matters of energy conservation is the Ministry of Energy which also chaired the National Level Committee. The following ministries involved in specific sectors are represented in the Committee:

- Ministry of Energy for the oil and gas sector
- Ministry of Electric Power (1) for gas and hydro power sector
- Ministry of Electric Power (2) for power distribution sector
- Ministry of Mines for coal sector
- Ministry of Forestry and Ministry of Agriculture for the biomass sector
- Ministry of Industries, Ministry of Agriculture, and Ministry of Science and Technology for the renewable energy sector
- Ministry of Construction for energy usage in building

The Myanmar Engineering Society also collaborates with various governmental organizations, international and local NGOs, and business organizations to raise EE awareness.

Selected EE programmes and projects in Myanmar

Institutional Strengthening within the Ministry of Energy 1991

This UNDP/ADB assisted project has the following elements: energy analysis, energy economics, energy conservation, management information system, and fuel safety.

ESCAP programmes

ESCAP has been assisting Myanmar's EE activities through workshops, seminars and trainings. These include: Seminar on Energy and Conservation in the industrial sector (1996), Seminar on practical training course on Efficient Energy Management in Industries (1998), Seminar on Energy Management (2005), and the National Consultation Workshop on the establishment of a framework of Energy Management System in Industries and Buildings (2006).

ASEAN programmes

The ASEAN has also conducted EE seminars in Myanmar. These include: Energy Audit of Mann petroleum refinery (2001), PROMEEC Building Energy Audit Training (2003), Workshop for Benchmarking and Energy Audit Guideline Development (2003), PROMEEC Energy Management Training (2004), Seminar-Workshop on EE&C for building Best Practices in South East Asia (2005), Energy Audit of Kyanhin Cement Plant (2006), Energy Audit of Thanlyan Oil Refinery Plant (2006), Energy Audit of Mayangone Textile Factory (2008), and Energy Audit of Automobile Factory (2009).

Main barriers to EE promotion in Myanmar

Among the major challenges and barriers in terms of promoting EE in Myanmar include:

- Absence of EE laws ;
- Absence of follow-up activities and initiatives to implement EE;
- Inadequate training programmes; and
- Absence of comprehensive, reliable and accurate energy consumption data.

PHILIPPINES

The Philippine government declared the efficient utilization of energy resources as a policy. The primary goal of the Philippine Government towards EE is to make it a way of life, increase awareness, and attain 229 MMBOE of total energy savings from EE implementation and alternative fuels programmes for the period 2005 to 2014. It is projected that about 50.9 MtC02 equivalent GHG emissions will be avoided for the same period (Department of Energy homepage). The strategies to achieve these goals include: the aggressive promotion of energy conservation and energy efficient technology; intensify collaboration effort with the private sector; continuous implementation and expansion of the appliance and equipment energy standards and labeling implementation; integration of EE concepts in government procurement practices; the provision of technical assistance to improve energy use efficiency; the use of alternative fuel to reduce dependence on imported oil; and periodic programme monitoring and evaluation.

EE enabling legislation and policies

Electric Power Industry Reform Act 2001 (Republic Act 9136)

This Act is aimed at reforming the serious financial and energy cost problems in the Philippines by introducing a competitive electricity market, supporting EE improvement, and attracting foreign capital. The Act also planned to restructure two major areas – electricity supply industry (i.e., separation of the different power market activities in terms of generation, transmission, distribution and supply), and the privatization of the country's National Power Corporation.

Department of Energy Act 1992 (Republic Act 7638)

The Act, approved in December 1992, created the Department of Energy and rationalized the organization and functions of government agencies related to energy. The Department is tasked to prepare, integrate, coordinate, supervise, and control all plans, programmes, projects, and activities of the Philippine Government relative to energy exploration, development, utilization, distribution and conservation.

Medium-Term Philippine Development Plan 2004 to 2010 (EE&C)

To optimize the use of scarce resources, supply-side strategies must go hand-in-hand with demand-side strategies. To save more on energy, the Department of Energy launched in August 2004 the EE&C Programme to help mitigate the impact of rising oil prices, reduce expenditures on fuel and power, and contribute to environmental protection programme. Along this line, the following programmes will be mandatorily implemented: (1) the use of Compressed Natural Gas for transport buses; (2) biofuels as mandatory fuel blends; (3) expansion of energy labeling to include other appliances, vehicles, electrical devices and equipment; (4) shift to energy efficient lighting in residential, commercial and industrial establishments; and (5) fuel consumption reduction among government agencies. Meanwhile, public cooperation will be encouraged in terms of VAs like anti-idling, carpooling, "carless" day schemes, partnership with fast food chains, ecozones, industries and companies, wider implementation of energy labeling and efficiency standards (e.g. fuel efficiency rating labels in auto dealer showroom), energy audits, and DSM (National Economic Development Authority, 2004).

Philippine Energy Plan 2005 to 2014

The Plan is aimed to strengthen EE programmes. Through this Plan, 23.4 MMBOE (8.1 MMBOE from alternative fuels for transport and 15.9 MMBOE from EE&C programme) average annual energy savings in ten years through the National EE&C Programme is expected to be attained. The Plan consists of two-pronged programmes: Fuel Efficiency and Conservation Programme (such as VAs, government energy conservation programme, and energy audits) and Electricity Efficiency and Conservation Programme (such as EES&L programme for A&E, government energy conservation programme, energy audit, energy use standards for buildings, heat rate improvement in power plants, and systems loss reduction) (Department of Energy, 2005).

EE&C Action Plans & Targets (2008 to 2030)

The ultimate goal of the Action Plans and Targets (2008 to 2030) is to attain energy savings equivalent to 5 per cent of annual final demand which accumulates a target potential energy savings of 332.09 MMBOE (47.95 Mtoe) or 7,866 MWe (342 MWe per year) deferred power capacity. Total CO_2 avoidance is around 54.30 million MT (Department of Energy homepage). The key periodic activities to be undertaken include:

- Policy study and development of legal framework;
- Information, Education and Communication Campaign;
- Government Energy Management Programme;
- Energy Management Services;
- Monitoring of retrofitting programme for land transport;
- Promotion of Aviation Fuel Efficiency Enhancement Programme;
- Promotion of major retrofit programme for commercial and industrial sectors;
- Implementation and monitoring of the implementation of the revised EE Guidelines for new buildings;
- Implementation of CFL Replacement Programme through distribution utilities to led rapid and massive switch on the use of CFL lamps;
- Recognition Awards;
- Fuel Economy Run;
- S&L for A&E by expanding the labeling programme to include fans and blowers, lamps and ballasts;
- Partnership/VAs;
- Establishment and accreditation of energy managers, energy auditors and ESCOs; and
- Massive phase out of incandescent bulbs and promotion of CFLs.

Major actors for EE promotion

Department of Energy

The Department is the central government body responsible for policy formulation and the planning and management of the overall energy sector. The Department is also tasked for ensuring a continuous energy supply at affordable costs and with due consideration to environmental concerns. Together with other attached agencies, it strives to address these concerns through the following:

- Formulation of clear policies and responsive plans and programmes;
- Intensive development of indigenous energy sources;
- Effective coordination of downstream energy activities;
- Judicious conservation and efficient utilization of energy;
- Enhancement of private sector participation in energy projects; and
- Close coordination and cooperation with other government agencies and private sector entities (Department of Energy homepage).

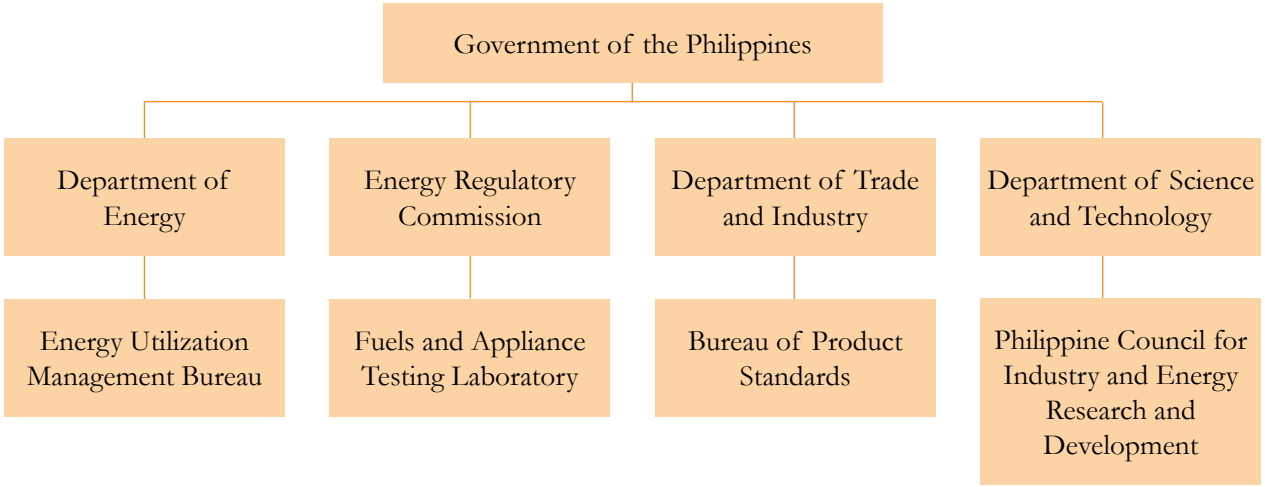
Energy Regulatory Commission

The Commission is created under the Electric Power Industry Reform Act as an independent, quasi-judicial regulatory body. It promulgates and approves rules, regulations, guidelines and policies, and enforces rules, regulations including issuances of permits and licenses. Regarding EE, its functions cover determination and approval of transmission and distribution wheeling charges, and retail rates through a Commission-established and -enforced rate-setting methodology that will promote efficiency and non-discrimination, and action on applications for cost recovery and return on DSM projects (Energy Regulatory Commission homepage).

Philippine Council for Industry and Energy Research & Development

The Council, an agency aligned with the Department of the Science and Technology, is a government research planning and policymaking body. It is a central agency for the planning, monitoring, and promotion of scientific and technological research for applications in the industrial, energy, utility, and infrastructure sectors. It has the authority to specify national R&D goals, draw corresponding plans and policies, and set priorities for research in its delineated sectors. the Council had supported several projects on energy conservation for industry and buildings. It was responsible for implementing a collaborative work under the ASEAN-US Project on Energy Conservation in Buildings which resulted

Figure 2-23 | EE Institutional Framework of the Philippines



in the Guidelines for Energy Conserving Design of Buildings and Utilities Systems. The Council is very much involved in DSM and has classified it as a priority programme (Philippine Council for Industry and Energy Research & Development homepage).

Standards Organizations

- The Department of Trade and Industry's Bureau of Product Standards issues product standards which include: defining testing procedures, certifying product performance and safety, and mandating energy performance requirements;
- The Fuels and Appliance Testing Laboratory is a part of the DOE. The laboratory conducts product EE testing;
- The Association of Home Appliance Manufacturers is part of a Technical Committee which defines EE standards.

Selected EE programmes and projects in the Philippines

Philippine National EE&C Programme

The Programme seeks to make EE a way of life in the Philippines by undertaking the following activities:

- Strengthen the implementation and monitoring of new and existing EE programmes with government agencies taking the lead in EE;
- Review and formulate policies and guidelines on energy-efficient lighting and lamp waste management in coordination with concerned agencies; and
- Propose executive issuances on: (1) Adoption and implementation of the "Guidelines for Energy-Conserving Design of Buildings and Utilities"; (2) Ban on the importation of inefficient second-hand vehicles; (3 Establishment of an EE testing center to include testing of vehicle engine performance, energy saving gadget, among others; and (4) EE fuel mileage labeling of all brand new vehicles (Department of Energy homepage).

Partnership for energy responsive companies

This encourages industrial and commercial establishments to voluntarily monitor their energy consumption and implement EE programmes.

Partnership for energy responsive ecozones

This is a government-private sector partnership which encourages industrial ecozones to voluntarily monitor their energy consumption and implement EE programmes.

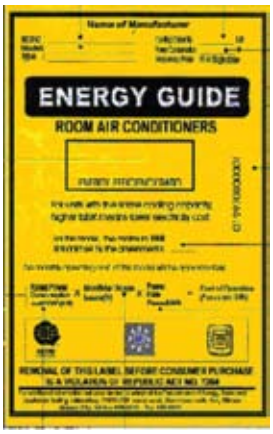
Energy Labeling and Efficiency Standards

The Philippines started adopting energy labels in 1991 on window-type room ACs (see Figure 2-24). The programme covers refrigerators, room ACs, CFLs, and ballasts.

ENERCON Programme

The programme, launched in December 2000, requires all government agencies, bureaus and offices to reduce their annual electricity and fuel consumption by at least 10 per cent, with monthly reports to be submitted to the Department of Energy. The "Energy Efficient Best Practices Awards in Government" were established to recognize agencies that achieve this objective. In addition, the Department has established a Government Energy Management Programme in 2002 to reduce government energy use and expenditure

Figure 2-24 | Energy Guide for Room ACs in Philippines



by implementing energy efficient technologies and practices in all government facilities.

Energy Management Programme

- Conduct of energy audit: Energy audit services of the Department of Energy help companies or establishments determine their energy use patterns and identify energy conservation in all energy-consuming sectors.
- Supply side energy management: The programme seeks for heat rate improvement in power plants by bringing the actual performance level of all national power corporation's and independent power producers' generating units close to their optimum performance levels.

Heat Rate Improvement Programme for Power Plants

The programme aims to reduce the amount of fuel consumed and minimize air pollutants emitted by power generating plants by providing technical assistance, training and improved information access to enhance a power plant's life, reduce operating costs, and ensure reliable power reserves. The Programme is also expected to achieve institutional and operational improvements (Benito, 2005).

Philippine Efficient Lighting Market Transformation Project

This is a five-year project led by the Department of Energy with support from UNDP/GEF, was launched in 2005 to address the barriers on the widespread utilization of energy efficient lighting (EEL) systems in the Philippines and the reduction of GHG emissions. It is expected that at the end of the second year of the project, total GHG emissions due to the lighting sector will be reduced by 4 and 11 per cent. Aggregate energy savings equivalent to at least 6 per cent is projected at the end of the second year and 11 per cent at the end of the Project. It also expects that about 57 per cent of lamps and 56 per cent of ballast used in the commercial and industrial establishments are energy efficient by end of the project's fifth year. To achieve the project's purposes, it is comprised of five major programme components:

- EEL Policies, Standards and Guidelines Enhancement;
- EEL Applications Institutional and Technical Capacity Development;
- EEL Applications Consumer Awareness Improvement;
- EEL Initiatives Financing Assistance; and
- EEL Systems Waste Management Assistance.

Numerous government and private stakeholders are directly involved in the implementation of the project. Several commercial and industrial establishments are also involved, specifically as host of the various demonstration activities and as participants in the VA schemes (Philippine Efficient Lighting Market Transformation Project homepage).

Main barriers to EE promotion in the Philippines

The major challenges and barriers in terms of promoting EE in the Philippines include:

- Insufficient fiscal and financial incentives;
- Lack of awareness about the benefits of EE projects;
- Lack of technical specifications required to select the most appropriate technology; and
- Presence of taxes and tariffs that discourage the import of foreign manufactured energy efficient products and equipment.

SINGAPORE

Singapore's energy intensity improved by 15% between 1990 and 2005 due to the adoption of better technology in power generation and the more productive use of energy in other sectors (E^2PO homepage). Between 2000 and 2007, energy intensity in Singapore remained constant at 0.20. The high cost of living placed Singaporeans second after

those from Brunei Darussalam in terms of TPES per capita. In Singapore, EE is seen as one important means to address climate change, enhance air quality, increase economic competitiveness, and reduce fossil fuel dependency.

EE enabling legislation and policies

Environmental Protection and Management Act 2008

The Act established a mandatory energy labeling of registrable goods in 2008. Under the Act, registrable goods must carry energy labels. Any importer and manufacturer who intends, in the course of any trade or business, to supply any registrable goods in Singapore on or after the effective date of 1 January 2008 shall apply to the National Environment Agency to be registered as a registered supplier and to register any registrable goods. Registrable goods include room ACs, refrigerators, motor vehicles and clothes dryers.

Building Control (Environmental Sustainability) Regulations 2008

The Regulations came into operation in April 2008. It stipulates a minimum Green Mark Score of 50 points for affected building works. The Green Mark is calculated in accordance with the compliance method spelt out in the Code for Environmental Sustainability of Buildings. This Regulation applies to all new building works (including extensions or additions to existing buildings) and building works involving major retrofitting to existing buildings with gross floor area of 2 000 square meters or more. Alteration to existing buildings which does not involve major retrofitting works is not subject to this requirement.

National Policies

Singapore's policies on energy and climate change can be found in three National Reports:

- National Energy Policy Report (published in November 2007)
- National Climate Change Strategy (published in March 2008)
- Sustainable Development Blueprint (published in April 2009)

The Sustainable Development Blueprint sets a target to reduce energy intensity (per dollar GDP) by 20 percent from 2005 levels in 2020 and by 35 percent from 2005 levels in 2030.

E^2 Singapore

Singapore's Energy Efficiency Programme Office has developed a comprehensive national plan on EE for Singapore known as 'Energy Efficient Singapore' or E^2 Singapore. This plan includes promoting the adoption of energy efficient technology and measures, building capability and expertise in energy management, public education to promote energy efficient behaviour, and R&D in EE technologies. The Energy Efficiency Programme Office primarily adopts a sectoral approach targeted at the power generation, industry, transport, building, and household sectors. The ongoing and planned programmes to promote EE include:

- Power generation. Includes switching from oil-fired steam plants to combined cycle gas turbines. The Energy Efficiency Programme Office will promote cogeneration and tri-generation through, for example, integrating the deployment of these facilities into ongoing and future industrial planning.
- Industry. The EE Improvement Assistance Scheme co-funds up to 50 per cent of the cost of energy appraisals for buildings and industrial facilities. Under the Investment Allowance Scheme, capital expenditure that results in more efficient energy utilization can be granted a capital allowance that allows a deduction against chargeable income. Programmes are being developed to help companies incorporate efficiency considerations early on in the conceptual design phase of a new facility.
- Transport. To further increase EE of land

transport system, the Singapore Government focus on encouraging greater use of public transport, promoting use of more fuel efficient vehicles, and reducing congestion on roads. Policies under consideration include mandating fuel economy labeling, and increasing public awareness of fuel efficient driving habits.

- Buildings. Building control regulations help reduce the energy required for cooling, while the Green Mark and Energy Smart schemes help spur developers to build energy efficient buildings. From 2008 onwards, all new buildings and existing buildings undergoing major retrofitting works with gross floor area above 2 000 square meters must meet the Green Mark Certified standard. The Government has also launched the Green Mark Incentive Scheme to encourage building developers to achieve higher Green Mark ratings.
- Households. Consumers are encouraged to purchase energy efficient appliances and to adopt energy saving habits. New initiatives include mandatory energy labeling for all household refrigerators and ACs sold in Singapore, and encouraging households to reduce standby power consumption (Singapore Ministry of Trade and Industry, 2007).

Major actors for EE promotion

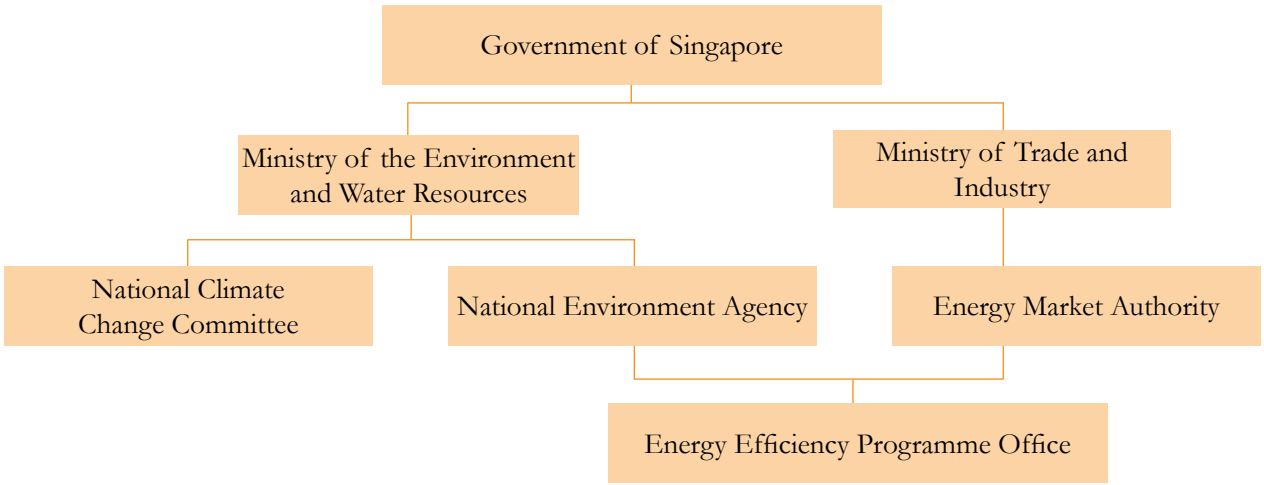
Ministry of the Environment and Water Resources

The Ministrty started as the Ministry of the Environment in 1972 and took its current name in September 2004 to reflect the Ministry's expanded role in managing water as a strategic national resource. It is committed to providing Singaporeans with a quality living environment. Having achieved its goal of a clean and green living environment, the Ministry now aims to move from maintaining good environmental performance in the short term to attaining environmental sustainability in the long run. Together with its two statutory boards, the National Environment Agency and Singapore's national water agency, the Ministry continues to manage Singapore's limited resources and address environmental sustainability challenges through innovation, vibrant partnerships and co-operation across the 3P sectors: private, public and people (Ministry of the Evironment and Water Resources homepage).

Ministry of Trade and Industry

The Ministry was created out of the former Development Division of the Ministry of Finance in March 1979 to anticipate problems ahead, identify opportunities for growth, rationalize existing policies and give broad

Figure 2-25 | EE Institutional Framework of Singapore



directions for the economy. Its mission is to promote economic growth and create jobs to achieve higher standards of living for Singaporeans (Ministry of Trade and Industry homepage).

Energy Market Authority of Singapore

The Authority was set up in April 2001 under MTI to promote effective competition in the energy market, ensure a reliable and secure energy supply, and develop a dynamic energy sector in Singapore. The Authority seeks to develop, in partnership with all stakeholders, an energy landscape that is forward-looking, innovative and vibrant. It aims to create an energy sector that contributes to sustained growth, for the benefit of all Singaporeans. The key areas of the Authority's work cover market regulation, system operation, industry development, and promotion, as well as its own internal drive for organizational excellence (Energy Market Authority homepage).

National Environment Agency

Formed under the Ministry of the Environment and Water Resources in July 2002, the Agency is the leading public organization responsible for improving and sustaining a clean and green environment in Singapore. It develops and spearheads environmental initiatives and programmes through its partnership with the people, public and private sectors. It is committed to motivating every individual to take up environmental ownership and to care for the environment as a way of life. By protecting Singapore's resources from pollution, maintaining a high level of public health and providing timely meteorological information, the Agency endeavours to ensure sustainable development and a quality living environment for present and future generations. One of the key programmes that underpin its mission is EE to improve air quality, reduce GHG emissions and help mitigate climate change (National Environment Agency homepage).

Energy Efficiency Programme Office

To drive EE improvement in Singapore, the Energy Efficiency Programme Office has been established. It is a multi-agency committee led by the National Environment Agency and Energy Market Authority and comprises the key government agencies in Singapore. The Energy Efficiency Programme Office integrates the overall efforts of the public, private and people sectors to improve EE. It has identified the following areas for action in developing a holistic EE strategy and Master Plan for Singapore (Energy Efficiency Programme Officehomepage):

- Promoting the adoption of energy efficient technologies and measures by addressing market barriers to EE,
- Building capability to drive and sustain EE efforts and to develop local knowledge base and expertise in energy management,
- Raising awareness to reach out to the public and businesses so as to stimulate energy efficient behaviour and practices, and
- Supporting R&D to enhance Singapore's capability in energy efficient technologies.

A case study of Energy Efficiency Programme Office is presented in Part 3 of this publication.

National Climate Change Committee

On April 2001, the Ministry of the Environment and Water Rresources formed the National EE Committee. With the announcement of Singapore's plan to accede to the Kyoto Protocol in 2006, the Committee has been expanded in scope to cover climate change issues and has been renamed as National Climate Change Committee to better reflect its expanded function. It is set to address climate change by:

- Promoting greater EE and less carbon-intensive energy in key sectors;
- Raising awareness amongst the people, private and public sectors on the impacts and opportunities arising from climate change, and the actions they can take;
- Building competency in Singapore to better respond to climate change such as through R&D promotion of low-carbon technologies;
- Understanding Singapore's vulnerability to climate change and facilitating the adaptation actions needed (National Climate Change Committee homepage).

Standards, Productivity and Innovation Board

As Singapore's standards and accreditation body, this Board develops and promotes internationally-recognized quality and standards assurance to enhance competitiveness and facilitate trade. The strategies in championing standards and conformance include:

- Enhancing the quality and standards infrastructure to help local enterprises comply with local and international requirements;
- Developing the testing and certification services industry; and
- Raising the adoption of quality and standards for market access and growth (Standards, Productivity and Innovation Board homepage).

Selected EE programmes and projects in Singapore

Energy Smart Building Labeling Programme

The Programme is developed by the Energy Sustainability Unit of the National University of Singapore and the National Environment Agency. It aims to promote EE in the building sector by recognizing energy efficient buildings. The Programme provides an online benchmarking system named Energy Smart Tool to evaluate the energy performances of office and hotel buildings. It enables building owners to review the energy consumption patterns within their buildings and compare them against industry norms.

Figure 2-26 | Energy Smart Building Labels in Singapore

Buildings that are in the top 25 percentile in terms of EE of the total building cohort are awarded with a certificate and an Energy Smart Label, taking indoor environmental conditions such as air quality, thermal comfort, ventilation and lighting level into consideration (Energy Efficiency Programme Office homepage).

Building Construction Authority Green Mark Scheme

The Green Mark Scheme was launched in January 2005 to promote sustainability in the built environment and raise environmental awareness among developers, designers and builders covering the process of project concept, design and construction. The Green Mark (see Figure 2-27) is a benchmarking scheme incorporating internationally recognized best practices in environmental design and performance. It provides a meaningful differentiation of buildings in the real estate market. It can have positive effects on corporate image, leasing and resale value of buildings by reducing water and energy bills, reducing potential environmental impact, and improving indoor environmental quality and providing clear direction for continued improvement (Building Construction Authority homepage).

Figure 2-27 | Building Construction Authority Green Mark in Singapore

Energy Labeling

The National Environment Agency and the Singapore Environment Council introduced the voluntary Energy Labeling Scheme for appliances in April 2002. Under this scheme, energy labels are affixed to target appliances. Since 2008, ELS for appliances has become a mandatory labeling programme (National Environment Agency homepage).

Figure 2-28 | Energy Labels in Singapore

Energy Label for air-conditioners Energy Label for refrigerators

ESCOs Accreditation Scheme

The Scheme aims to enhance the professionalism and quality of services offered by ESCOs. As an important market development measure, it can lead to the development of professional and qualified ESCOs, enhance the standing of ESCOs and energy auditing services, support services procurement and selection procedures, and support public sector incentive schemes in EE promotion. The Scheme is open to any company established in Singapore who wishes to be accredited in the provision of energy auditing services for building and industrial facilities. The accreditation is valid for a period of three years from the date of approval (National University of Singapore Environmental Sustainability Unit homepage).

Energy Audit Scheme

The National Environment Agency in partnership with major industrial consumers implements the Scheme under the National Climate Change Committee initiative to encourage industries to improve EE. The Scheme is voluntary. Companies can either use in-house staff or engage external energy audit specialists in carrying out energy audits every three to five years. It could help industries to systematically identify opportunities for improving EE and develop energy saving projects accordingly.

Singapore Certified Energy Manager Programme

The Programme, developed by the Environmental Ssustainability Unit of the National University of Singapore, offers a formal training and certification system in the area of energy management. The National Environment Agency and the Institution of Engineers, Singapore under a Singapore Certified Energy Manager Monitoring Committee jointly administer the programme with support from the Curriculum and Examinations Board. Registration is undertaken by the Singapore Certified Energy Manager Registry under the Institution of Engineers, Singapore. The programme, designed for engineering professionals who intend to be energy managers, gives a thorough understanding of the key energy issues either in the building or industry sector.

EE Improvement Assistance Scheme

The National Environment Agency administers this co-funding scheme to encourage companies in the manufacturing and building sectors to carry out detailed audit on their energy consumption and identify potential areas for EE improvement. Funding would be provided for up to 50 per cent of the qualifying cost of engaging an expert consultant or ESCO to conduct investment grade energy appraisals and recommend specific measures that can be implemented to improve EE (Energy Efficiency Programme Office homepage).

Design for Efficiency Scheme

The National Environment Agency administers this Scheme to encourage investors in new facilities in Singapore to integrate energy and resource efficiency improvements into manufacturing development plans early in the design stage. It is targeted at large energy consumers.

Grant for Energy Efficient Technologies

The Grant is aimed at encouraging owners and operators of industrial facilities to invest in energy efficient equipment or technologies by providing funding of up to 50 per cent of the qualifying costs, capped at S$2 million per project. Only projects with a payback of more than three years and up to seven years would be considered for funding (Energy Efficiency Programme Office homepage).

One-Year Accelerated Depreciation Allowance for Energy Efficient Equipment and Technology

Provided under the Income Tax Act and administered

by the National Environment Agency, this tax incentive scheme encourages companies to replace old, energy-consuming equipment with more energy efficient ones and to invest in energy-saving equipment. Under this scheme, the capital expenditure on the qualifying energy efficient equipment can be written off in one year instead of three. Capital expenditure pertains to costs incurred by the investment in or purchase of long-term business assets (National Climate Change Committee homepage).

Innovation for Environmental Sustainability Fund

The Fund encourages and assists Singapore-registered companies to undertake innovative environmental projects that could help to meet the government's goal of environmental sustainability. The proposed project must have strong elements of 'innovation' and 'early adoption', not exceed three years in duration, and its outcome should assist the country to meet the goal of environmental sustainability. The Fund provides assistance through grants to cover a percentage of the qualifying cost of the project at three levels of funding, up to a maximum of S$2 million for each project.

CDM Documentation Grant

This National Environment Agency-administered Grant is a co-funding scheme that encourages companies to develop CDM projects in Singapore. Funding would be provided for various percentage of the qualifying cost of engaging a carbon consultant to develop a new methodology and Project Design Document or develop the document that uses an existing approved methodology (Energy Efficiency Programme Office homepage).

Tracking Electricity Usage at Home

- Electricity Vending System is an innovative concept of integrating the state-of-the-art smart metering technologies and the existing e-Payment infrastructure that will allow small electricity consumers to purchase electricity, enable them to monitor their electricity consumption, and reduce their electricity bill through prudent use of electricity. It is still in the process of feasibility study.

- Energy Consumption Tracker: With support from NEA, a local company is currently developing an Energy Consumption Tracker which will track real-time energy consumption of key energy-consuming appliances in the home. The Tracker can display energy consumption information in KWh and S$ value and households' monthly energy consumption for the past twelve months. This will enable households to track the effectiveness of their energy conservation efforts in reducing their overall energy consumption (Energy Efficiency Programme Office homepage).

Main barriers to EE promotion in Singapore

For Singapore, there is no lack of technical measures or solutions to improve EE. Numerous examples can be identified in all sectors. In many of these cases, it makes good financial sense to adopt or implement such measures. However, EE consciousness is not yet prevalent in Singapore. There are a number of reasons for this including cost structure, long payback period of EE investments, lack of awareness and information, and too many EE players. Moreover, the National Climate Change Committee through its Inter-Agency Committee on Energy Efficiency Report, listed several challenges facing EE promotion in Singapore including local capability building, human resource development, collection and analysis of energy data for regional studies, open source approach to research data, etc.

THAILAND

As with other economies, energy is considered a basic factor for economic development in Thailand. Energy costs accounted to about 14 per cent of GDP in 2008. Oil imports accounted to ten per cent of the country's total import values. In 2008, industry contributed to 37 per cent of Thailand's total final energy consumption

of 66,284 ktoe (Statistics Division, Department of Alternative Energy Development and Efficiency). Thailand has set to reduce its energy intensity by 8 per cent in 2015 compared to 2005.

EE enabling legislation and policy

Thailand Energy Policy

The Policy was delivered by the Minister of Energy on 12 January 2009. Strategies toward the related EE directives, supported by speciic targets and implementation methodologies, include the following:

- national energy development and energy conservation;
- organizing campaigns to create conscience and provide knowledge about energy conservation;
- devising incentives and providing privileges to induce investment in energy saving;
- R&D on energy-saving system and technologies;
- setting standards, rules and regulations for energy-saving equipment, materials as well as energy management; and
- promoting the creation of prototype networking, e.g. SMEs with distinguishing features or with interest in energy-saving. (Government of Thailand, 2009)

Policy Statement of the Council of Ministers

The Policy Statement was delivered by the Prime Minister to the National Assembly on 30 December 2008. Related EE policy directives include:

- encouraging energy conservation in household sector, industrial sector, service sector and transportation sector through energy conscience building campaign and promoting effective energy usage with incentives to attract private sector in opting for energy conserving appliances;
- setting incentive measures to reduce electricity usage during peak period;
- researching, developing and setting standard for electrical appliances and energy conserving building;
- encouraging the development of mass public transportation and railway system to promote effective energy usage which will reduce the country's investment in obtaining energy. (Government of Thailand, 2008)

The 10th National Economic and Social Development Plan (2007 to 2011)

The Plan stated that Thailand must increase efficiency in energy usage and develop alternative energy sources to meet the domestic demand for energy. Thailand must maintain average elasticity of energy consumption no higher than 1:1 during the period of the Tenth Plan; increase renewable energy to 8 per cent of total, and reduce the ratio of energy use to GDP.

The Energy Conservation Promotion Act B.E.2535 (and the approved version – The Energy Conservation Promotion Act No.2.B.E.2550)

This is the main legislative provision for EE in Thailand which serves as the foundation for EE policy, plans and programmes in the country. The Act encourages the production and use of high-EE machineries and equipment. It is targeted at three groups: designated factories, buildings, and producers or distributors of energy equipment and machinery. Companies with transformers of more than 1 000 kVA or annual energy conservation in plants energy use exceeding 18 900 million Btu are required to conduct energy audits. They are also required to appoint full-time certified energy managers, keep records of energy use for at least 5 years, and submit an energy rationalization plan for review and approval. Non-compliance will be met with penalties, e.g. by increasing tariffs. Factory owners are given three years to meet the requirements. For owners of designated buildings, they are also required to appoint energy managers, conduct audits and keep records of energy use, and submit an energy plan for review and approval every 3 years to the Department of Alternative Energy Development and Efficiency. The same three-year time frame is given to owners to meet their efficiency requirements.

Major actors for EE promotion

National Economic & Social Development Board

The Board prepares the country's five-year development plans which typically set the direction and strategy for national development.

Ministry of Energy

In November 2001, the resolution of the Council of Ministers established the Bureau of Energy. Subsequently, in January 2002, the Bureau of Energy became the Ministry of Energy. Under royal mandate, the Government Administration Regulations Act (No.5) B.E. 2545 [2002] and the Ministerial Restructuring Act B.E. 2545 [2002] are enacted. These Acts officially inaugurated the Ministry of Energy and tasked it to:

- study, survey, analyze, assess, monitor, and evaluate energy-related situations as well as serve as an information center on energy;
- determine energy-related policies, planning, and measures;
- procure energy, alternative energy, and renewable energy;
- supervise and control as well as prescribe measures, rules and regulations, governing energy-related operations;
- conduct research and development on energy;
- promote and support the procurement, development and conservation of energy;
- transfer technological know-how and develop personnel; and
- act as coordinator in managing energy-related affairs at international level (Ministry of Energy homepage).

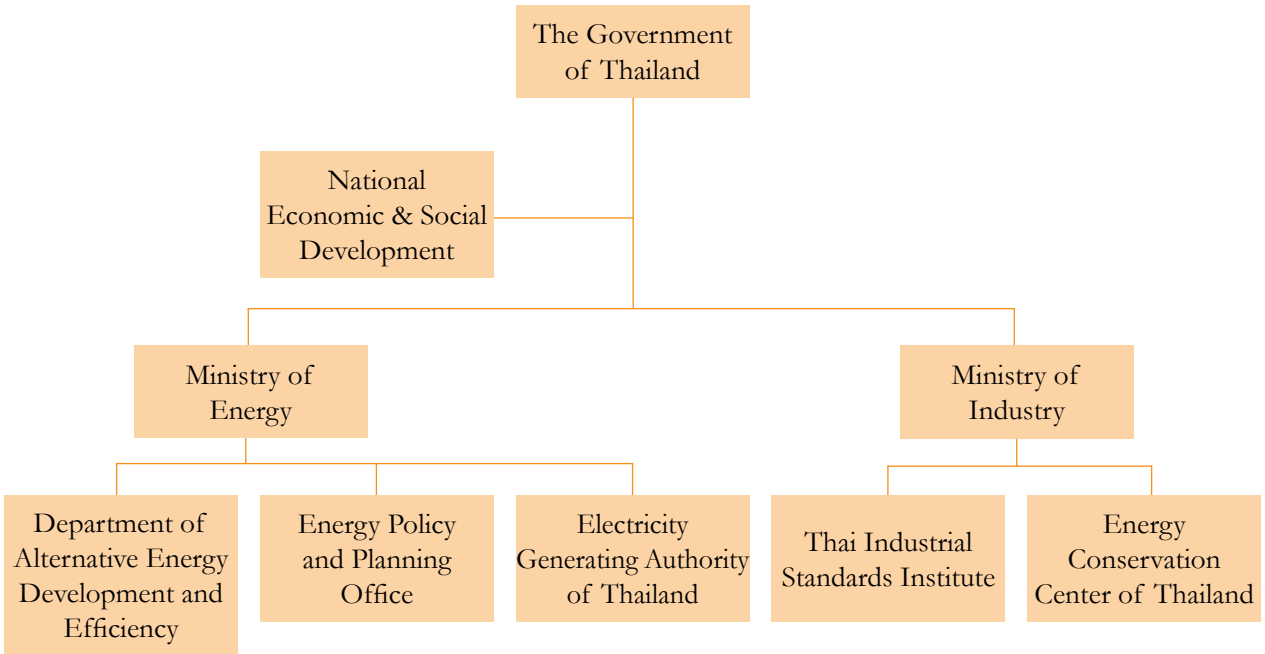
Energy Policy and Planning Office

This Office is a pivotal agency in the management and administration of Thailand's energy policies and planning. It develops energy policies and plans as well as coordinates, monitors and assesses its execution. It also fosters cooperation with other countries with regard to energy management, EE development and promotion.

Department of Alternative Energy Development and Efficiency

The Department, formerly known as the National Energy Authority, was established under the National Energy Authority Act. By the virtue of this Act, the

Figure 2-29 | EE Institutional Framework of Thailand



National Energy Authority Committee was formed to formulate policy and make consideration on various energy projects. It seeks to support and promote cost effective and sustainable clean energy production and consumption. It is also tasked to develop commercial clean energy technology for both domestic consumption and export, including the creation of a cooperation network. Moreover, the Department has the following responsibilities:

- Under the Act on Administrative Organization of State Affairs, it is responsible for EE promotion, energy conservation regulation, energy sources provision, alternative development of integrated energy uses, and energy technology dissemination.
- Under the Energy Conservation Promotion Act B.E.2535, it is responsible for regulation, supervision, promotion, and provision of assistance to designated factories and buildings to comply with laws and regulations for efficient use of energy and savings (Department of Alternative Energy Development and Efficiency homepage).

Electricity Generating Authority of Thailand

Since 1978, the Authority has been involved in new and renewable energy technology including geothermal, solar thermal and PV, wind turbines, fluidized bed combustion and fuel cell development programmes. Several demonstration systems have been developed especially for grid connected power generation while some small-scale applications have been developed for the Authority's own use at various sites all over Thailand. In addition, a demonstration of battery energy storage for load levelling at the far end or distribution was started in 1994. Other new energy technologies are virtually kept on study. The approaches of the Authority include: joint study with experts from foreign countries and local institutions, participation with local R&D committee working groups, and involving local government agencies in its activities. The Authority is the state-owned national utility carrying out the DSM master plan (Electricity Generating Authority of Thailand homepage).

The Thailand Industrial Standards Institute

The Institute is a focal point for standardization for internationally recognized equipment. The Institute prepares and publishes national standards and conducts EE testing.

Selected EE programmes and projects in Thailand

Energy Conservation Programme

This Programme is aimed at promoting EE and protecting the environment. The Department of Energy Development and Promotion under the Ministry of Science, Technology and Environment is the lead agency for implementing this programme. (Note: The Department is now called Department of Alternative Energy Development and Efficiency and has been moved to the new Ministry of Energy). The main components of the Programme include: (1) providing financial assistance and incentives for EE and renewable energy projects; (2) supporting demonstrations of energy conservation and renewable energy technologies; (3) supporting the promotion and dissemination of proven energy conservation and renewable energy technologies; (4) increasing R&D and training in energy conservation technology; (5) organizing public relations campaigns to promote EE.

Recently, the Programme launched National Energy Policy Office, Energy Conservation Plan, Course of action, Standards, and Conditions and Expenditure Priorities of the Energy Conservation Fund During Fiscal Year 2008-2011.

The aims for plan 2008-2011 are (1) decreasing energy usage in Thailand down by 10.8%; (2) replacing alternative energy in the system by 12.2% of the need of energy usage in 2011; (3) promoting alternative energy from agricultural by-products e.g. palm oil; (4) launching policy supports those alternative energy SME producers e.g. decrease the tariff; (5) securing energy demand by nuclear power.

DSM Programme

DSM programme was launched by the government through its three electric power utilities. Two phases of DSM in Thailand can be divided according to financial support which are: the first phase ran between 1993 and 2000, a grant was administrated by the World Bank and the second phase covers the period 2000 to 2006 onward, the Electricty Generating Authority of Thailand's utilities revenues or budget.

- Phase I (1993 to 2000): The government and the Electricty Generating Authorityof Thailand implemented a Five-year DSM Master Plan to deal with a huge investment demand for electricity supply capacity expansion due to the rapid economic growth. Phase I consisted of six major sub-programmes including the Residential Programme, Commer-cial/Governmental Building Programme, Industrial Sector Programme, Load Management Programme, Energy Conservation Attitude Promotion Programme, and Programme Monitoring and Evaluation. The first three programmes focused on energy-efficient appliances, particularly lighting equipment, high-efficiency refrigerators and ACs, and high-efficiency motors.
- Phase II (2000 onward): Phase II consists of thirteen DSM programmes targeting three major sectors: residential, commercial, and industrial. The Electricity Generating Authority of Thailand intended to build about 330 green learning rooms to create awareness of EE in the curriculum. Built on successful approaches implemented during Phase I, such as market transformation, EE labeling, customer-oriented programme design, public-private sector partnership (ESCOs), and attitude creation, strategies for Phase II included additional efforts, such as EE promotion and load management technologies in SMEs and the enhancement of standardization of energy use in corporations and the social sector.

The Energy Conservation Promotion Fund

The Conservation Fund was created in 1992 in accordance with the Energy Conservation Promotion Act 2535 (1992) to promote energy conservation activities in factories and commercial buildings. It is aimed at providing financial support to various energy conservation activities. It is mainly used to provide soft loans or grants for EE and renewable energy projects and supporting relevant research, development, demonstration, promotion and educational activities. Sourced from the imposed levies on petroleum products, the Fund also come from the government, the private sector, foreign governments and international organizations including the World Bank and ADB. Funds may be granted to individuals, businesses, NGOs and government agencies. As start up capital, in August 1992 the Fund received budget transfer of 1,500 million Baht (equivalent to US$ 37.5 million) from the Oil Fund. (ESCAP Report).

Main barriers to EE promotion in Thailand

EE is yet to be a priority in Thailand's energy policy. The major challenges and barriers for promoting EE are grouped as follows:

- Information and awareness barriers:
  - Strong public awareness: EE label or "Label#5" programme has been particularly successful since a project launched in 1993 by the Electricity Generating Authority of Thailand as a part of DSM programme. Nowadays, high EE fridges, ACs and CFLs can fully compete in the market and the first 2 products move to MEPS in 2004. Others 3 products are nearly designated in Ministry regulation for the requirement of MEPS.
  - Medium-high awareness in factories and commercial buildings section: there is still no fully confidence in the effectiveness of EE implementation evaluation esp. the estimated payback period. (The Thailand Research Fund, 2008)

- Investment-related barriers:
  - ESCOs have been receiving support from the Department of Alternative Energy Development and Efficiency to provide technical and financial support to the low-risk industrial and commercial sectors.
- Procedural and administrative barriers:
  - Period to process the EE label (by the Department of Alternative Energy Development and Efficiency) procedure would take approx. 60 days. Most of the time is spent for testing process in the test appliances' lab and EE label printing. Since the label cannot be copied by the manufactures themselves.
- Technical capacity barriers:
  - In 2009, the Department of Alternative Energy Development and Efficiency started to establish EE testing laboratories network which is now comprised 36 lab members (17 from universities, 5 from the government and 13 from the private sector). They have ability to test 8 products that have recently been designated under EE label program (under Ministry of Energy regulation).

VIET NAM

The economic growth of Viet Nam as measured in terms of its GDP between 2000 and 2007 has been impressive (see Table 1). Alongside, TPES and GDP energy intensity have also considerably increased. In order for Viet Nam to maintain a viable and sustainable economic growth pattern, it is critical that the country adopts sound EE and DSM policies, programmes and practices.

EE enabling legislation and policy

The Government has undertaken a series of laws, decrees, and decisions to implement its national EE Programme. The Prime Minister executed a decision to implement a major EE programme for the country called the Decision on Approval of the National Programme on EE&C. This Decision set forth a set of national targeted goals for the country to save energy: 3 to 5 per cent reduction in total energy consumption between 2006 and 2010, and 5 to 8 per cent reduction in total energy consumption between 2011 and 2015. These goals are set against a business-as-usual forecast as the base case. It should be noted that these goals come at a critical time when the average annual growth rate of energy from 1999 to 2006 was 12.4 per cent while average annual economic growth rate measured as GDP rate was only 7.2 per cent. This means that Viet Nam's energy intensity is increasing as well.

Additionally, in December 2007, the Prime Minister issued the Decision Approving the National Energy Development Strategy of Viet Nam for the period up to 2020 with an outlook to 2050. EE targets set forth in the Decision are joined by the following six components expected to form a strong foundation for a successful national EE programme:

- Strengthen the legislative framework;
- Increase public awareness through outreach campaigns and the education system;
- Develop EES&L for A&E;
- Establish EE programmes for industry;
- Implement EE in the design and operation of buildings; and
- Reduce fuel consumption and emissions in the transportation industry (APEC Energy Working Group, 2009).

Circular No. 08/2006/TT-BCN: Guidance on EE Labeling Process and Procedure for Energy Using Products (16 November 2006)

The Circular provides guidance on the procedures for registration, evaluation, certification and labeling for energy consuming products. It prescribes specific provisions concerning testing laboratory requirements, procedure for product certification, including preparation, registration application, file review, evaluation, re-registration, etc. The Circular also prescribes the relevant requirements for initial performance check, after-certification supervision of

products, and procedures applicable to suspension and revocation of EE certificates.

Decision No. 08/QD-BCN: Decision on Assigning the Implementation of National Target Programme on Economical and Efficient Use of Energy in 2007 (29 December 2006)

This Decision assigns tasks for the year 2007 to relevant offices and agencies that implement Decision No. 79/2006/QD-TTg. The Decision prescribes a lead unit, a cooperative unit, activities, expected results, expenses, and duration for every task.

Decision No. 80/2006/QD-TTg: Decision on Approval of Electricity Saving Programme for the period 2006 to 2010 (14 April 2006)

The Decision describes the detailed activities to meet the national target for the first five years of operation. The objectives of the programme for the first five years include: (1) Raising community's awareness and adopting the habit of electricity savings and effective use of energy; (2) Ensuring electricity savings and effective energy usage to guarantee stable electricity supply for production facilities and businesses, as well as households and minimizing interruptions and power outages. Among the key elements of this Decision is for the Ministry of Industry and Trade to issue a Circular on labeling high-efficiency electrical appliances.

Decree No.102/2003/ND-CP: The Government's Decree on Energy Conservation and EE (3 September 2003)

The Decree regulates the technological measures which can be applied to production units to improve their EE. It also describes the responsibilities of these units and that of key energy-consuming units in the industry sector. The Decree serves as Viet Nam's basic EE regulation. However, this is only a general statement without details and concrete requirements for its application.

Other EE legal documents

There are some other EE legal documents, such as:

- Circular of MOIT No 01/2004/TT-BCN guiding the EC&EE in production bases
- Circular of MOIT No 111/2009/TTLB/BTC-BCN guiding the electricity saving in the state agencies and public organizations

Major actors for EE promotion

Figure 2-30 summarizes the link among most important institutional stakeholders for EE promotion in Viet Nam. The Ministry of Industry and Trade is responsible for the supervision of the standards and labeling programme while the Ministry of Science and Technology is responsible for the development and approval of EE standards including testing procedures for the labeling programme.

Ministry of Industry and Trade

The Ministry is the primary stakeholder for Viet Nam's S&L programme. Under the national programme for EE, the Ministry was mandated to supervise all EES&L activities in Viet Nam. In addition to being the primary actor defining and implementing S&L policies, they also act as a key national counterpart for international finance organization projects related to EE issues (such as the World Bank, UNDP-GEF, and others).

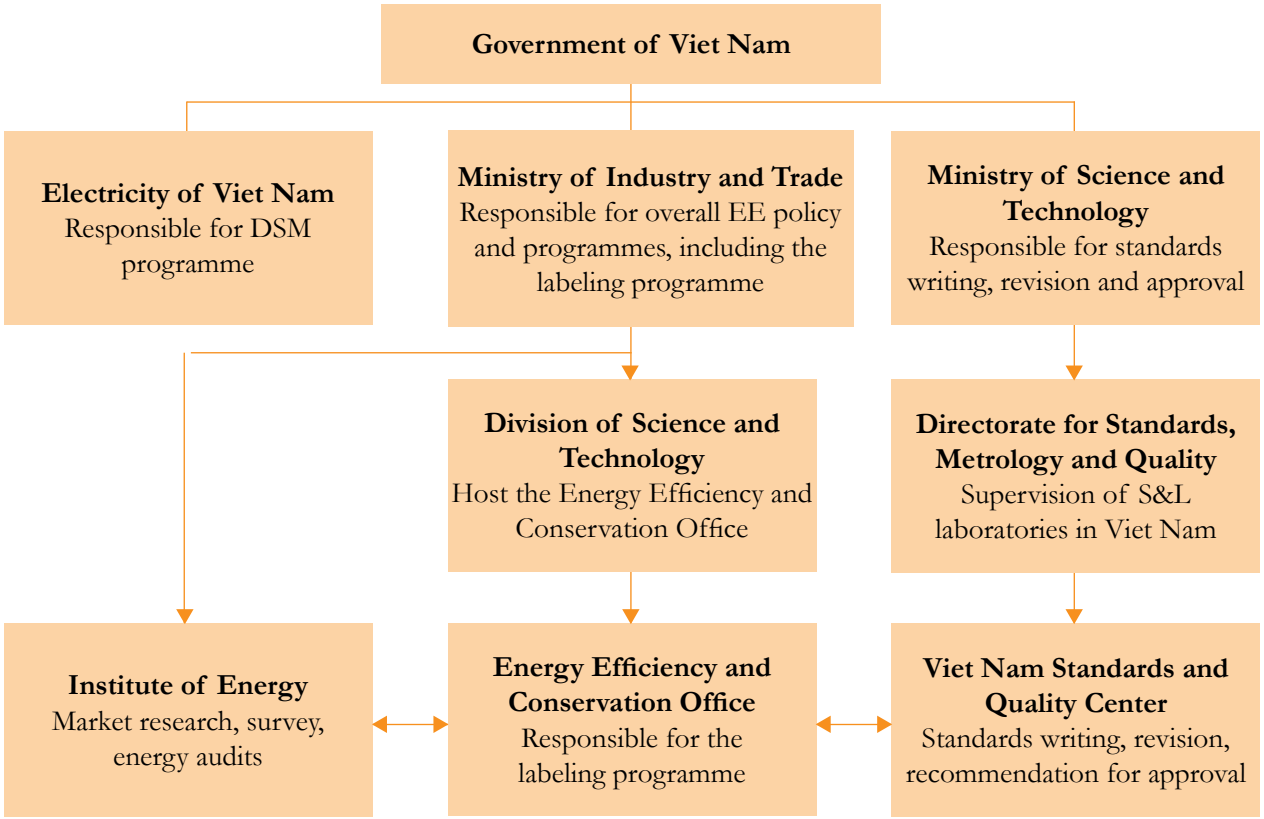
Energy Efficiency and Conservation Office

To strengthen the institution for energy efficiency improvement, this special agency was established under the Ministry of Industry and Trade on 7 April 2006. This agency is tasked to formulate, develop and implement energy efficiency and conservation policies and programmes, including endorsement and comparative EE labeling programmes.

Ministry of Science and Technology

The Ministry is responsible for the development and approval of national EE standards, including energy performance testing procedures. Within the Ministry of Science and Technology, one group named the Directorate for Standards, Metrology and Quality oversees all work related to standards, metrology and quality. The Directorate oversees the activities of the Viet Nam Standards and Quality Center.

Figure 2-30 | EE Institutional Framework of Viet Nam



Directorate for Standards, Metrology and Quality

The Directorate is an agency attached to the Ministry of Science and Technology which performs the function of State management over standardization, metrology as well as product and goods quality according to law provisions. Standards, accreditation, and legal and scientific metrology all fall within the remit of the Directorate.

Vietnam Standards and Quality Centre

This Center transposes internationally recognized test procedures and reviews EE levels that are to be used in the labeling programme and for future MEPS levels. This makes it the primary organization for the day-to-day development of Viet Nam's EE standards.

Electricity of Viet Nam

This state-owned utility, established in 1995, is engaged in generation, transmission and distribution of electricity in Viet Nam. It oversees various entities or business units grouped as either dependent (generation and transmission entities attached to the Electricity of Viet Nam accounts) or independent accounting units (distribution and supply entities detached from their accounts). In spite of strong government regulation of power tariffs, the Electricity of Viet Nam is capable of raising profits out of its operations and sourcing external funds (subject to approval of appropriate government agencies) for infrastructure development, network expansion, and human resource management. The utility has been implementing a national DSM programme since 2001.

Institute of Energy

The Institute of Energy is an energy research and planning institute established in 1989 under the authority of the Ministry of Industry and Trade. The Institute participates in market research activities to determine energy usage in Viet Nam and performs energy audits for different buildings and facilities (CLASP, 2008).

Selected EE programmes and projects in Viet Nam

Viet Nam National EE Programme 2006 to 2015

This programme is the first comprehensive plan to institute measures for improving EE in all sectors in Viet Nam. The programme includes a set of activities to encourage, promote, and propagate EE in the public. It aims to reach certain targets of energy saving and investment for the energy supply system. The programme has six components including state management on EE, education and information dissemination, high EE equipment, EE in industrial enterprises, EE in buildings, and EE in transportation. It has two phases. Phase 1 (2006 to 2010) aims to start up actively all components of the programme, while Phase 2 (2011 to 2015) aims to expand each component based on the lessons learned from Phase 1 (APEC Energy Working Group, 2009).

Viet Nam Energy Efficient Public Lighting 2006

This GEF project started in 2006, is executed by the Vietnamese Academy of Science and Technology. The project contains five components including public lighting policy development, public lighting technical support programme, public lighting financing programme, public lighting system demonstration programme, and information dissemination programme. The project seeks to reduce electricity consumption, decrease Viet Nam's contributions to global GHG emissions, enhance Viet Nam's national capacity to implement efficient lighting in general, and stimulate and accelerate transformation of the market for EE public lighting (United Nations homepage).

EE Programmes outside Viet Nam National EE Programme

Since 1995, the World Bank and other international institutions have supported the Government of Viet Nam in implementing various programmes and projects related to EE including financial packages and a variety of technical assistance to local agencies. Some of these large-scale internationally sponsored EE programmes in Viet Nam are summarized in Table 2-3.

Main barriers to EE promotion in Viet Nam

The key challenges and barriers for promoting EE in Viet Nam, according to Phuong Hoang Kim include:

- Inadequate information on potential EE improvements, costs and benefits of EE equipment, potential low low-cost measures, and new technologies and practices;
- Lack of technical expertise by end-users, manufacturers/suppliers and potential service providers on modern efficient technologies and practices, efficiency potentials, energy audits and inspections, actual performance of EE measures, limited understanding of third party EE services (e.g., ESCOs);
- High capital investment costs due to prevailing higher costs of EE equipment as well as limited local manufacturing capability which currently discourage end-users from selecting high-efficiency equipment despite their overall lower life-cycle costs;
- High project development costs due to audits and technical studies required to properly determine investment requirements and ensure appropriate project design, perceived risks of projects developed by auditors with limited track record, and technologies/equipment with limited tested performance under Vietnamese conditions;
- Lack of affordable financing due to a lack of commercial and lending culture in Viet Nam, weak banking sector and very limited term lending, restrictive lending terms, dominance of state-owned enterprises and dependence on public budgets for project investment capital, foreign capital requirements for imported efficient equipment, relatively small investment sizes for EE, and limited credit available to residential sector;
- Limited interest of end-users of energy efficient products due in part to production or core business priority bias, limited financial significance of the operating cost reductions from

Table 2-3 | Major EE Programmes in Viet Nam

Programme Name	Year	Sponsor	Implementing Agency
1. Viet Nam DSM – Phase 1&2	2000-2007	World Bank, SIDA and GEF	MOIT & EVN
1a. The Pilot Commercial EE Programme	2004-2009	World Bank and GEF	MOIT
1b. CFL Promotion Programme	2004-2007	World Bank and GEF	EVN
1c. Fluorescent Thin Tube Lamp Promotion Campaign	2004-2009	World Bank and GEF	EVN
2. Energy Conservation and Efficiency Programme for Viet Nam	1995-2001	Governments of Viet Nam and Netherlands, EU, SIDA, UNDP, US-EP UNDP and GEF	MOST
3. Promoting Energy Conservation in Small and Medium Scale Enterprises	2006-2010		MOST
4. Viet Nam Energy Efficient Public Lighting	2006-2010	UNDP and GEF	MOST
5. The Study on Master Plan on Energy Conservation and Effective Use in Viet Nam	2008-2009	JICA	J-Power, a Japanese consultant

Source: APEC Energy Working Group (2009), Peer Review on Energy Efficiency in Viet Nam, Final Report.

energy savings and the ownership of savings benefits from state owned enterprise/municipal agencies;

- Limited local energy efficient products and equipment given the current manufacturing capability within Viet Nam and low domestic demand for high high-efficiency products. Collectively, these issues have discouraged any sizeable investments in efficiency measures;
- Inadequate policy implementation capacity, untimely development and implementation of necessary regulations, circulars, supportive and control mechanisms and its enforcement;
- Lack of knowledge information, skills and coordination to promote and coordinate EE;
- Low energy prices: this situation obviously limits the demand for EE services; and
- Financial incentives such as tax or pricing incentives have to be emphasized in EE projects.

3

Good Practices and Case Studies

GOOD PRACTICES AND CASE STUDIES

INTRODUCTION

Increasing demand for energy, volatility in oil pricing, continuing energy-driven economic growth, and heightened concern about climate change require governments to provide adequate energy policy, instruments and programmes. Among these policies is the pursuit of EE aimed at reducing energy waste. EE has long been acknowledged as a win-win solution; however, the implementation of an effective EE programme requires an enabling environment. One of which involve strong institutions to inform and coordinate the actions of various strategic actors in the energy industry including consumers, producers, and local and national public authorities. While the formal distinction between an "institution" and an "organization" is understood (the former being an organization that has become an accepted part of the social fabric), the two terms are interchangeably used in this section.

EE institutions take several forms, structures and placements in the bureaucratic system. Their tasks are usually diversified. For example, some institutions carry out EE projects themselves while others create the conditions which allow projects and programmes to be executed. Regardless of their multiplicities, institutions are expected to provide maximum impact in terms of technical, economic, social, and environmental efficiency by promoting, supporting and facilitating the introduction of more energy efficient technology and strategies.

In addition to these varying roles, the capacity of EE institutions are also diverse. For instance, in the Organisation for Economic Cooperation and Development (OECD) countries, public bodies are existing, organized and well-functioning; whereas they are usually weak, unsystematic and cumbersome in most developing countries. To address the fragile structural conditions of these institutions, this section presents good practices and case studies in countries where institutions are perceived to be strong to locate alternatives and replicable practices.

In this section, the framework and arrangements of institutions engaged in the promotion of EE strategies and technology and their significant programmes are presented. Twenty-one institutional case studies were compiled and classified based on their geographic reach - national, regional, supra-regional and international - to provide examples in varying degrees of success from different locations. While the case studies mention nationally created institutions, we do not forget to accentuate regional conglomerations based on the growing prominence of cooperation initiatives in the international and global settings.

The institutions and their respective programmes showcased here have been selected to cover the different aspects of EE institutional arrangements and practices and elucidate the situation in and outside the ESCAP region. The objective is to generate observations and ideas for policymakers regarding the institutional methodologies for the implementation of EE practices to improve and strengthen EE institutions for a sustainable energy future in Asia.

The case studies can be used as a guide in identifying issues and collecting information that will be helpful in devising strategies to enhance institutional capacity and performance. This section is targeted at either a new institution or one at a turning point wanting to take stock and formulate a plan for addressing weak areas or gaps through learning from the experiences of the institutions selected. It is also geared towards a consortium of organizations. Possible applications may range from internal self-assessment of every

aspect of institutional functioning to the assembling of a few key impressions for others to learn from.

This section is primarily descriptive in nature (rather than analytical) trying to capture the major structural, organizational and performance elements of institutional frameworks for promoting EE. Because of the uniqueness of each institution, the section has used a presentation framework that is not mean to be analytic and prescriptive.

The Case Studies

The social science literature dealing with the constructs of organizational performance is quite scanty as pertains to energy institutions. Moreover, the process of evaluating institutions usually uses the concepts and methods from the social and behavioural sciences to assess current practices and find ways to increase their efficiency and effectiveness. An ideal evaluation goes beyond the usual summative approach to dealing with a measurement of the total impact of an organization's programmes, products and services ideally conducted in tandem with the subject institutions. While it is acknowledged that this indeed should be the 'right' way of doing things, inadequate resources limits us from doing so.

Institutions are normative structures. They are socially constructed, thus can be hardly understood outside of their contexts. For this reason, there can be no specific method for conducting institutional evaluations. Moreover, each institution is unique, grounded in a particular history, and housed in a distinctive culture. While almost all EE institutions are dealing with the same EE issues, a specific institution carries an oftentimes exclusive mission designed to serve the complex and unique needs of its own and distinct stakeholders. Dynamics is also a factor since circumstances and needs are on continuous evolution. Institutions, therefore, are never static entities. Given these conditions there is a need to temper over-generalization of issues or to apply blanket-style approaches.

These dynamics, uniqueness and limitations rationalize the adoption of a framework that will harness existing knowledge in order to yield practices that could be replicated. The relative importance given to the various factors in the framework used - and the way they are presented and assessed - will depend on the particular contexts in which the framework is utilized.

Concepts that are appropriate to a particular institution's stage of development and context are extensively used. These are, however, adapted and adjusted to fit the presentation and description process.

The framework encompasses the following three principal dimensions:

- Institutional motivation and capacity: This dimension involves a dynamic and on-going process by which people and systems in the institution develop, operate and implement strategies to meet their objectives for increased performance. This dimension includes institutional history, mission, culture, leadership, human resources and other core resources.
- Institutional programmes: This dimension allows the reporting and evaluation of programmes by emphasizing on the institution's flagship initiative. As data availability would allow, this dimension includes, among others, the evaluation of programme management, process management, and inter-institutional linkages.
- Institutional performance: The performance of organizations could be conceived as falling within three broad areas: performance in activities that support the mission (effectiveness), performance in relation to the resources available (efficiency), and performance in relation to long term viability or sustainability (adaptability and relevance).

Our a priori interest in this section of the publication is to see clear-cut results from the selected institutions. As such, the natural tendency is to intersect an

organization at the level of its "performance", made visible through its products, programmes and services. But before assessing these outputs, it is first necessary to gain an understanding of institutional motivation: its missions and goals, and insofar as possible, its culture. While it is interesting to delve into this factor, our current methodology impedes us to go deeper into evaluating organizational culture as it takes robust field observation to come up with a thorough assessment as to how performance is driven from within the organization, and how well the organization is fulfilling its mission.

Performance, which is of central importance in assessing organizational health, can be conceived as the fruits of organizational motivation and capacity made visible to the outside world. In the case of EE institutions, these fruits refer to their products and services as well as changes within the organization itself, such as its organizational resilience and adaptiveness over time in order to maintain relevance. Our framework, therefore, asserts that performance is a function of an institution's unique motivation and organizational capacity. However, we are not discounting key forces in the external environment which have a bearing on the institution's performance. For national EE institutions for instance, these external forces could include the host country's science/technology policy, the level (or lack of) basic infrastructure services, or pressing social and development problems in that country.

The framework used in this paper will work best only if performed in conjunction with various methods such as field testing and probing. While this is the ideal, we reiterate that our limited resources hamper us from doing so. Nevertheless, important considerations within each dimension in the framework and focused were utilized.

It is also important to note that the issues inherent in each institutional profiles are institution-specific and do not mean to encompass similar institutions. Making judgments about the available data (especially when judging whether performance is "good") is one of the most difficult aspects in these case studies. It is ultimately the reader's responsibility to accept or reject the analysis and judgments and decide whether to commit to making organizational change.

The case studies are structured based on a common outline that reflects our framework. While we exerted effort to collect as much data to cover the three principal dimensions mentioned in the framework, there are instances where some dimensions are simply absent. This can be attributed to the dearth (if not absence) of available data which brings us back to the desk review methodology used. The data provided in this section is mainly based from publicly-available information in websites, annual reports, catalogues, news items and brochures.

Lastly, the strengthening of capacity is a complex, problem-solving process, and one for which there is no single formula for success. It is apparent that there is no one-stop-shop solution to create a successful institution and that there is no single formula for strengthening capacity.

The choice of case studies in this publication was largely subjective. Whether these are indeed arrangements and practices worthy of replication is for the reader to consider. Using the case studies as guides, each institution must engage in its own analysis and formulate its own conclusions. The process of institutional evaluation advocated here should further empower those involved by helping them learn about their organizations and about strategies for supporting them.

NATIONAL INSTITUTIONS

AUSTRALIA: Department of the Environment, Water, Heritage and the Arts and Energy Efficiency in Government Operations

Institutional Background, Motivation and Capacity

In Australia, government operations consume 8 951 077 GJ of energy with associated greenhouse gas emissions of 1 703 710 tCO_2 equivalent (Energy Use in the Australian Government Operations, 2009:8). This takes EE improvement to the forefront of Australian Government's energy policy agenda. EE is expected to reduce the country's total energy consumption and help meet its GHG emission reduction targets. Henceforth, the Government adopted the green energy management paradigm i.e., providing the same or better energy service by using less or the same amount of energy (Department of the Environment, Water, Heritage and the Arts homepage, Energy Efficiency in Government Operations Policy, 2009). The Department has been in-charge of the Australian Government's EE programmes in the federal level since its creation in 2007. In addition to the Department core functions of developing and implementing national policy, programmes and legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture, it oversees EE operations in households and communities, appliances, equipment and fittings, business and industry, and buildings (Department of the Environment, Water, Heritage and the Arts homepage, 2009).

Institutional Programmes

The Australian Government aims to reduce GHG emissions from its own operations by adopting EE improvement measures and in doing so, lead the community by example. In 1997, the Australian Government devised a policy called "Measures for Improving EE in Commonwealth Operations." The policy was updated in 2006 into the "EE in Government Operations" (IEA and Department of the Environment, Water, Heritage and the Arts homepages, 2009). The 1997 policy was one of a number of GHG emission reduction policies in Australia's "Safeguarding the Future: Australia's Response to Climate Change" (IEA homepage, 2009).

The Energy Efficiency in Government Operations policy is aimed at improving EE, and consequently reducing the whole of life cost and environmental impact of Government operations. The 'whole of life cost' is a concept closely associated with life-cycle cost (Whole of life costs equal life-cycle costs plus after-purchase costs). The policy 'facilitates good energy management by setting out enhanced processes and frameworks that empower Australian government agencies to address EE in a holistic manner, manage their current energy budgets more cost effectively, and meet revised energy intensity portfolio targets.' The policy is set to reduce the energy intensity of Australian Government's operations by 2011 which include a 20 to 25 percent reduction in EE for offices (Department of the Environment, Water, Heritage and the Arts homepage, Energy Efficiency in Government Operations Policy, 2009).

While this policy applies to all Australian Government departments and agencies, it also encourages other public and private sector organizations to adopt a similar approach. The policy has the following key features:

- Achievable energy intensity targets and performance standards,
- Lease-based partnership management model,
- Enhanced value for money,
- Improved consistency across government,
- Flexibility to integrate other sustainability outcomes and reporting frameworks,
- Comprehensive education and awareness programme, and
- Practical tools to support implementation (Department of the Environment, Water, Heritage and the Arts homepage, Energy Efficiency in Government Operations Policy, 2009).

This updated policy retains the original emphasis on progressively improving overall agency energy performance through annual energy intensity reporting and minimum efficiency requirements. The policy comprises three major elements:

- Annual reporting of energy performance by agencies,
- Portfolio energy intensity targets by 2011, and
- MEPS for office buildings, appliances and vehicles.

The policy requires the preparation of an annual whole-of-government report on the total energy use and estimated GHG emissions of Australian Government departments and agencies. The reporting process is subject to public scrutiny through tabling of the report in the Australian Parliament (Department of the Environment, Water, Heritage and the Arts homepage, Energy Efficiency in Government Operations Policy, 2009).

Summing up, the policy,

- sets the strategy for Australian Government agencies to achieve revised energy intensity portfolio targets by the 2011 to 2012 financial year (Set at 7 500 MJ/person/annum for office tenant light and power; and 400 MJ/m2/annum for office central services).
- provides an enhanced proactive management framework for agencies to identify, monitor and manage their energy consumption by specifying MEPS in contracts, leases and other relevant documentation for new buildings, major refurbishments and new leases over 2 000 sqm (Generally 4.5 stars on the Australian Building Greenhouse Rating or equivalent scheme with exceptions if it is not practical or cost effective to achieve 4.5 stars rating or equivalent).
- actively engages all stakeholders through industry workshops and energy forums and assists them to identify the whole of life and environmental benefits of adopting EE initiatives.
- offers day to day support for agencies through a help desk function to clarify reporting requirements, EE advice and technical issues.
- includes a comprehensive communications and existing building strategy to identify and address misinformation about EE.

Secretaries of departments and heads of budget-dependent agencies are expected to report their annual organizational energy performance to their respective Ministers and the Department, and determine how they can most effectively adopt the minimum energy performance measures to meet their individual needs and the revised portfolio energy intensity targets.

Note: On 8 March 2010, EE and renewable energy functions of the Department of the Environment, Water, Heritage and the Arts were transferred to the Department of Climate Change and Energy Efficiency.

CHINA: Beijing Energy Efficiency Center

Institutional Background, Motivation and Capacity

In December 1993, China's Energy Research Institute, an agency of the National Development & Reform Commission, together with Battelle Pacific Northwest Laboratory, Lawrence Berkeley Laboratory of the United States and the World Wildlife Fund for Nature, founded the Beijing Energy Efficiency Center. The Center is a non-profit, independent non-governmental energy conservation and promotion organization administered by the Energy Research Institute. It has its own budget and accounting system, and independently undertakes its own activities.

The Center envisions itself as China's first class agency in research on energy conservation theory, policy and methodology, information dissemination, and technological extension. Moreover, it also aspires to support China's related energy conservation leading government agencies through major policy

consulting and technology support. It also hopes to become China's core agency bridging the governments of China and the United States, NGOs, and enterprises to encourage and carry out energy conservation activities, including the introduction of foreign advanced technologies, equipment, funds and energy management experiences. It is also aimed to broaden the channel for international cooperation and information exchange, and to promote energy conservation and environment protection in China. However, the ultimate purpose of the Center is to increase EE in the country.

The Center is composed of a consultative group, a council and a support staff. The consultative group is consisted of Chinese senior officials in-charge of energy conservation and environment protection. The council is composed of senior experts in related fields and officials with long connections with the Center. A twelve-member staff, eight of whom hold senior researching titles, is responsible for routine work, planning, management and actual implementation of projects. (Beijing Energy Center homepage, 2009).

Institutional Programmes

Since 1993, the Center's work on energy conservation has included more than ten foreign-funded research projects, market surveys and consulting projects. Among the Center's significant projects include:

- Energy Conservation and Promotion Project in China;
- Barrier Removal for Efficient Products and Systems in China, known as the China Green Lights Project);
- China End-Use EE Project);
- The Social/Economy/Energy Development and Carbon Emission Scenario Analysis for Mid-& Long- Term in China); and
- Energy Conservation Planning for the Tenth-Five Plan and Ten Years Beyond.

In this case study, we focused on the China Green Lights Project.

China Green Lights Project

Initiated in 1996 and started in 2001, the project was piloted in China to meet an overall objective 'to save energy and protect the environment by reducing lighting energy use in China in 2010 by 10 per cent relative to a constant efficiency scenario, and establishing a vibrant, self-sustaining market in efficient lighting products and services.' To meet this goal, the project has the following objectives:

- upgrading Chinese lighting products;
- increasing consumer awareness of, and comfort with, efficient lighting products;
- normalizing Chinese lighting products market; and
- promoting efficiency lighting projects.

Four strategies were eventually set up to meet these objectives, including:

- supply of high quality products,
- high awareness among consumer groups,
- regularized market and good investment environment, and
- dynamic policy guidance and adjustment.

The project received a total of US$26.20 million budget and was funded by a GEF Grant (US$8.1 million), the Chinese government (US$10.6 million), and the rest by enterprises and third parties (Best Practice for International Cooperation and China Green Lighting promotion project, IEA-China Seminar on EE Standards and Labelling, Beijing, China. 6-7 November 2001).

The UNDP implemented the project with a Project Management Office (PMO) especially created to handle its management and operations. The State Economic and Trade Commission chaired it. The institutional framework for energy conservation in China includes a series of specialized energy conservation units within national, provincial and county/municipal government agencies, operating under the Commission and its provincial and local affiliated commissions (Project Information Document. China Energy Conservation Project,

undated). The Commission had appointed a senior official as National Project Director who, in turn, was complemented by five to seven full-time personnel. For the technical development of the project, the Commission had established a project Advisory Committee consisting of key members of the programme, the Ministry of Finance and UNDP.

When the first China Green Lights Project concluded in 2005, the need to implement the project in a nationwide scale became imperative. Thus, it was broadened as a major national effort maintaining the same objective of addressing identified market barriers to wide spread use of energy efficient lighting in China. A more specific project goal is to save energy and protect the environment by reducing lighting energy use in China in 2010 by 10 per cent relative to a constant efficiency scenario (UNDP homepage, Project Description, 2009). Complementary to this goal is to increase exports of efficient, quality lighting products in order to bring down GHG emissions in China and help reduce energy use and GHG emissions worldwide.

Specifically, the project has five objectives:

- to upgrade the quality of Chinese lighting products;
- to increase consumer awareness of, and comfort with, efficient lighting products;
- to make quality, efficient lighting products more affordable to consumers;
- to increase the sales of efficient lighting products and services; and
- to establish a vibrant, self-sustaining market in efficient lighting products and services and associated supporting policies and services (UNDP homepage, Project Description, 2009).

The project has employed a strategy of Technology Push – increasing the supply of quality energy-efficient products – and Demand Pull – creating awareness of, and stimulating demand for, the products in order to achieve its goals (UNDP homepage, Project Description).

In gist, the project had targeted four beneficiaries, namely:

- Government agencies and institutions by strengthening their capacity to implement the Programme and similar EE initiatives using market-oriented measures to promote socially and economically beneficial products;
- Lighting manufacturers by training and exposing them to international manufacturing standards, and consequently by increasing and stabilizing sales of energy efficient lighting products;
- Consumers by improving the quality of light ing products which consequently reduced their energy bills; and
- Dealers and Lighting Designers by educating them about the benefits of energy efficient-lighting and how to sell these value-added services and products to their customers.

The four-year project was concluded in 2005, and has been expanded on a nationwide scale.

Institutional Performance

UNDP reported that the project was named as one of the ten key EE projects in China's five-year plan. In terms of total energy savings, the project activities claimed to have saved around 15.78 billion kWh which is equivalent to US$986 million savings in electricity costs in 2004. This brings to a total cumulative savings in lighting energy of 25.54 billion kWh (equivalent to US$1 596 million savings in electricity costs to the consumer) since it started in 2001. Around 4.9 percent reduction in lighting electricity use was recorded for 2003. In 2004, about 4.3 $MtCO_2$ emissions related to lighting were reduced which brought the cumulative reductions in carbon emissions to 6.8 $MtCO_2$ since 2001 (UNDP homepage, Project Description, 2009).

In terms of public awareness, the programme claimed an increase in the number of energy-efficient product users from 32.1 per cent in 2002 to 34.7 per cent in 2003. The project also included the development

and airing of two TV series which were later placed on CDs and distributed. Other awareness-raising activities included series of seminars, workshops and training activities. A bilingual website in English and Chinese was also launched to promote the project's presence to the Chinese public (UNDP homepage, Project Description, 2009).

Certification of lighting products was among the project activities. At the end of the project, more than 600 lighting products for eight different lighting product types from 46 firms were certified by the China Energy Conservation Product Certification Committee. It is also reported that the output of high efficiency lighting products had increased by 46 percent, while China's exports of high-efficiency lamps had increased substantially by approximately 40 percent from 2002 to 2003 (UNDP homepage, Project Description, 2009).

FRANCE: French Environment and Energy Management Agency

Institutional Background, Motivation and Capacity

Agence de l'Environnement et de la Maîtrise de l'Energie (The French Environment and Energy Management Agency) is an industrial and commercial public agency jointly supervised by the French Ministry for Ecology, Sustainable Development and Spatial Planning and the Ministry for Higher Education and Research. It is aimed at encouraging, supervising, coordinating, facilitating and undertaking operations to protect the environment and manage energy. Other priority areas of the agency include air, noise, transport, waste, polluted soil and sites, and environmental management.

In 2009, the Agency consisted of 820 employees; 44 per cent of them are engineers. It has three central departments (in Angers, Paris and Valbonne), 26 regional branches, three representative offices in overseas territories of France and one representative office in Brussels. The Agency has also forged strong collective agreements through established partnerships with all of France's 26 regions via framework agreements appended to government/ region framework contracts (The French Environment and Energy Management Agency homepage, 2009).

In terms of funding, the Agency has received €638 million for its budgetary requirements in 2009. Around €557 million was allocated for action budget toward delegated programme authorizations for intervention fund including funds for waste management, energy management, and research. The other €81 million are for operations (The French Environment and Energy Management Agency homepage, 2009).

The Agency's strategic research orientation for 2007 to 2010 has focused on the emerging fields of knowledge and technology, articulated in its ten main programmes. Of these programmes, seven are geared towards the development of technical and organizational options to reduce the pressure that humans exert on their surroundings. The three remaining programmes are aimed at acquiring the knowledge needed to conceive and implement effective public policies in the areas of energy management, renewable energy, waste, air quality, soils and noise pollution.

The Agency has liaised with the National Strategy for Sustainable Development of France to highlight the need for improving actions to prevent pollutions and manage energy. Adopted in June 2003, this national strategy aims to encourage socio-economic players to adopt sustainable-development integration strategies in their policies and activities. The national strategy requires the government to set the example by monitoring the economic, social and environmental impact of its actions and integrating sustainable development into its public policies and day-to-day procedures. Since its mission falls within this framework, the Agency aims to reinforce its expertise on sustainable development and become the point of reference and partner for the general public, companies and local authorities.

Institutional Programmes

Among the Agency's key missions is to implement France's national policy on the rational use of energy. This policy has long been paramount in France as a way to reduce its GHG emissions. The major challenges set within the scope of the country's energy policy are to manage energy demand, extend their range of technological sources of production and supply, develop research in the energy sector, and guarantee the provision of energy transportation and storage infrastructures.

In this regard, the Agency has formulated its five primary concern areas:

- to raise public awareness regarding the issue of sustainable development;
- to help in the development and implementation of action programmes;
- to assist companies, local and administrative authorities by developing environmental management procedures;
- to promote sustainable consumption by encouraging demand for and supply of environmentally friendly products; and
- to contribute to the implementation of the programme called "The State Sets the Example" which facilitates the adoption of ecologically responsible practices in all areas (purchasing policies, waste management, energy management, and mobility) by circulating information, promoting the sharing of experience, training government agents, developing practical tools and more (The French Environment and Energy Management Agency homepage, 2009).

In order for the Agency to achieve these concerns, it relies on its three main areas of expertise in

- science and technology (to seek out environmentally friendly solutions),
- expertise and advice (to guide decision-makers in their projects and choices), and
- results and experience in the field (pooled in the agency's own Resource Centre to promote the circulation of best practices).

It also has fostered a number of partnerships to support its initiatives with major corporations, local and regional authorities, NGOs, and counterpart organization located outside of France. The partnerships forged by the Agency with these groups have taken the forms of collaborative efforts in one of the agency's areas or on a means of involvement, general and cross-sectoral framework agreements, and co-founded organizations (research foundation, scientific interest groups, bank funds, etc).

Given these wide array of resources, experiences and partnerships, the Agency situates its programmes, projects and initiatives in the following ways:

- Orienting, managing and financing research programmes to spur technological innovation in the fields of energy and the environment
- Providing expert advice (technical and financial) to companies, public authorities and individuals to help them choose the solutions best suited to their needs.
- Developing practical tools and disseminating best practices of model initiatives it has financed to help spread the most effective practices and best technologies.
- Offering grants and comprehensive project guidance to provide support for implementing projects and installations that seek to manage energy consumption more effectively.
- Providing training, information, communications and awareness-raising initiatives to guide companies, public authorities, NGOs and the general public in changing their behaviour.

To achieve EE in France, the agency operates in four ways:

- support research programmes on clean, economical transport systems (electric vehicles, biomass fuels, particulate filters and so on), EE of buildings (including heating, hot water, cooling, ventilation and lighting systems) and new energy technologies;
- provide financial and technical assistance for feasibility studies that enable developers to deploy more efficient energy solutions;

- promote the implementation of illustrative, motivational operations regarding the efficient use of energy, making these operations known; and
- give the general public specific information on existing technologies (white goods labelled "low consumption", energy-efficient boilers, individual solar-powered water heaters, heat pumps, insulation techniques, room thermostats and "green" tires and fuels) and energy-saving best practices through the agency's "Espaces Info'Energie" (Energy Info Points). It has also been publishing and circulating informational brochures, organizes communications campaigns, devises educational materials to keep the general [public informed on all sustainable development issues. In 2009, the Agency has launched its three-year campaign – dubbed "There's no time to lose - things are heating up" – to rally public support on the issue of saving energy (The French Environment and Energy Management Agency homepage, 2009).

The Agency's activities in the energy field mainly target national and regional cooperative efforts. The agency provides its expertise, campaigning resources and funding to various partners, including local and regional authorities, companies, government bodies, consumer associations, banks, research bodies, and industry professionals

Institutional Performance

Perhaps, the Agency's notable achievement is with regards its ability to forge alliances. It is not only concentrated in France but also has an established strong presence at the European and world levels where it is a key player in the area of sustainable development. Among its efforts include:

- the implementation of European policy on energy conservation and the development of the European research centre in the energy and environmental sectors;
- membership to Club E^{n}R;
- cooperative efforts in Mediterranean region (the Agency has enjoyed long-term relationships with its counterparts in Algeria, Morocco, Tunisia and Lebanon, and is a member of the Mediterranean Association of National Energy Management Agencies.); and
- cooperation with developing nations particularly those in French-speaking Africa and Asia as part of the international framework agreements on sustainable development and the fight against climate change.

Partnerships with several groups committed to sustainable development include:

- a partnership with France's Professional Association of Car Manufacturers to reduce greenhouse gas emissions;
- as part of the "Club Planète Gagnante" ('Save the Planet Club') in order to promote the "Energy savings: let's act fast – it's heating up" campaign;
- partnership within the framework of the Eco-Business Export Plan whose aim is to promote the international development of eco-friendly French companies;
- partnership with France's National Institute for the Industrial Environment and Risks and the Agricultural and Environmental Engineering Research Agency to support research and development; and
- partnership with France's SME Development Bank and Charbonnage de France, in implementing guarantee funds for investments in energy management.

JAPAN: Energy Conservation Center

Institutional Background, Motivation and Capacity

Established in 1978, the Tokyo-based Energy Conservation Center, Japan functions as the country's hub for promoting energy conservation. The Center contributes to promoting the efficient use of energy, protection of the global warming and sustainable development.

Within the Center, a unit called Asia EE&C Collaboration Center was established in 2007 to promote EE and conservation in Asian countries through international cooperation. The Collaboration Center provides one-stop window service for a variety of inquiries about Japanese EE&C and related issues.

The Center maintains 122 employees as of 2009 and receives around 1.68 billion yen to fund its operations. Organization-wise, the Centre has a Chairman, a President, three Managing Directors, 25 Directors, two Auditors, and 30 Councilors. It has 2 719 supporting members as of May 2009 (Energy Conservation Center, Japan homepage, 2009).

Institutional Programmes

The Center leads Japan's EE initiatives by supporting projects, lectures, exhibitions, and promotion. More than a third (38 per cent) of its resources is being spent to subsidize projects including:

- energy conservation diagnosis training,
- technical intelligence support for green logistics partnership,
- ESCO programme supporting subsidy,
- idling-stop vehicle subsidy, and
- international cooperation.

More than a quarter (27 per cent) is spent for other projects such as:

- surveys and analyses of factories and work-places,
- promotion of EE and conservation in buildings,
- presentation of successful cases on EE&C,
- information provision on qualified person for energy management,
- energy-saving labeling programme,
- international Energy Star Programme,
- Energy Conservation Grand Prize,
- promotion and surveys on Eco-Drive, and
- promotion of EE and conservation in developing countries.

Other resources are spent on activities including publishing, public lecture courses, International Energy Exhibition exhibition, and energy-saving promotion goods.

Top Runner Programme

Japan's Top Runner Programme is considered the Center's flagship initiative that cuts across the commercial, residential and transportation sectors. While MEPS enhances the EE of electrical appliances in many countries, Japan has followed a different strategy. Instead of setting a minimum efficiency, the country looks for 'the most efficient model on the market and then stipulates that the efficiency of this top runner model should become the standard within a certain number of years' (Wachter, 2006). This approach is done through its Top Runner Programme

In 1999, the Programme was developed based on three rationales (Japan's Energy Conservation Law, lack of domestic energy resources, and the signing of the Kyoto Accords) and has been applied to machinery and equipment in the residential, commercial, and transportation sectors (Energy Conservation Center, Japan homepage, Top Runner, 2009).

The Top Runner Programme sets targets by product category (such as cars, TVs, air conditioners, etc). Targeting works this way. In each category, the most efficient model currently on the market is used as a benchmark to be attained within four to eight years. At the end of the target year, each manufacturer must ensure that the weighted average of the efficiency of all its products in that particular category is at least equal to that of the top runner model. This approach has three effective results:

- the elimination of the need to ban specific inefficient models from the market,
- making manufacturers accountable, and
- the voluntary development of products with even higher efficiency than the top runner model (Energy Conservation Center, Japan homepage, Top Runner, 2009).

A committee composed of representatives from Japan's manufacturing industry, universities, trade

unions, and consumer organizations set the standards by following well-defined, but flexible, procedures. This flexibility ensures that the Programme is not limiting consumer's choice. For example, if the pay-back ratio of newly developed products complying with the standard becomes too low, two separate categories may be created: one for the expensive, highly efficient models, and one for the reasonably priced, low energy models (Energy Conservation Center, Japan homepage, Top Runner, 2009).

The EE Standards Subcommittee, established under the Advisory Committee for Natural Resources and Energy, deliberates 'Top Runner Standard Values.' These discussions include technical deliberations on details of standards for individual machinery and equipment products. If situation warrants, working groups are established in the preparatory stages prior to the establishment of subcommittees to carry out studies concerning whether the subject machinery and/or equipment are potential Top Runner Target machinery and equipment. The working groups also conduct studies concerning energy consumption efficiency measurement methodologies. To be considered, the machinery and equipment must meet three requirements in principle: it is used in large quantity in Japan, it consumes considerable amounts of energy while in use, and it requires particular efforts to improve its energy consumption efficiency. In addition to these requirements, market trends and other factors are also considered.

Institutional Performance

Since 1999, Japan's Top Runner Programme has expanded from 10 to 21 product categories (Energy Conservation Center, Japan homepage, Top Runner, 2009). The real power of this programme has something to do with maintaining a company's brand image which can be put to risk if it is not able to meet targets or fails to make a good faith attempt at reaching the standard in spite of several warnings. Failure to reach the standard is publicized, and with Japanese culture on corporate pride, this is something each company will make considerable efforts to avoid.

Consumers, in turn, are also made to assume a certain level of responsibility by a labeling system. Individual products that do not meet the target are not withdrawn from the market; instead they receive an orange label, in contrast to a green label for the models which do achieve the top runner standard.

The Top Runner Programme imposed the effort to meet certain targets on manufacturers of machinery and equipment. Thus, energy conservation is seen to advance through replacement of machinery and equipment by consumers who will opt for more energy efficient product. A consequence however has something to do with pricing as a result of new technological development. This is however compensated by current conditions in Japan whereby consumer interests are high in equipment functionality. Thus, there is currently steady progress being made in the shift to products with higher efficiency.

Since its introduction in 1999, the Top Runner Programme has been successful in making manufacturers in each product category attain efficiency improvement that exceeds initial expectations (Energy Conservation Center, Japan homepage, Top Runner, 2009).

REPUBLIC OF KOREA: Korea Energy Management Corporation (KEMCO)

Institutional Background, Motivation and Capacity

The Korea Energy Management Corporation (KEMCO) is a government agency responsible for the implementation of energy conservation policies and EE improvement measures in the Republic of Korea. Established in 1980 by the Ministry of Commerce, Industry and Energy under the "Rational Energy Utilization Act", the primary function of KEMCO is to provide nation-wide energy management services that vary from technical and financial support to administrative services. KEMCO is headed by a Chief Director who oversees various teams which

include energy and climate measurement, energy management, low carbon energy, and renewable energy. The Chief Director also oversees eight regional energy and climate change centres located across the Republic of Korea.

Currently, KEMCO seeks to create an energy culture to improve EE, and to develop & disseminate what it calls "next generation energy." KEMCO brands this as "the creation of an Enertopia" (Enertopia aims at leaving a land of clean energy and green environment to the next generation) wherein rational energy conservation programmes are being implemented toward a sustainable development that harmonizes energy, economy and the environment. To meet this energy culture, KEMCO has been doing its business in various ways, including:

- energy savings in buildings,
- countermeasures against climate change,
- energy savings in transportation,
- renewable energy,
- inspection of heat-using machines and equipment,
- energy audit,
- ESCO,
- support in the form of funds and tax incentives,
- energy savings through partnership,
- VAs, and
- energy standards and labelling (S&L) (KEMCO homepage, 2009).

KEMCO works by involving itself on a variety of activities which include

- energy audits and surveys,
- research and development,
- demonstration and dissemination of technologies on energy and mineral resources,
- promotion of EE,
- commercialization and diffusion of higher-efficient energy appliances,
- energy-saving programmes by sector of energy use, and
- climate change mitigation efforts.

Institutional Programmes

KEMCO implements various projects aimed at rationalizing energy use in response to climate change through programmes, projects and initiatives that enhance energy use efficiency (KEMCO homepage, 2009). Among these are:

- Building Certification System. In response to climate change, investments in energy savings technologies, and improvement of energy saving perception, this form of KEMCO business has adopted a system approach to provide objective information on building energy performance for construction project implementers, project owners, building users and other stakeholders. The buildings covered by the KEMCO system include apartments consisting of eighteen or more units. KEMCO serves as the operating organization for the system with Ministry of Knowledge Economy as the Certification organization. Evaluations are carried out by KEMCO together with the Korea Institute of Energy Research and the Korea Institute of Construction Technology. Certification are divided into two: preliminary certification which provides the EE grade of the applicant building based on the result of evaluation performed in the design stages; and final certification based on the result of the final evaluation performed through the final design and field surveys.
- Countermeasures against climate change. In light of the climate regime, KEMCO has been gathering GHG statistics, registering GHG reduction records, analyzing the feasibility of utilizing CDM projects in the Republic of Korea, and analyzing the possibility of utilizing guidelines and systems related to GHG amount calculation, CDM projects, etc. to support industries in their response to climate change efforts. KEMCO has also been involved with international cooperation on EE including participation to the APEC Expert Group on EE&C, Implementing Agreement on Efficient Electrical End-Use Equipment (Note:

This is one of the execution agreements of IEA which seeks to promote the adjustments and development of policies of various countries through collaborative research and forums aimed at enhancing machine efficiency), and the APEC Energy Standards Information System.

- Energy Savings in Transportation. This initiative has involved a fuel efficiency grade indication system for car manufacturers to indicate the energy consumption efficiency of each car they manufacture, information on the grade given based on the efficiency, and emission amount for CO_2 as a representative of GHG.
- Energy Audit. KEMCO executed the law which made mandatory the conduct of energy audit once every five years in businesses which use energy of 2 ktoe or more.
- ESCO Project. KEMCO has also been on the ESCO business, a system which enable energy users wishing to replace or supplement their existing energy with facilities for efficient energy saving.
- Support in the form of funds and tax incentives. This system allows for a deduction in the amounts invested by any corporation or individual in any of the energy saving facility. The deduction was set at 20/100 of the relevant investment.
- Energy Saving through Partnership. This programme enables industrial companies to share new energy saving technologies and information with each other through the partnership Council. It is designed to reinforce the competitive ability of industry to seek EE improvement solutions through research, analysis and common application in the field of emerging technologies. The programme's major activities have included: regular conferences on practical technologies, workshops, and continuous information exchange through the Partnership homepage.
- VA. This is a non-regulatory measure wherein energy suppliers or consumers conclude agreements with the government. In this system, businesses present and achieve their energy saving goals while the government provides support in the form of funds and tax incentives.
- Energy S&L. KEMCO operates EE programmes and projects which include promotion of high efficiency equipment, identification method for energy savings products, and support to government programmes. Together with the Ministry of Knowledge Economy, KEMCO operates three EE programmes: the EE S&L Programme, High-efficiency Appliance Certification Programme, And e-Standby Programme.

Energy S&L

The EES&L Programme is aimed at rating high energy consuming products. All Korean manufacturers are subject to this programme and those which fail to reach the MEPS are prohibited to manufacture and sell. An EE Label (graded 1 to 5) is attached to products. The programme seeks to save energy by enabling consumers to identify the high efficiency energy saving type products easily and accordingly. Savings of up to 30 per cent to 40 per cent of energy are expected from using first grade products. The purpose of this MEPS programme is to prohibit the spread of low efficiency products and to promote manufacturers' technical development by setting up and controlling the minimum required efficiency standard.

The High-efficiency Appliances Certification Programme seeks to single out products that perform above certain standards. Certified products may bear the High-efficiency Equipment Label and certificates are also issued. The programme is directed toward 41 types of products. The e-Standby Programme promotes the widespread use of energy saving products in the home and office that decrease standby power consumption. Electronic appliances consume standby power while they do not perform their main function. This accounts for 10 per cent of all household energy consumption in Korea

(Economy Report on Specific EE Programme/Policy, submitted by Korea, APEC, 2008). The products that meet the energy saving standard suggested by the government are entitled to bear the Energy Saving Label nicknamed "Energy Boy" (Certification and Accreditation Administration of the People's Republic of China Homepage, 2009).

In April 1999, Korea became the first country to introduce mandatory Standby Power Warning Label in the world. Specifically directed toward 22 types of office equipment and home electronic products, KEMCO in tandem with the Ministry of Knowledge Economy, has been applying this labeling effort to save standby power. The e-Standby Programme is managed according to the long-term road map called "Standby Korea 2010." Standby Korea 2010 details the three stages of the "1W initiative" designed to reduce standby power usage to below 1W by 2010. Stage 1 involves the "Voluntary 1W Policy" (2005 to 2007) where manufacturers were encouraged to adopt the standard under their own volition; Stage 2 is the "Preparation for Transition to a Mandatory 1W Policy" (2008 to 2009) where manufacturers are prepared to adopt the standard as compulsory; and Stage 3 is the "Mandatory 1W Policy" (from 2010) will be implemented as the final stage.

Initially, e-Standby was a VA programme where manufacturers guarantee energy-saving capacities of their products under the mutual confidence between them and KEMCO until it was made mandatory in 2007 through amendments made to the Rational Energy Utilization Act. Products with the Energy Boy label claim to have saved from 30 to 40 per cent more energy than ordinary products. Since 2008, Warning labels have been attached to products that do not meet the standby requirements (APEC Energy Standards Information System homepage, S&L Programmes for Modems in Republic of Korea, 2009).

Institutional Performance

In its 2008 Submission to the APEC-Expert Working Group Meeting in Peru, the Republic of Korea, through KEMCO, has reported that its e-Standby programme has conserved annual energy equivalent of 1 100 GWh (US$11.5 million), and accounted for 530 000 tC per year. The e-standby Programme claims to have provided energy savings benefits to consumers, improvements in technology competitiveness, minimum cost burdens to manufacturers through improving efficiency of energy use, as well as with dealing climate change challenges and energy intensity in the Republic of Korea (Economy Report on Specific EE Programme/Policy, submitted by Korea, APEC, 2008).

NEW ZEALAND: Energy Efficiency and Conservation Authority

Institutional Background, Motivation and Capacity

In New Zealand, energy demand increases at around 2 per cent more each year as its population and economy grow. Making the most out of EE opportunities means reduction in this growth. The New Zealand Energy Efficiency and Conservation Authority is the mandated government body to 'encourage, support, and promote EE&C, and the use of renewable sources of energy in New Zealand.' It is a Crown Entity established by the New Zealand Energy and Conservation Act of 2000. The passing of the Act provides the legislative basis for promoting EE, energy conservation, and renewable energy. The Authority is focused on delivering significant energy savings to New Zealanders, and making wise use of their abundant renewable energy resources (Energy Efficiency and Conservation Authority homepage, 2009).

The Authority reports to the New Zealand Ministry of Energy and Resources. It is governed by a Board of eight members who are appointed by the Minister of Energy and Resources. Members of the Board are responsible for the supervision and direction of the Authority, including the long-term strategic financial plan, strategic initiatives, budgets, and the policy framework. The Board is also responsible for

the Energy Efficiency and Conservation Authority Statement of Intent and the Purchase Agreement with the Minister of Energy and Resources, which sets out what the Authority will deliver with the funding allocated to it. The normal Board membership term is three years. Under the Act, it is mandated to assist the Minister of Energy in the preparation and administration of New Zealand's National EE&C Strategy. The first five-year Strategy was released in 2001 and consequently updated and published as New Zealand EE&C Strategy in 2007. The Strategy was updated with inputs from a number of government agencies, local government, and businesses. It sets out the action plan for EE&C actions, and assigns responsibility for the delivery of each action to a central or local Government agency. The Authority's work programmes are guided by the goals of the Strategy (Energy Efficiency and Conservation Authority homepage, 2009).

Institutional Programmes

In making changes in energy use and consumption in business and at home, the Authority provides New Zealanders with a kit of information, tools, and support they need to make such changes. In doing this, the Authority works with many partners which include the private sector, community groups, industry associations, and central and local governments. It also undertake a number of different research projects to make sure it understands the New Zealand situation and the opportunities for greater uptake of EE and renewable energy that are available.

ENERGYWISE™

The Authority's research shows there is a lack of information for the public on EE&C and renewable energy. This lack of information is a major barrier to the uptake of EE (Energy Efficiency and Conservation Authority homepage, 2009). The ENERGYWISE™ information programme targets this gap.

ENERGYWISE™ is the Authority's consumer programme that provides information and funding for householders so they can make the most of EE&C and renewable energy. The programme is aimed to serve a threefold objective, that is, to:

- explain the benefits of EE&C and renewable energy;
- motivate people to take action; and
- show householders and consumers how to take action easily (Energy Efficiency and Conservation Authority homepage, 2009).

The programme provides New Zealanders with

- general home EE information;
- information on government funding available for home insulation retrofits, clean heat and other EE solutions;
- information to help consumers improve their energy choices (for example, purchasing and running home appliances); and
- information on energy labeling schemes, such as Energy Star (Energy Efficiency and Conservation Authority homepage, 2009).

Institutional Performance

The Authority reports that the EE improvement in New Zealand has helped offset its energy demand growth. About 34 per cent of the increased demand for energy services was met through improvements in EE. Nearly two thirds of the efficiency gains came from the industrial and agricultural sectors; the balance is spread across the commercial, residential and passenger transport sectors. These gains in EE come from: improvements in technology, better systems and processes, better information, changing behaviour, and benefits from efficiency and conservation (Energy Efficiency and Conservation Authority homepage, 2009). Furthermore, EE has been delivering a number of benefits. These include: affordability of overall energy costs for businesses and families, increased productivity for businesses with better international competitiveness, a more secure electricity system, reduction in carbon emissions, health benefits for people who are living in houses that are warmer and drier, and more jobs created (Energy Efficiency and Conservation Authority homepage, 2009).

SINGAPORE: Energy Efficiency Programme Office

Institutional Background, Motivation and Capacity

Formed in 2007, the EE Programme Office is Singapore's lead agency tasked to improve the city state's EE. It is a committee composed of several agencies led by the National Environment Agency and Energy Market Authority. Other committee members include the Economic Development Board, Land Transport Authority, Building and Construction Authority, Housing and Development Board, Info-comm Authority of Singapore and the Agency for Science, Technology and Research. The Ministry of the Environment and Water Resources and Ministry of Trade and Industry are also represented at the committee.

To develop a holistic EE strategy for Singapore, the Office has identified the following areas for action:

- addressing market barriers to EE,
- capability building and developing local knowledge base,
- raising public awareness, and
- supporting research and development (EE Programme Office, 2009).

Institutional Programmes

The initiatives of the Office have been targeted at households and businesses. These include the 10 per cent Energy Challenge where households are encouraged to reduce about 10 per cent of their household energy consumption in five years (EE Programme Office homepage, 2009).Other programmes include: Energy Smart Building Labelling Programme, the Green Mark Scheme, Fuel Economy Labelling, ESCOs Accreditation Scheme, and the CDM Grant.

- The 10 per cent Energy Challenge. In Singapore, energy labeling is imposed as mandatory for air-conditioners, refrigerators and clothes dryers. The 10 per cent Energy Challenge is a challenge for Singapore's 1.12 million households to cut their energy usage by 10 per cent. This underscores Singapore's key focus in raising awareness amongst its residents on energy conservation and stimulating the adoption of an energy efficient lifestyle as part of their daily lives. The 10 per cent Energy Challenge enables anyone who cuts his home energy consumption by 10 percent between May and August 2008 to stand a chance to win prizes. Singapore has also invited appliance makers to become partners in the campaign. In 2009, there are four retailers and twelve suppliers which have become "10 per cent Energy Challenge Partners" (EE Programme Office homepage, 2009)
- Energy Smart Building Labelling Programme. The Energy Sustainability Unit of the National University of Singapore and the National Environment Agency developed this building label programme to promote EE and conservation in Singapore's building sector by giving due recognition to energy efficient buildings. In addition to energy performance, other factors are considered including indoor environmental conditions (thermal comfort, ventilation, air quality, and lighting level). The label, however, expires in three years. Like other building labeling programmes, Singapore's Energy Smart Buildings expect benefits to range from energy savings due to efficient energy management, higher occupant satisfaction, and enhanced corporate image. In relation to this programme, the Energy Smart Tool was launched in 2005 to provide a benchmarking system for the online evaluation of office and hotel buildings' energy performance. The tool allows building owners to review the building's energy consumption patterns and compare these to industry norms (National University of Singapore, Energy Sustainability Unit, Energy Smart Tool homepage, 2009).
- The Green Mark Scheme. Launched in 2005 by Singapore's Building and Construction Authority, this scheme is aimed at promoting sustainability in the built environment

and raise environmental awareness among developers, designers and builders throughout the entire project cycle (Building and Construction Authority homepage). The scheme functions as a benchmark to differentiate buildings in the real estate market which consequently produce a positive effect on their market values.

- Fuel Economy Labelling. Under Singapore's Environmental Protection and Management Act, a Mandatory Energy Labelling system was started in 2008. The system requires registrable goods to carry energy labels (National Environment Agency homepage, about mandatory fuel economy labelling, 2009).
- ESCOs Accreditation Scheme. Singapore acknowledges the role of ESCOs in promoting growth in its energy industry. The accreditation of ESCOs is aimed at enhancing their professionalism and quality of the services they are offering (National University of Singapore, Energy Sustainability Unit, ESCO Accreditation Scheme). This initiative seeks to benefit in terms of developing professional energy engineers, enhancing the standing of ESCOs particularly in energy audit, supporting procurement and selection procedures in ESCOs, support public sector incentive schemes, and reducing wastage and false claims amongst industry players. A Guideline for the assessment and accreditation of ESCOs is also formulated.

(Note: The Guideline can be downloaded from the National Univesity of Singapore Energy Sustainability Unit homepage).

Institutional Performance

Spearheading Singapore's EE movement in the public sector is its Ministry of Environment and Water Resources building. The building put up several measures including optimization of pumps and cooling towers, improvement in its ventilation system, and installation of carbon dioxide sensors for the basement car park, among others. These measures were implemented under a Shared Energy Savings Performance Contract where an ESCO financed the project cost. Performance contracting is an arrangement under which an ESCO is engaged to review the energy consumption of a building or facility and to identify measures that will achieve energy savings. Since the ESCO guarantees the level of savings, it therefore assumes the technical risks of implementing the measures. In this project, for instance, estimated payback period for the improvement is five years with annual savings estimated at S$55 000 (EE Programme Office homepage, 2009).

Through the implementation of the energy conservation and efficiency measures identified by the ESCO, companies have also reaped significant energy and cost savings. For instance, an ESCO has assisted the Singapore Post Center, a recipient of the ASEAN Best Practices Awards, in realizing an estimated annual savings of S$1.2 million and a reduction of around 2,500 tC emissions from merely improving its chiller plant system efficiency. It undertook the following measures: replacing three of its existing chillers, and optimizing its pumps and cooling towers. The retrofit costs S$2 million which puts payback period to less than two years (SingaporePost, 2008).

UNITED KINGDOM: Energy Savings Trust

Institutional Background, Motivation and Capacity

Formed in 1992, Energy Savings Trust is an independent, non-profit making, UK-based organisation focused on promoting action that leads to the reduction of carbon dioxide emissions - a key contributor to man-made climate change. The Trust acts as a bridge between government, consumers, trade, businesses, local authorities and the energy market.

The Trust envisions a future that every home is a low-carbon home and everybody leads a low-carbon lifestyle by:

- taking energy-saving behaviours,
- buying the most energy-efficient products,
- fitting homes with energy-saving measures,
- making sustainable travel choices,
- choosing renewable energy, including micro-generation, and conserving water, reducing and recycling waste (Energy Savings Trust homepage, 2009).

EST is one of the country's leading organisations set up to mitigate the damaging effects of climate change. They work in concert with organisations and groups in tackling this issue both in the public and private sectors. Essentially, the Trust's main objective is to help in reducing carbon dioxide emissions by helping people take action to reduce carbon it their homes and lifestyles: promoting the need for action, providing information and advice on what they should do, and offering practical support to help them do so through our advice centres and website, through the media and through communities (Energy Savings Trust homepage, 2009). They accomplish these tasks by providing people a range of advisory services that are delivered at a local level. These information and advice are available through the Trust network of local advice centres in the country specifically designed to help consumers take action to save energy.

Aside from advising, the Trust also supports manufacturers and retailers to deliver low-carbon technology and energy efficient products. It also helps builders and suppliers to build low-carbon homes and improve existing housing. Moreover, it advises governments on policies needed to create a low-carbon society. They are not tied to any particular commercial organisations or driven by political or corporate motivations (Energy Savings Trust homepage, 2009).

The Trust maintains regional structure in England and teams in Scotland, Wales and Northern Ireland. This approach is aimed at delivering not only countrywide programmes on a country and regional basis, but also country-specific programmes. This structural arrangement helps the Trust to offer people help tailored to their home type, circumstances and household budget.

The Trust, being an independent company, gets its funding from three sources:

- the government (including the Department for Energy and Climate Change and the Scottish Executive),
- devolved governments, and
- the private sector (Energy Savings Trust homepage, 2009).

The Trust counts among its members the following. From the government:

- The Secretary of State for the Energy and Climate Change,
- The Secretary of State for Transport,
- The Secretary of State for Northern Ireland,
- The First Minister for Scotland, and
- The Welsh Assembly Government.

From the private sector, membership include:

- BG Group plc,
- BG Microgen,
- BP Oil UK Ltd,
- Centrica plc,
- EDF Energy plc,
- Innogy plc,
- Johnson Matthey,
- National Grid Transco plc,
- Northern Ireland Electricity,
- Phoenix Natural Gas,
- Powergen plc,
- Scottish and Southern Energy, and
- ScottishPower plc (Energy Savings Trust homepage, 2009).

The Trust also acknowledges that the increasing environmental responsibility is a significant concern not only for the government and citizens, but also for businesses and local governments thus, it has embarked on a number of partnerships with SMEs and local governments to promote energy saving

messages to their customers and staff. The Trust accomplishes this in various ways: helping businesses by greening their cars and/or fleet and helps them to engage their employees to take environmental action; certifying efficient products and services and helping those who manufacture, sell, or install these become available to consumers; developing and delivering policy, promoting the need for action and providing practical support for the government and the community; and providing advice and support on what action to take for individuals and other people who are part of the community.

The Trust provides a number of advantages. It has a network of local advice centres based across the country which means that it is uniquely placed to offer individuals advice and support on environmental issues specific to their personal and local circumstances. The Trust, being an independent organisation, can provide specially made statistics and facts about saving energy, generating renewable energy, sustainable transport, water conservation and waste reduction that have been verified and are trustworthy. It has a wealth of experience in evaluating the carbon reduction effectiveness of programmes and activities. This means that it can provide evidence based results for the programmes and activities which interested business are running or supporting.

Institutional Programmes

Shifting to low carbon lifestyles is foremost among the goals of the Trust. It seeks to deliver 'low carbon citizens' who can make a difference by changing their behaviour. To accomplish this, EST has developed local advice networks as its key initiative. These are basically local advice centres which provide citizens with practical advice on sustainable energy and transport, renewables, water conservation and waste reduction at a local level. Funded by Defra, the Department for Business, Enterprise and Regulatory Reform and the Scottish Government, these advice centres provide free, impartial, expert advice to encourage people to take up sustainable energy products and services, and to adopt low carbon lifestyles.

This network of advice centres help people to reduce their energy consumption in three ways: developing infrastructure, providing a one-stop-shop service, and providing a focal point for regional sustainable energy initiatives. On top of these, the centres also provide signposting and tips on water wastage and household waste reduction, reuse and recycling. Advice can be provided over the phone, by email and in person. They provide information on local grants and subsidies, and can refer people to local professional installers. They also carry out targeted campaigns and run events to promote sustainable energy use. In 2009, there are 21 centres spread across the country aimed at reaching around 250 000 people per year.

Knowing that environmental issues need not be compartmentalized, the Trust has also expanded its suite of advice and support by including not only EE, renewables and sustainable travel choices, but also water conservation and waste reduction. In 2009, It has come up with its consumer campaign aimed at raising consumer awareness of the Trust's brand and helping everybody save energy at their homes.

Recognizing that they also adversely affect the environment in their own daily practices, the Trust is now aiming at becoming carbon neutral by 2010. The Trust has outlined actions to reach this goal by maximising emission savings of their own activities, preventing pollution and minimising negative environmental impacts and consumption of resources and by measuring, avoiding and minimising emissions from their own office energy. In so doing, it has been following Defra's carbon reduction virtuous circle which states that consumers should follow this order: calculate their emissions, do all they can to avoid emissions, reduce emissions from activities they can not avoid, and offset emissions.

To provide an appraisal of its impact, the Trust has embarked on regular evaluation, both quantitative and qualitative. The Trust has adopted an audience-based approach to evaluation in order to provide a more

cost effective and realistic approach to evaluation across all of its audiences and programmes. Specific evaluations are undertaken for different audiences: consumer, community, trade, SMEs, renewables, and transport. The quantitative evaluation takes the form of impact assessments that aim to identify the carbon dioxide savings that are attributed to its activity and the cost of these savings. Impact assessments are undertaken through specifically designed evaluation surveys of individual members of an audience to identify actions that have been undertaken as a result of their programme activities. This is supported by qualitative evaluation, the objective of which is to ensure that the Trust understands how these impacts have been achieved so that important learning can be fed into the planning and development of any future activity. This is undertaken using in-depth interviews of a small number of users (Energy Savings Trust homepage, 2009).

Institutional Performance

The Trust continues to deliver increasing and significant savings of CO_2 emissions through its range of activities across its household, supply chain, local authority and community audiences. In 2009, the Trust helped nearly three million people save energy through its website and local advice network. In 2007 to 2008, EST's work stimulated annual CO_2 savings of 1.2 Mt and lifetime savings of over 24 Mt. Their average cost effectiveness has improved by 25 per cent over last year - from US$3.50 to US$2.50 per tC saved (Energy Savings Trust homepage, 2009).

Through its local advice network, the Trust has supported 80 local authorities with in-depth consultancy advice on reducing CO_2 emissions in their locality - and 96 per cent of all local authorities recognise the Trust as an authority on climate change. Nearly 6 000 organisations were also assisted to save money and CO_2 emissions through advice on low carbon transport. The housing construction industry also received leadership and technical guidance demanded from the Trust. On top of its advising initiative, it has also been into product certification. In 2009, over 3 000 Energy Saving Recommended products were certified across several categories. This was done by working with more than 300 manufacturers and retailers (Energy Savings Trust homepage, 2009).

The Trust has successfully continued to deliver savings in carbon emissions through its range of activities across its audiences (the consumer, local authority, trade, community and business). Overall, it has stimulated annual carbon savings of over 400 000 tC and lifetime savings of over 6 MtC in 2006 and 2007. The Trust continues to ensure the robustness of household EE and microgeneration technologies by working with Government, energy suppliers and industry on field trials including microwind turbines, heat pumps, advanced heating controls, LEDs and solid wall insulation. In 2009, the Trust has administered over 7,000 household grants for microgeneration installations through the Low Carbon Buildings Programme totalling US$ 15.75 million (Energy Savings Trust homepage, 2009).

The consumer (household) audience remains the main focus of its activities reaching directly through its advice centres, the website and advertising activities or through local authorities, housing associations or trade partners. This particular audience accounts for over 75 per cent of the Trust's annual carbon savings and nearly 60 per cent of its lifetime savings, a vast majority of which continue to be through household EE actions by households (Energy Savings Trust homepage, 2009).

UNITED STATES: Environmental Protection Agency (EPA) and Energy Star

Institutional Background, Motivation and Capacity

Established by the US Congress in 1970, the United States Environmental Protection Agency (EPA) is the government's response to the growing American demand for cleaner water, air and land (EPA homepage). EPA has then become the US leader

in environmental science, research and education efforts. Among EPA's various functions is to address the growing concern over increasing greenhouse gas emissions. EPA does this mainly by providing objective information and technical assistance (Energy Star homepage, Annual Report 2006). In partnership with private entities, EPA has then initiated its voluntary climate protection programmes to encourage cost-effective investments in EE, clean energy, and other climate-friendly technologies. These programmes include Climate Leaders, Green Power, and Energy Star.

Institutional Programmes

Acknowledging that EE offers one of the lowest cost means to reduce energy bills and address climate change at the same time, EPA has initiated Energy Star as its flagship programme for EE. Energy Star was introduced in 1992 as a voluntary labeling programme designed to identify and promote energy-efficient products to reduce greenhouse gas emissions (Energy Star homepage, 2009). In 1996, the US Department of Energy has joined EPA and assumed specific Energy Stay programme responsibilities. In the years that followed, Australia, Canada, Japan, New Zealand, Taiwan, Province of China and the European Union have also adopted the programme.

Energy Star is aimed at addressing carbon dioxide emissions from residential, commercial and industrial sectors (Energy Star homepage, Annual Report 2009). The programme focuses on driving greater efficiency in the areas of:

- market exposure by bringing home and office energy efficient products to the market,
- construction by building energy efficient new homes and commercial buildings, and
- efficiency improvement by introducing improvements to existing buildings through standardized measurement systems, proven energy management strategies, and new EE services (Energy Star homepage, Overview of 2008 Achievements, 2009).

Labeling programme

Energy Star is a well-known branding system for energy-efficiency in the appliance industry. Energy Star partners with more than 15 000 private and public sector organizations to deliver the technical information and tools that organizations and consumers need to choose energy-efficient solutions and best management practices (Energy Star homepage, 2009). The first Energy Star labeled products were computers and monitors. Labeling was later expanded to additional office equipment products and residential heating and cooling equipment. Since its inception in 1992, Energy Star has provided label on over 60 product categories (and thousands of models) for the home and office which are comparable or even better performing than other models while using less energy and saving money. Products carrying the Energy Star logo save around 20 per cent to 30 per cent on average (Tugend, 2008). From then on, the Energy Star label has morphed not only from being confined with major appliances, office equipment, lighting, home electronics, and more, but also extended to cover new homes and commercial and industrial buildings.

Energy Star in the Residential Sector: Energy Star seeks to address high utility bills at home and the American growing interest in 'green' products and practices by helping American consumers in their purchasing decisions. Energy Star estimates that by using qualified products, energy use reduction can be as high as 30 per cent with annual savings of US$ 600 (Energy Star homepage, Annual Report 2006).

Aside from this, Energy Star is also involved in promoting energy-efficient improvements and remodeling at time of renovations. As part of these efforts, Energy Star introduced Home Performance to promote 'whole house, EE retrofits through a qualified contractor network that is backed up by a quality assurance programme' (Energy Star homepage, Annual Report 2006, 2009). An average of 20 per cent of total energy consumption or between

US$400 and US$500 per year can be saved if retrofits are made (Energy Star homepage, Annual Report 2006, 2009).

Energy Star has also introduced the Energy Star Qualified Homes programme which brands independently verified homes that meet EPA's strict guidelines for EE. Any home three stories or less can earn the Energy Star label.

Energy Star in the Commercial Sector: Energy use in US commercial buildings reached more than 14 percent of CO_2 emissions in 2006 (Energy Star homepage, Annual Report 2006, 2009). The role of Energy Star in this sector relates with the promotion of energy management approaches, the provision of objective guidance to assess current energy use, and the development of action plans to reduce energy consumption. Energy Star accomplishes this with its established alliance with states and industry associations.

Energy Star in the Industrial Sector: Industries have also raised the same concerns about higher energy prices and global warming. Energy Star supports in terms of providing means to strategically manage energy and improve EE. To this, EPA has been providing guidelines for energy management, energy performance measurement tools, and peer exchange networks to enable manufacturers to measure, monitor, manage, and continuously improve their energy use. Each year, EPA recognizes three Energy Star industrial partners with the honor of Sustained Excellence in Energy Management which challenges partner organizations to improve EE and consistently achieve impressive results.

Institutional Performance

EPA, through its suite of climate protection partnership programmes, has claimed significant reduction in greenhouse gas emissions (Energy Star homepage, Annual Report 2006). Since its inception in 1992, EPA's flagship programme the Energy Star has helped not only individual consumers but also organizations in finding cost-effective and energy-efficient solutions. Based on the programme's 2008 Overview of Achievements, Energy Star has contributed to the prevention of 43 Mt of GHG while saving more than US$19 million on utility bills.

Key Energy Star highlights in 2008 include, among others:

- the use of Energy Star label in over 40 000 individual products across more than 60 product categories from over 2 400 manufacturers,
- over 6 500 builder partners constructing new energy-efficient homes, and
- around 4,500 private businesses, public sector organizations, and industrial facilities investing in EE and reducing energy use in their buildings and facilities (Energy Star homepage, Overview of 2008 Achievements, 2009).

In 2008, the influence of Energy Star as a label has also increased and grew such that more than 75 per cent of Americans can identify it. This sends a signal that the label has been trusted as a national symbol for EE. At individual household level, energy cost reduction is estimated at around one third of the usual average household bill valued at US$750 annual savings. Also in 2008, more than 100 000 new homes were constructed to meet the Energy Star guidelines thus earning them the qualified homes label. In terms of commercial and industrial buildings, 130 new buildings, more than 6 200 existing buildings, and 45 plants has earned the label (Energy Star homepage, Overview of 2008 Achievements, 2009).

UNITED STATES: US Green Building Council (USGBC)

Institutional Background, Motivation and Capacity

In the United States, buildings are among the heaviest consumers of natural resources and account for a significant portion of the greenhouse gas emissions that effect climate change. In fact, building structures

represent 40.63 per cent of US primary energy use and account for 39 per cent of all CO_2 emissions. Buildings also consume 9.4 per cent of all water or approximately 38.34 billion gallons per day (US Department of Energy homepage, Buildings Energy Data Book, September 2008). Around 40 per cent of raw materials globally equivalent to around 3 billion tonnes per year are used to construct new buildings (Lenssen and Roodman, 1995). An estimated 136 Mt of building related construction and demolition debris are also generated in the US in a single year in the report by the US EPA (US EPA, 1998).

Greening buildings is therefore a significant economic and environmental opportunity to address these issues and consequently make greater building efficiency a platform to meet future U.S. demand for energy. The U.S. Green Building Council (USGBC) is a leader in advancing this cause. It is a Washington, D.C.-based non-profit community of leaders working to make green buildings available to everyone by providing a knowledge bank about green buildings. USGBC is committed to a prosperous and sustainable future through cost-efficient and energy-saving green buildings in the US. The Council is composed of a diverse constituency of builders and environmentalists, corporations and non-profit organizations, elected officials and concerned citizens, and teachers and students (USGBC homepage, 2009).

USGBC is set to transform the way buildings and communities are designed, built and operated, and enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life. The Council is spearheaded by a Board of Directors who is responsible for articulating and upholding USGBC's vision, values and mission. The members of the Board meet in-person three times in a year and by regular teleconference throughout the year. Board composition, as described in the USGBC Bylaws, include the President/CEO, representatives from USGBC's membership categories/member communities, "at-large" directors, representatives from the Regional Councils of USGBC chapters, and Board-appointed directors representing special perspectives (USGBC homepage, 2009).

The members of the Board elect the following officers: Chair, Chair-elect, Immediate Past Chair, Treasurer and Secretary. The elections for the Board of Directors are held annually according to a schedule determined by the Board. Elected directors serve three-year terms (who may serve at a maximum of two consecutive terms). Appointed directors serve two-year terms (and may serve up to three terms consecutively). Of the officers, the Chair, Chair-elect, and Immediate Past Chair each serve one-year terms that total three years of leadership. The Treasurer and Secretary each serve two-year terms (USGBC homepage, 2009).

Institutional Programmes

The annual U.S. market in green building products and services has been in increasing trend. It was more than $7 billion in 2005, $12 billion in 2007 and projected to increase to $60 billion by 2010 (USGBC homepage, 2009). To support this increase in green construction, USGBC has commenced the following programmes: Chapter Programmes, education, Emerging Green Builders programme, and its flagship LEED Green Building Rating System.

The Council's strong 78 regional chapters nationwide offer green building resources, education, and networking opportunities in their respective communities. These chapters provide top quality educational programmes on green design, construction, and operations for professionals from all sectors of the building industry. USGBC also hosts the annual Greenbuild, the largest international conference and expo focused on green building. Meanwhile, USGBC's Emerging Green Builders programme provides educational opportunities and resources to students and young professionals with the goal of integrating these future leaders into the green building movement.

LEED Green Building Rating System

Paramount among USGBC's programmes is the Leadership in Energy and Environmental Design (LEED) Green Building Rating System which scores the design, construction and operation of green buildings and certifies it thereafter. LEED certification has become the recognized standard for measuring building sustainability in the US and in a number of other countries around the world. Achieving LEED certification is the most accepted way to demonstrate that a building project is truly "green."

The system is intended to promote design and construction practices that increase profitability while reducing the negative environmental impacts of buildings and improving occupant health and well-being. LEED-certified buildings are expected to provide savings for families, businesses and taxpayers, reduce greenhouse gas emissions, and contribute to a healthier environment for residents, workers and the community at large (USGBC homepage, 2009).

LEED encourages and accelerates global adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. It is like the nutrition label on a box of crackers since LEED provides the same kind of important detail about the green aspects of a building.

LEED is a voluntary certification programme that also offers flexibility as it can be applied to any building type – commercial and residential – and to any building lifecycle phase – design and construction, operations and maintenance, tenant fit out, and significant retrofit. The programme provides building owners and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. It is a third-party certification programme administered by the Green Building Certification Institute. The Institute includes a network of ISO-compliant international certifying bodies thus ensuring the consistency, capacity and integrity of the LEED certification process. The Institute scores a building or community and checks whether it was designed and built using strategies aimed at improving performance across all green metrics: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts (USGBC homepage, 2009).

LEED was built in an open and transparent process. The technical criteria proposed by the LEED committees are publicly reviewed for approval by the USGBC member organizations. This Rating System was created to accomplish the following six objectives: define "green building" by establishing a common standard of measurement; promote integrated, whole-building design practices; recognize environmental leadership in the building industry; stimulate green competition; raise consumer awareness of green building benefits; and transform the building market.

Through the years, LEED has grown from one standard for new construction to a comprehensive system of six interrelated categories covering all aspects of the development and construction process (USGBC homepage, 2009). These categories include:

- Sustainable sites. This category emphasizes the importance of choosing a building's site and managing that site during construction aimed at project's sustainability. This includes discouraging development on previously undeveloped land; minimizing a building's impact on ecosystems and waterways; encouraging regionally appropriate landscaping; rewarding smart transportation choices (such as encouraging car pooling and bicycling); controlling stormwater runoff; and reducing erosion, light pollution, heat island effect and construction-related pollution.
- Water efficiency. Acknowledging that buildings

are major users of potable water supply, this category encourages the smarter use of water which be achieved through more efficient appliances, fixtures and fittings inside, and water-wise landscaping outside. This can also be done by eliminating site irrigation, reducing water consumption, and minimizing or treating wastewater.

- Energy and atmosphere. This category encourages a wide variety of energy strategies including: commissioning building systems; energy use monitoring; efficient design and construction; efficient appliances, systems and lighting; the use of renewable and clean sources of energy, generated on-site or off-site; and other innovative strategies.
- Materials and resources. This credit category promotes the reduction of waste as well as reuse and recycling, hence, this category encourages the selection of sustainably grown, harvested, produced and transported products and materials. During both the construction and operations phases, buildings generate a lot of waste and use a lot of materials and resources. Generally, this category emphasis efforts made to minimize construction waste, re-use existing building façade, use recycled and salvaged materials, use renewable construction materials and design and build more durable buildings.
- Indoor environmental quality. This category promotes strategies that can improve indoor air as well as providing access to natural daylight and views, improving acoustics, using low off-emitting materials, and providing operable windows and occupant control of work space.
- Innovation and design process. This credit category provides bonus points for projects that use new and innovative technologies and strategies to improve a building's performance well beyond what is required by other LEED credits or in green building considerations that are not specifically addressed elsewhere in LEED. This credit category also rewards projects for including a LEED Accredited Professional on the team to ensure a holistic, integrated approach to the design and construction phase.

LEED points are awarded on a 100-point scale and credits are weighted to reflect their potential environmental impacts. An additional ten bonus credits are available (six points for Innovation in Design and four points for Regional Priority). Buildings can qualify for four levels of certification that correspond to the number of credits accrued in six green design credit categories outlined above. The four levels of certification are Certified (40 to 49 points), Silver (50 to 59 points), Gold (60 to 79 points), and Platinum (80 points and above) (USGBC homepage, 2009).

LEED certified buildings generally use resources more efficiently vis-à-vis conventional buildings which are simply built to code. These certified buildings often provide healthier work and living environments, which contribute to higher productivity and improved employee health and comfort. The USGBC has compiled a long list of benefits of implementing a LEED strategy which ranges from improving air and water quality to reducing solid waste, benefiting owners, occupiers, and society as a whole. Other reasons for certifying include: Gain recognition for green building efforts, validate achievement through third party review, qualify for a growing array of government incentives, and contribute to a growing green building knowledge base. Moreover, certification provides increased market exposure and places the building in elite company among the greenest buildings in North America.

When LEED certification is pursued, this will often increase the cost of initial design and construction. One reason for the higher cost is that sustainable construction principles may not be well understood by the design professionals undertaking the project which means extra time requirement to be spent on research. There may also be a lack of abundant

availability of manufactured building components which meet LEED standards. Pursuing LEED certification for a project is an added cost in itself as well. This added cost comes in the form of USGBC correspondence, LEED design-aide consultants, and the hiring of the required Commissioning Authority.

However, these higher initial costs can be effectively mitigated by the savings incurred over time due to the lower-than-industry-standard operational costs which are typical of a LEED certified building. Enermodal projects that a LEED-certified building can save energy from a minimum of 25 per cent for a certified building to greater than 60 per cent for Platinum building (Enermodal homepage, 2009). Typical payback ranges from three years to more than ten years. Additional economic payback may come in the form of greater employee productivity gains and lower absenteeism incurred as a result of working in a healthier indoor environment. Among the larger benefits of LEED buildings include lower maintenance costs (commissioned building, more durable materials, smaller or eliminated building systems), higher corporate profile (increased product sales, marketing advantage, improved employee morale), and reduced risk of remedial measures (to deal with sick building syndrome or environmental contaminants).

Institutional Performance

Since its commencement in 1998, LEED has grown to encompass more than 35 000 projects, comprising over 4.5 billion square feet of construction space in all 50 states and 91 countries (USGBC homepage, 2009). LEED has also become the benchmark of similar rating system in other countries.

It is a community comprising of 78 local affiliates, more than 20 000 member companies and organizations, and more than 100 000 LEED Accredited Professionals. In 2009, USGBC registered 19 957 member organizations which include corporations, government agencies, non-profits and other industry players throughout the building industry. In terms of manpower complement, LEED has grown from six volunteers on one committee to more than 200 volunteers on nearly twenty committees and nearly 150 professional staff (USGBC homepage, 2009).

SUBREGIONAL, REGIONAL AND INTERNATIONAL INSTITUTIONS

While most EE-related issues in the past have been considered largely at the national level, the emphasis has shifted to include transboundary cooperation in the context of the rapidly growing globalized world; thus the move beyond national independent energy policies to intercountry interdependent policies for the benefit of all. Strategic and collaborative policies at the regional, subregional, and global levels could ensure a rapid sharing of technology and knowledge in the intercountry settings. This section presents a selection of eight EE collaborative initiatives.

ASIA-PACIFIC: APEC Expert Group on Energy Efficiency and Conservation

Institutional Background, Motivation and Capacity

The Asia Pacific Economic Cooperation (APEC) is the leading forum for facilitating economic growth, cooperation and trade in the Asia-Pacific region. It is the only inter governmental grouping in the world working on the basis of non-binding commitments, open-dialogue and equal respect for the views of all participants. It has 21 members referred to as 'Member Economies' (APEC homepage, 2009).

The APEC region accounts for around 60 per cent of world energy demand (APEC Factsheet, February 2009). With global demand for energy projected to increase and APEC being a net energy importer, APEC has made energy cooperation an important agenda item. Among these priorities are the policy instruments for promoting EE which was specifically endorsed by APEC leaders in their September 2007 Meeting in Sydney, Australia through the 'Declaration on Climate Change, Energy Security

and Clean Development' (this document has been called the Sydney Declaration in APEC parlance). In this Declaration, the leaders acknowledged that EE is a 'cost-effective way to enhance energy security and address greenhouse gas emissions while promoting economic growth and development' and 'without prejudice to commitments in other fora.' The agreement was aimed towards working on energy intensity reduction of at least 25 per cent by 2030 with 2005 as the base year. Further discussions had directed officials to set individual country goals and action plans, to collaborate with the the IEA in developing EE indicators, to share information on EE policies and measures, and to allow a voluntary review of the progress made through the APEC Energy Peer Review Mechanism.

The APEC Energy Working Group is the major APEC body concerned with energy issues. Launched in 1990, the Experts Working Group is a voluntary, regional-based forum which seeks to maximize the energy sector's contribution to the Asia Pacific region economic and social well being while mitigating the environmental effects of energy supply and use. The Group meets formally twice a year to discuss developments and progress on energy policy issues. It is assisted in its work by a Task Force on Biofuels and four Experts Groups, inter alia, the Expert Group on EE&C, Expert Group on Clean Fossil Energy, Expert Group on Energy Data & Analysis, and Expert Group on New & Renewable Energy Technologies.

The Expert Group on EE&C promotes energy conservation and the application of energy-efficiency practices and technologies through 'advancing the application of demonstrated energy-efficiency practices and technologies, developing and enhancing trade between APEC Economies in products and services and energy-efficiency practices and technologies, contributing to international efforts to reduce the adverse impacts of energy production and consumption, and improving the analytical, technical, operational and policy capacity for EE&C within APEC Economies.'

At each Experts Working Group Meeting, the Experts Group on EE&C tables a Progress Report on its activities. It also maintains the Expert Group on EE&C website and the APEC Energy Standards Information System (APEC Energy Standards Information System homepage, 2009).

Institutional Programmes

The Expert Group on EE&C mainly conducts and supports workshops on efforts to improve EE in the built environment, transport, appliance standards, and labeling by sharing best practices and experiences of countries.

The most notable project undertaken by the Expert Group, however, is the APEC Energy Standards Information System. The System was built on the framework for cooperation in EE Testing Standards discussed in the Experts Working Group meeting in Peru in the year 2000. The framework was renamed in 2002 to "Energy Standards and Labeling Cooperation Initiative" with the inclusion of labeling activities. It is aimed at 'enhancing the trade of energy efficient products and facilitating harmonization of energy performance test methods, S&Ls.' In meeting these objectives, an information sharing website was put up.

The Energy Standards Information System's primary objectives are to:

- provide up-to-date information about appliance and equipment energy standards and regulations;
- provide links to experts and information related to standards and regulations being used by APEC and other economies;
- provide a regular newsletter with news updates and a listing of new and proposed standards in the region;
- provide a user-friendly way for Key Contacts in APEC economies to review the listing of standards for their economies so that they can be updated systematically, and on a regular basis (A 'key contact' or 'Economy Contact' is a representative from an APEC Member

Economy who checks and updates data in Enery Standards Information System. A directory of the Key Contacts is available at the APEC Energy Standards Information System website); and

- provide "Communities of Practice" for experts and officials to discuss efforts to harmonize and rationalize the testing, labeling, and minimum energy standards for specific appliances and equipment.

In 2009, the APEC Energy Standards Information System project is chaired by New Zealand and is managed by a Steering Committee made up of contributing economies and organizations. The team includes energy experts and officials from Australia, Japan, New Zealand, Thailand, and the United States. The team reports to the Expert Group on EE&C.

Funding-wise, APEC Energy Standards Information System was initially created with support from APEC Experts Working Group. Ever since, funding has come in the form of annual contributions from APEC member economies. Core funding for web site maintenance in 2007 was provided by Australia, Taiwan, Province of China, Japan, Republic of Korea and New Zealand. In prior years, Canada has also contributed to core funding. In addition to core funding, the US provided in-kind support in 2007 and the Renewable EE Partnership provided funding for supplemental tasks to enhance the Energy Standards Information System and its interface with Renewable EE Partnership online resources. Cost share has been provided by CLASP and the USAID EcoAsia programme through sponsorship agreements.

Meanwhile, the Experts Working Group has endorsed the APEC Peer Review Mechanism on EE. The objectives of the Mechanism are to promote information sharing among APEC members on EE performance and on policies and measures for improving EE and explore how EE goals on an overall and/or sectoral basis and action plans could be effectively formulated and implemented in APEC economies.

Institutional Performance

The APEC Energy Standards Information System has now become a fully functional medium for information sharing for EE products, equipment, S&L in the Asia-Pacific region. It serves as a major platform of information on energy efficient equipment and appliances. As of 2009, the Enery Standards Information System website listed all energy labeling programmes in APEC's 21 Member Economies. It also provides summaries of labeling programmes and technical standards for equipment and appliances while listing reference test standards and links to collaborating institutions.

Since its inception, the APEC Energy Standards Information System became a forum for disseminating information on EE practices and a hub for sharing information and international comparisons on the efficiency and performance of energy-using appliances and equipment. The Energy Standards Information System website also maintains a database and online library of EE-related information from APEC member countries.

While the APEC Experts Group on EE&C has successfully embarked on EE programme in appliances and equipment through S&L, it still has to improve EE initiatives in other fields such as the built environment, transport and supply side management. Based on its established strengths and experience in networking, information sharing, and collaborating, these new initiatives could easily be manipulated in the drawing table and consequently implemented.

APEC Energy Standards Information System has turned out to be the key success indicator for this initiative with regards to knowledge accumulation and sharing. The Key Contact method has been efficiently working and has since gained ground. In this case, the establishment of a parallel information sharing system or linking databases in other regional associations and cooperation platforms is worthy of examination.

Another success indicator of this initiative is the Expert Group's proven capacity in collaborating with international institutions with the same, shared, or at least comparable objectives. While funds are readily available from core contributions from APEC Member Economies, alliances have also reached the shores of funding contribution which is another key for the Initiative's success.

EUROPE: Club E^{n}R

Institutional Background, Motivation and Capacity

Founded in 1991, E^{n}R is a voluntary network currently numbering twenty three European energy agencies, with responsibility for the planning, management or review of national research, development, demonstration or dissemination programmes in the fields of EE and renewable energy and climate change abatement (E^{n}R Network homepage, 2009).

The Network seeks to strengthen cooperation between member agencies and other European actors on all issues relevant to sustainable energy (EE, sustainable transport and renewable energy). International comparison and information sharing takes place primarily through the Network's eight Working Groups, which are also open to relevant non-member organizations. The E^{n}R Working Groups serve as forums for the conception and implementation of successful common projects within the framework of European Union-funded programmes, such as the European Commission's Intelligent Energy Europe Programme (E^{n}R Network homepage, 2009).

E^{n}R provides a first point of contact for national energy agencies in EU Member States. The Network dedicates its efforts towards joint activities where its unique character provides added value at both a European and individual Member State level. It provides a channel for pan-European technical support on matters of energy policy, strategy, evaluation, programme design & delivery and marketing communications.

E^{n}R operates within the framework of a Charter that regulates forms of cooperation between members. It works according to a principle of voluntary membership and has neither its own budget nor administrative procedures (except for the rules of the Charter). E^{n}R activities rely primarily on 'in-kind' staff time and resources volunteered by member agencies to, for example, participate in the bi-annual management meetings and the meetings of the eight E^{n}R Working Groups. A number of specific projects originating from within the working groups are funded by outside sources.

The administration of E^{n}R is in the hands of a Troika management committee with a yearly rotating Presidency and Secretariat. A Troika management committee consisting of the E^{n}R President supported by two member agencies manages and coordinates E^{n}R activities throughout the year. Each elected agency spends three years on the Troika, taking over the Presidency and Secretariat in the second year. A new Troika member is elected each February at the annual Full Meeting.

The agency holding the E^{n}R Presidency chairs the Troika management committee, which meets between four and six times per year. The E^{n}R President, supported by the Troika, is responsible for progressing any strategic, operational or communications issues on behalf of the network, liaising with other members as and when necessary.

The E^{n}R Presidency and Secretariat is responsible for managing and coordinating the bi-annual management meetings that take place in June and February of each year, as well as the annual Thinking Group Meeting, which takes place in April. The E^{n}R Presidency and Secretariat acts as the main point of contact for all stakeholder interactions, coordinating across members and working groups as necessary.

In March 2009, Agencia para a Energia, the Portuguese Energy Agency took over the Presidency

of the EnR network from the Agentia Romana pentru Conservarea Energiei, the Romanian Agency for Energy Conservation. The most recent addition is STEM, the Swedish Energy Agency (EnR Network homepage, 2009).

On top of its targets to improve EE, EnR also seeks to be at the forefront of Europe's drive to increase the use of renewable energy and mitigate the damaging effects of climate change. The Network aims to achieve this vision by acting as a bridge between national activities and those of the European Community and other relevant international bodies.

Club EnR offers a number of benefits to its members and other actors, bodies and organizations with interest in sustainable energy at a European level. EnR serves as one point of contact via the Club's Presidency & Secretariat to instigate dialogue with national energy agencies across Europe. The cumulative experience and know-how of Club EnR members constitutes a unique and valuable European resource. Another benefit includes independent, impartial expertise from leading policy, evaluation, accreditation, programme delivery, research & development and marketing communications experts in the field of sustainable energy. Moreover, Club membership encourages and facilitates exchange of information and expertise amongst EnR members and with other relevant European actors. The regular information sharing ensures EnR members operate in the most efficient and effective manner possible which means that they can add real value to their work at a national level. Club membership also allows a combined stance vis-à-vis European energy & environmental policy issues.

Institutional Programmes

The EnR Working Group on EE aims at increasing the quality and effectiveness of EE work in EU countries by providing a leading forum for communication and cooperation on issues of common interest, with special emphasis on practical and operational matters in relation to programmes and measures. The EnR EE Working Group is tasked to:

- Focus on practical and operational issues concerning the impact of the implementation of policies, programmes and measures,
- Facilitate communication and exchange of information on the experience gained from putting EE policies into practice within countries represented on the Working Group,
- Identify problems and barriers in areas of common interest, elaborate potential solutions and propose good practice or project initiatives to address these problems, and
- Provide technical and institutional support and capacity building services for European institutions and, in particular, the European Commission in their work to promote EE.

EUROPEAN COMMISSION: Directorate General for Energy & Transport and the Greenlight Programme

Institutional Background, Motivation and Capacity

The European Union Member States recognize that the issues and challenges of policy in the fields of transport and energy require action at European level, and that no single national government can successfully address them alone. By working in concert, EU Member States and European industry can develop transport and energy sectors which best meet the needs of citizens and the European economy while minimizing damage to the environment.

The Directorate-General for Energy and Transport is the government department in the European Commission that manages work in the fields of transport and energy. Given the close links between these two policy areas, the Commission ensures that its work across them takes advantage of all possible synergies such that it fused the Directorate-General for Transport and the Directorate-General for Energy in January 2000 thus creating the Directorate-General for Energy and Transport. In June 2002, the Euratom Safeguards Office which is the office entrusted with

the control of nuclear materials in the European Union has became part of the Directorate-General for Energy and Transport. This Directorate-General is based in Brussels, Belgium and reports to the Vice-President of the European Commission, Commissioner for Transport and Commissioner for Energy. The organization is made up of some 1000 officials, 11 Directorates (two of which deal with Euratom issues), and the Euratom Supply Agency. Manpower is divided between Brussels (700) and Luxembourg (300) (European Commission homepage, 2009).

The Directorate-General for Energy and Transport is responsible for developing and implementing European policies in the energy and transport field. Its mission is to ensure that energy and transport policies are designed for the benefit of all sectors of the European community. It carries out these tasks using legislative proposals and programme management, including the financing of projects. In addition to developing community policies in the energy and transport sectors and handling State aid dossiers, It also manages the funding programmes for trans-European networks and technological development and innovation. For the period 2000 to 2009, the Directorate-General for Energy and Transport managed the fund worth US$1.2 billion per annum.

The Directorate-General is currently working on seven goals:

- completing the internal market in energy and transport;
- ensuring sustainable development of transport and energy;
- deployment of major networks in Europe;
- space management (including air traffic congestion management);
- improving transport and energy safety;
- accomplishing enlargement; and
- developing international cooperation.

In its Green Paper "Towards a European strategy for the security of energy supply", the European Commission stresses its actions and guidelines for energy policy. Actions sprouting from the Green Paper include encouraging sustainable development where the European Member States were encouraged to reduce energy demand, in particular through a proactive EE policy.

Institutional Programmes

Reducing energy consumption and eliminating energy wastage are among the main goals of the EU. EU support for improving EE will prove decisive for competitiveness, security of supply and for meeting the commitments on climate change made under the Kyoto Protocol. There is significant potential for reducing consumption, especially in energy-intensive sectors such as buildings, manufacturing, energy conversion and transport. At the end of 2006, the EU pledged to cut its annual consumption of primary energy by 20 per cent by 2020 (European Commission homepage). To achieve this goal, it is working to mobilize public opinion, decision-makers and market operators and to set minimum EE standards and rules on labeling for products, services and infrastructure.

Lighting has substantial impact on the environment, accounting for up to 40 per cent of electricity used in non-residential buildings. Major energy savings can be achieved. Examples from the field have shown that between 30 per cent and 50 per cent of electricity used for lighting could be saved investing in energy efficient lighting systems (European Commission homepage, 2009). In most cases, such investments are not only profitable but they also maintain or improve lighting quality.

The Directorate-General for Energy and Transport launched GreenLight on February 2000. The GreenLight Programme is an on-going voluntary pollution prevention initiative whereby private and public organizations commit towards the European Commission to reducing their lighting energy use, thus reducing polluting emissions. GreenLight benefits from the active support of the National Energy Agencies of 14 European countries. The Programme

encourages non-residential electricity consumers (public and private), referred to as Partners, to commit towards the European Commission to install energy-efficient lighting technologies in their facilities when it is profitable, and lighting quality is maintained or improved. The Programme is aimed at reducing the energy consumption from indoor and outdoor lighting throughout Europe, thus reducing polluting emissions and limiting the global warming. The objective is also to improve the quality of visual conditions while saving money (European Greenlight homepage, 2009).

The programme's core feature is a registration form signed by the Partner and the Commission, in which the Partner commits to:

- For existing spaces: either upgrade at least 50 per cent of all the eligible spaces owned or on long term leases or reduce the total aggregate lighting electricity consumption by at least 30 per cent. Eligible spaces are those spaces where the lighting upgrades are profitable.
- For new spaces: choose new installations so that no alternative installation exists that would: maintain or improve the lighting quality provided by the chosen installation and consume less electricity and represent a supplementary investment which would be profitable.
- In addition, the Partner shall complete the upgrades within five years of joining the programme, send a progress report every year and appoint a Corporate Manager responsible for assuring the programme execution.

The programme being totally voluntary means that companies are free to decide whether they want to join or not. If a Partner cannot meet minimal space requirements or reductions in total lighting energy, they may drop out of the programme without any prejudice to rejoin when their situation changes.

Lighting professionals interested in promoting GreenLight and assisting its Partners were encouraged to register as GreenLight Endorsers. In return, the Endorsers get public acknowledgement for their efforts to support the GreenLight Programme. You need to register to join the Greenlight Endorser Programme.

While the European Commission does not provide actual funds for the lighting upgrades (because they pay for themselves), it provides support to the Partners in the form of information resources and public recognition (plaques on building, advertisements, exclusive use of the logo, awards, etc.). Other implicit benefits for Partners are savings; better lighting conditions; access to technical assistance; claiming to be a "green or environmental conscious company"; and getting free publicity about their participation from public authorities including the Commission

In January 2006, the New GreenLight programme was organized in France and in eight new European Member States in Central and Eastern Europe (Czech Republic, Bulgaria, Latvia, Lithuania, Poland, Romania, Slovenia and Slovakia). Running throughout 2007 and 2008, the project was aimed at promoting the idea of energy efficient lighting in non-residential premises and to attract new GreenLight partners and endorsers in each of the above mentioned countries (European Greenlight homepage, 2009).

New GreenLight wants to commit at least 110 partners to the GreenLight principles and achieve energy savings of more than 20 GWh per year at the end of the project. In order to achieve this outcome, the New GreenLight partners plan to create new National Contact point of the project, each of which should identify at least 3 endorsers every year and to transfer and market the GreenLight know-how to the new member states (guidelines for potential partners and supporters, leaflet and brochures, CD ROMs and presentations, extension of the programme's web-site, organization of seminars, individual consultations, conferences etc).

Throughout the New GreenLight project, several promotion materials have been produced. Notable of these materials are the guidelines for partners and endorsers, brochures and leaflets, presentations and media articles which are all available for download at the programme's website. These materials are also available in several languages.

Joining GreenLight means adopting energy-efficient lighting solutions which not only improve or maintain lighting quality but also are highly profitable. In order to adopt GreenLight in spaces, Partners are encouraged to do the following steps: survey the lighting characteristics of their existing spaces, choose energy efficient alternatives, assess their profitability, verify energy savings, and communicate their success. Throughout, GreenLight endorsers provide help to partners.

Programme Performance

The GreenLight Brochure details several achievements of the programme in the participating EU member states (European Greenlight homepage, Europe GreenLight Brochure with case studies from EU New Member, 2009). These achievements include:

- Belgium: In 2000, the healthcare company, Johnson & Johnson, was the first organization to join GreeenLight. In their Janssen Pharmaceutica facility in Belgium, they have performed a relighting study for 75 per cent of their 410,000 square meter workspace. The actual relighted surface amounts 62 000 square meters. All new facilities are equipped with daylight- and occupancy-sensors, 26 mm diameter fluorescent tubes with high efficiency ballasts and reflectors. In addition to less cooling needs, lower maintenance costs and better working conditions for employees, they reported the following savings: 1 240 000 kWh/year lighting electricity savings, 40 per cent reduction of electricity use in the areas covered, 62 000 euro/year energy cost savings, and 1.5 to 6 years payback time depending on the project.
- Norway: Statoil joined the programme in January 2001. As part of their commitment, they installed occupancy controls in their research centre. These controls turn off the lights once they have failed to detect occupancy for a set time. When occupancy is detected, they switch the lighting on again. Previously, the lights remained on the whole day in all offices and laboratories with a common switching system. This was a waste of energy given that occupancy patterns were intermittent and unpredictable. After measurements, Statoil reported the following results: 219 000 kWh/year lighting electricity savings, 74 per cent reduction of electricity use in the areas covered, €13 375 per year energy cost savings, 2.5 years payback time, and 40 per cent internal rate of return.
- Spain: In Madrid, Gas Natural replaced the incandescent fixtures with modern luminaires for CFLs in the hall of each floor. As a general rule, comparable total light output from a CFL scheme may be obtained for only around 20 to 30 per cent of the wattage required using standard incandescent lamps. In the offices, Gas Natural changed their halophosphate fluorescent lamps, high-loss magnetic ballasts and poor-efficiency luminaires, for triphosphor lamps, electronic ballasts, and parabolic troffers. They also replaced their general manual switch by localized switches offering better control to the users. Overall, Gas Natural reported much better visual conditions, in particular higher illuminance levels and the following savings: 533,028 kWh/year lighting electricity savings, 60 per cent reduction of electricity use in the areas covered, €27 230 per year energy cost savings, and 3.5 years payback time for the floor halls while eight years for the offices.
- Portugal: Sonae Imobiliaria upgraded its Central Colombo covered car park, one of the largest in Europe, by substituting the magnetic ballasts with electronic ones. These operate

fluorescent lamps at higher frequencies and offer significant advantages compared to magnetic ballasts, inter alia lower power losses. After measurements, Sonae Imobiliaria claimed the following results: 400,838 kWh/year lighting electricity savings, 11.5 per cent reduction of electricity use in the areas covered, €23 814 per year energy cost savings, and 20 per cent internal rate of return of the investment.

- Belgium: Beerse Metaalwerken nv replaced the standard high pressure mercury lamps of their workshop with 26mm diameter fluorescent lamps. They also installed a control system to dim the lamps' outputs in response to daylight availability. In their offices, they replaced the 38mm diameter fluorescent lamps with 26 mm diameter lamps. All new lamps are geared with electronic ballasts. Besides improved visual conditions, they reported the following savings: 24 919 kWh/year lighting electricity savings, 38 per cent reduction of electricity use in the areas covered, €7 133 per year total running cost savings (includes company-estimated gains in productivity), and a 20 per cent internal rate of return of the investment.
- Italy. The city of Sassari installed a centralized dimming system to reduce its street lighting levels and thus its energy consumption during periods of the night where traffic is lower. The city signed a "paid from savings" contract with power control manufacturer and the installer. These financed up-front capital improvements in exchange for a portion of the savings generated. Besides providing tele-control capabilities, and thus easier maintenance, their system is claimed to have provided the following savings: 1 855 385 kWh per year lighting electricity savings, 30 per cent reduction of electricity use in the areas covered, €172 551 per year energy cost savings, three years payback time, and 33 per cent internal rate of return.

GLOBAL: Collaborative Labeling and Appliance Standards Programme (CLASP)

Institutional Background, Motivation and Capacity

Established in 1999, CLASP is a non-profit corporation which helps policymakers and practitioners in the field of EE S&L in promoting 'socio-economic development, improve the environment, stimulate global trade, and alleviate poverty.' CLASP seeks to transform the manufacture and sale of appliances, equipment and lighting worldwide by the application of EE S&L so that countries develop in a more environmentally sustainable and economically efficient manner. CLASP takes its roots from a 1996 initiative which begun at Lawrence Berkeley National Laboratory. It is now listed as one of only two UN-sanctioned Sustainable Development Partnerships devoted solely to EE (CLASP homepage).

CLASP is global in scope with an established partnership in twenty seven countries, six of which are in the ESCAP region (Australia, China, India, Nepal, Sri Lanka and Thailand). It is supported by 30 state agencies from thirteen governments, six UN offices, international organizations, research institutes, and private institutions (CLASP homepage). It is comprised of a worldwide assembly of Sponsoring partners who fund its activities, Country Partners who are recipients of its services, Implementing Partners who provide its services, and interested stakeholders as Affiliates.

An international Board of Directors comprised of ten voting members from six countries in four continents governed CLASP with daily operations managed by a Secretariat based in Washington, DC. The President of the Board and the CEO supervise CLASP Executive Director who, in turn, is responsible for managing the daily operations of the partnerships and its activities. A small number of staff is maintained for this purpose.

CLASP has diversified global funding sources from governments, foundations and international

governmental organizations. Early funding was provided by the USAID and the United Nations Foundation.

Institutional Programmes

CLASP primarily functions as an EE S&L project broker. As such, it 'aggregates resources, assembles project teams from diverse organizations, provides technical support to project teams, actively oversees project performance, and provides quality control of project output.' To the end, CLASP expects that in each participating country, the projects will result in 'enhanced institutional capacity for implementing S&L programmes, increased production of energy-efficient products by manufacturers, improved average EE of A&E, significant reductions in electricity consumption, and lower energy-related emissions of greenhouse gases and other pollutants.'

In doing so, CLASP starts its work at the national level building upon existing initiatives, as well as the skills and institutional capacity necessary to develop, enforce, and maintain S&L to promote the cost-effective adoption and implementation of EE S&L. From national successes, CLASP builds on the participation of multiple countries in the same region to foster cross border trade flows in the regional and international levels. To achieve this outcome, CLASP has spread its resources: 70 per cent to national assistance, 20 per cent to regional harmonization projects, and 10 per cent to building partnerships and creating tools such as the CLASP website to facilitate national and regional projects (CLASP homepage).

CLASP follows a seven-step process in standard-setting or labeling programme implementation and provides assistance in any or all of these steps (CLASP homepage). These steps include:

- Deciding to implement S&L;
- Developing a testing capability;
- Designing/implementing a label programme;
- Analyzing and setting standards;
- Designing and implementing a communications programme;
- Ensuring programme integrity; and
- Evaluating the S&L programme.

CLASP works in several Asian countries.

- Viet Nam: CLASP is investigating initial opportunities for S&L technical assistance based on feedback from the Ministry of Science and Technology (MOST) in light of a new and substantial commitment to EE by that government. In India, CLASP is actively participating in the S&L process led by the Indian Bureau of Energy Efficiency with a recent emphasis on launching endorsement labeling for consumer electronics.
- China: CLASP works with the China National Institute of Standardization to enhance the enforcement and monitoring of existing S&L as well as improvement and expansion of the EE thresholds. CLASP has collaborated over the years with several Chinese institutions in order to promote EE, enhance the capabilities of Chinese institutions that promote EE, and understand the dynamics of energy use in China. In partnership with Lawrence Berkeley National Laboratory, CLASP has helped China implement a robust EES&L programme that includes minimum standards, voluntary energy labeling, and a residential energy consumption survey.

  As China's capacity for S&L implementation has grown, the nature of CLASP's support has shifted from technical training and capacity building for the domestic programme to assistance in extending market transformation effects internationally through harmonization of efficiency specifications. Most notably, in 2005, China, Australia, and the US adopted a harmonized set of efficiency specifications for external power supplies, based on a single testing standard. Current efforts support both

the application of China's S&L programmes into new market transformation programmes—such as government procurement—domestically as well as the expansion of China's outreach internationally in additional harmonization efforts.

- Regional Asia: CLASP participated in the S&L dialogue within the Energy Working Group of APEC, serving as the Secretariat for the ESIS. It has also supported the ASEAN S&L programme's alignment of fluorescent lighting ballast S&Ls which began in 2004 and completed in 2005. In South Asia, CLASP has engaged with USAID's South Asia Regional Initiative for Energy Cooperation and Development (SARI/Energy) programme in efforts to harmonize standards developed by each country in the region. Focusing first on harmonizing refrigerator standards, CLASP prepared white papers on testing facilities and protocols, and led workshops in Sri Lanka with key regional technical experts to discuss the regional implications of the refrigerator standards already developed by India & Sri Lanka. This historic meeting led to the formation of an informal regional technical group to pursue future regional standards.

Institutional Performance

The success of CLASP is benchmarked in terms of saved energy and reduced tC emitted. This yardstick is based on the programme's goal to support S&L programmes that save 390 TWh of electricity per year and reduce total anthropogenic CO_2 emissions by 2 per cent by 2030.

In 2009, CLASP has provided S&L technical assistance with national implementation to over 50 countries. It has assisted with the development and implementation of 24 new MEPS and/or energy labels. These efforts will save an estimated 115 TWh of electricity and 30 megatonnes of CO_2 annually by 2020 and have avoided the construction of the equivalent of 38 750-MW coal-fired power plants (CLASP homepage, 2009).

On a country basis and taking CLASP engagement with China, its China S&L programme has transformed several product markets, improved the nation's economic efficiency, and accelerated the pace of China's GHG mitigation. S&L has become a prominent element in China's increasing emphasis on more sustainable energy development and its recently announced energy intensity goals. With CLASP, China has implemented eleven MEPS for nine products and endorsement labels for 11 products. By 2020, China's S&L programme is estimated to save 11 per cent of its residential energy use, reduce CO_2 emissions by 34 Mt of carbon annually, and avoid the need for $20 billion investment in power plant construction (United Nations, CLASP Case Study).

The essence of the programme's work in China is technology transfer, transferring to China the last twenty years of experience and toolkits that have been developed around the world to support S&L programmes. The success relies heavily on cooperation with a wide range of organizations and groups and training of Chinese counterparts. Lawrence Berkeley National Laboratory has provided 196 person-weeks of training for 90 officials from five agencies, split roughly evenly between training at Lawrence Berkeley National Laboratory and training inside China (United Nations, CLASP Case Study).

In terms of audience, CLASP website has been receiving a monthly hit of over 75 000 from over 80 countries. It has also published two editions of an S&L Guidebook that has been translated into Chinese, Korean and Spanish (CLASP homepage, 2009).

SOUTH ASIA: South Asian Association for Regional Cooperation (SAARC)

Institutional Background, Motivation and Capacity

Founded in 1985, the South Asian Association for Regional Cooperation (SAARC) has been acting as the nodal intergovernmental agency to collaborate across the eight countries in South Asia – Afghanistan (joining in 2007), Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Cooperative agreements and linkages have been forged in areas of agriculture, rural development, environment, science, health, and resources development. This development cooperation has extended to providing policy recommendations and coordination support through several high-level working groups formed in areas that include energy.

Under the SAARC energy cooperation programme, a Technical Committee on Energy was formed in 2000 to review recommendations related to a number of energy issues relevant to South Asian countries including EE. In 2005, SAARC Energy Ministers formed an Expert Group to formulate a Road Map on EE measures for Member States to implement. These measures aimed at promoting EE at the national and subregional levels have included standards and labelling harmonization, institutional strengthening and capacity building, knowledge exchange and the promotion of public private partnerships (SAARC homepage, 2009).

In November 13 of the same year, in line with this Road Map, the Heads of State or Government at the 13th SAARC Summit agreed on the recommendation of the SAARC Energy Ministers to establish the SAARC Energy Centre in Islamabad to serve as its centre of excellence in energy development cooperation. SAARC Energy Centre is aimed at promoting development of energy resources, including hydropower; and energy trade in the region; developing renewable and alternative energy resources; and promoting EE and conservation in the region (SAARC homepage, 2009).

Since 2006, SAARC Energy Centre has been administered by a team headed by the Centre Director.

Institutional Programmes

The 2007 SAARC Road Map for implementation by the Member States on energy conservation and EE has included the following:

- Review of EE and conservation policies and legislative frameworks;
- Strengthening institutions that promote EE;
- Sharing of experiences, expertise and best practices;
- Developing and harmonizing S&L programmes;
- Awareness programmes;
- Increasing regional cooperation;
- Promoting public-private partnership; and
- Developing an Energy Conservation Directory (SAARC Energy Newsletter, 1(2)).

To provide more public awareness on energy issues, SAARC Energy Centre has been publishing a biannual newsletter and maintaining a homepage.

SOUTH-EAST ASIA: ASEAN Centre for Energy

Institutional Background, Motivation and Capacity

The Association of South-East Asian Nations (ASEAN) Centre for Energy is an intergovernmental organization established by the ASEAN member countries (Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam) in 1999. The Centre was formerly known as the ASEAN-EC Energy Management Training and Research Centre (Established based on an agreement signed in Brussels, Belgium).

The Centre is envisioned to be a catalyst for the economic growth and development of the ASEAN region by initiating, coordinating and facilitating regional as well as joint and collective activities on energy. To realize this ambition, ACE is aimed at

accelerating 'the integration of energy strategies within ASEAN by providing relevant information state-of-the-art technology and expertise to ensure that over the long term, necessary energy development policies and programmes are in harmony with the economic growth and the environmental sustainability of the region' (ASEAN Centre for Energy Homepage,2009).

ACE is headquartered in Kuningan, Jakarta, Indonesia in the compound of the Directorate-General for Electricity and Energy Development of Indonesia's Ministry of Energy and Mineral Resources. A Governing Council composed of energy senior officials and a representative from the ASEAN Secretariat guides the Centre. Core funding is sourced from an Energy Endowment Fund established from equal contributions of the ten member countries and managed by a private fund. (ASEAN Centre for Energy Homepage, 2009).

Since its establishment, ACE has been instrumental in preparing the five-year ASEAN Plan of Action for Energy Cooperation. The Plan of Action was formulated to implement the 1998 Hanoi Plan of Action aimed at realizing ASEAN Vision 2020. Specific to energy, ASEAN Vision 2020 seeks to promote EE cooperation and the development of new and renewable energy resources on top of establishing interconnection arrangements for energy sources within the region. The first Plan of Action (1999 to 2004) integrated six cooperation programmes: power grid, trans-country gas pipeline, coal production, EE, renewable energy, and energy policy.

Among the major accomplishments made under the Plan of Action for 1999 to 2004 that are related to EE include:

- the conduct of yearly ASEAN Best Practices Competition for Energy Efficient Buildings,
- energy labeling programme for energy efficient products under the ASEAN S&L Programme for magnetic ballasts, refrigerators, air-conditioners, and motors; and
- the conduct of EE technology transfer workshops and energy audits for selected buildings and industries (ASEAN Secretariat homepage, 2009).

Now in its second phase, the Plan of Action for 2004 to 2009 considers emerging global developments aside from its routinely regional focus. Various cooperation activities have been undertaken for greater regional cooperation and became precursors to the new Plan of Action. Specific to EE, the ASEAN has forged cooperation activities with Japan through the Framework for Comprehensive Economic Partnership signed at the 9th ASEAN Summit in 2003. Another important cooperation initiative was forged between the ASEAN and three neighboring countries of Japan, China and the Republic of Korea. In 2002, the ASEAN + 3 Energy Ministers reached a common understanding for Energy Cooperation among Japan, China, Republic of Korea and ASEAN which include improvement of EE in this five-point initiative (ASEAN Secretariat homepage, 2009).

The ASEAN through the Plan of Action for 2004 to 2009 recognizes the urgent need for closer and enhanced cooperation within and outside the region. It maintains the six programme areas of the first Plan of Action which include EE programme. Various measures to promote EE form part of the objectives of ACE and are aimed at reducing energy consumption without reducing the use of energy-consuming plant and equipment. It intends to make better use of energy, resulting in the promotion of individual behaviour, working methods and industrial practices which are less energy-intensive. In response to evolving developments, the Plan of Action for 2004 to 2009 specifically aimed the ASEAN EE programme 'to strengthen cooperation in EE through institutional capacity building and increasing private sector involvement including enhancing public awareness as well as expanding markets for energy efficient products' (ASEAN Secretariat homepage, 2009).

Institutional Programmes

The ASEAN mandates its Centre for Energy to carry out its plans of actions as laid out in the Plan of Action for 2004 to 2009. In coordination with the ASEAN Secretariat and other ASEAN energy specialized bodies, the Centre is tasked to implement six strategies to promote EE in the region (ASEAN Centre for Energy homepage, 2009).

- Information Sharing and Networking. Building on the Plan of Action for 1999 to 2004, this strategy sets out priorities to concentrate efforts towards the promotion of EE in the region. These efforts include: collection of policies, strategies and programmes from member economies, directory of energy efficient resources, products and technologies, and dissemination of best practices researches. The information gathered is uploaded at the ACE homepage.
- ASEAN Energy S&L. ASEAN energy ministers have endorsed a standard label to promote awareness on ASEAN energy efficient products. These products are currently being identified by the committee for ASEAN S&L Programme.
- Expansion of Private Sector Involvement. The ASEAN recognizes the critical role of the private sector to the successful implementation of plans and programmes for the energy sector. Thus, the ASEAN wishes to engage this sector through establishments of networks, fora, conferences and seminars. The ASEAN Best Practices Competition Awards is perhaps the most notable activity within the scope of this strategy. The Awards is further discussed in the next section.
- Capacity Building. This is a new strategy adopted in the Plan of Action for 2004 to 2009 considered for the medium term noting that demand for energy and energy prices have been increasing rapidly. It became a major focus of the new Plan of Action aimed at addressing the lack of experience and technology on facilitating the development and implementing EE projects in some ASEAN member countries.
- Promotion of ESCO Business. The ESCO approach to improve EE within ASEAN has not been widely used in the region due to lack of awareness, financial, institutional and legal framework, hence the Plan of Action for 2004 to 2009 looks forward at engaging ESCOs and their services.
- Promotion of EE in the Transport Sector. The transport sector has been considered as a major energy consumer, thus the new Plan of Action calls for formulation of actions such as information sharing focused on this sector.

The last three strategies are new while the first are but continuation from the first Plan of Action (ASEAN Secretariat homepage, 2009).

Institutional Performance

ACE supports a number of initiatives and projects. Notable of these is the ASEAN Best Practices Competition Awards which is expected to increase the potential in energy savings, increase participation of other buildings through replication and adoption of building energy management system and other good practices towards energy efficient operation of their building.

The competition is divided into four categories:

- new and existing building (open for those which are not more than five years old),
- tropical building (not more than fifteen years old with air conditioning of less than fifty percent of the total gross floor area and gives high emphasis on effective use of passive design),
- retrofitted building (more than five years old and where major changes and improvements have already been introduced to improve EE), and
- special submission (special projects which study, apply, and/or develop innovative use of technologies which could be applied to reduce energy consumption in buildings) (Rules and

Guidelines for the ASEAN Best Practices Competition for Energy Efficient Buildings, ASEAN Centre for Energy homepage).

While the marks allocations vary, the criteria for scoring categories are the same. These are:

- overall on-site natural environment considerations. This criterion includes the use of vegetation, landscape and hardscape; the use of water body; the use of wind; and other use of on-site natural environment.
- passive design concepts. This includes the orientation and building design, envelope design (material, shading and fenestration), overall heat transfer through building envelope, daylighting, natural ventilation, and other passive design concepts.
- active design concepts. This criterion looks at the building's air-conditioning system, lighting systems, other systems (such as transportation), indoor air quality, overall energy consumption, and other active design concepts.
- management and maintenance scheme. This involves energy management systems, and maintenance and management measures.
- environmental impact consideration. This criterion looks at waste management, pollution management (air, noise, visual, exhaust, etc), green materials, and others.

The number of winners for building categories is a maximum of three winners and a maximum of two runner ups, whereas for the special submission category, winners can be of any number. The evaluation criteria are further discussed below. Since it begun in 2001, ACE has awarded a total of 81 with Singapore getting the most number at 24; Malaysia has fourteen; Indonesia has twelve; Thailand has ten; Philippines has eight; Myanmar has six; Viet Nam has five and Cambodia has two (tally was made from a year-to-year list available at the ASEAN Centre for Energy homepage in 2009).

SUBREGIONAL, REGIONAL AND INTERNATIONAL PROGRAMMES

Efficient Lighting Initiative (ELI)

Institutional Background, Motivation and Capacity

Insufficient information about the energy, economic and environmental benefits of efficient lighting, and a lack of credible sources of such information, can discourage purchases of energy-efficient lighting. In response, Efficient Lighting Initiative (ELI) has developed and started promoting voluntary technical specifications that address product efficiency and reliability. ELI is a specialized international branding/certification system for high-quality energy-efficient lighting products. It is a "reach" standard for lighting efficiency in developing and transition economies which provides an endorsement of the quality and efficiency of lighting products. The ELI Quality Certification Institute, a non-profit organization operates it for the benefit of end users, policymakers, and lighting suppliers worldwide. ELI operates on the mission of providing 'a transparent and simple mechanism for certifying the quality and efficiency of lighting products sold worldwide' (ELI homepage, 2009).

Originally, ELI was a US$15 million World Bank programme designed by the International Finance Corporation and funded by the GEF to accelerate the penetration of energy-efficient lighting technologies into emerging markets in developing countries. It was designed to lower the market barriers to efficient lighting and thereby increasing the use of energy-efficient lighting technologies in seven countries: Argentina, the Czech Republic, Hungary, Latvia, Peru, the Philippines, and South Africa through a set of multi-country initiatives, local and global partnerships, and interventions tailored to individual country conditions. ELI sought to have a sustainable, long-term impact, creating vibrant markets for energy-efficient lighting technologies. Since its inception in 1999, ELI worked with lighting manufacturers, electric utilities, the public sector, NGOs, and educational institutions to

accelerate the growth of lighting markets in its seven target countries (ELI homepage, 2009).

ELI has three main target groups:

- manufacturers and importers of lighting equipment, who benefit through the association with an international brand that signifies EE and quality;
- programme managers and bulk purchasers of lighting equipment, who immediately become part of a global network of purchasers who are specifying and purchasing lighting equipment that meets the ELI quality standards.
- policymakers and regulators, who gain access to a "turn-key" international standard for lighting efficiency and quality

The ultimate beneficiaries of ELI, however, are the consumers who are more easily able to locate and purchase high-quality, affordable, and energy-efficient lighting equipment.

When ELI's seven country programmes were shut down in late 2003, a Next Generation of ELI has continued to provide services to support the use of high-quality energy-efficient lighting. This expansion was also commissioned by the International Finance Corporation and funded by the GEF with the China Standard Certification Center developing and expanding the ELI certification and branding system in 2005 in a global scale. This is in response to an outpouring of demand from manufacturers, large consumers, and a variety of national programmes emerging both within and outside the ELI countries (ELI homepage, 2009).

The Programme

The ELI seven-country programme was built around the development of a recognizable ELI consumer logo representing efficient and reliable product performance. The ELI specifications was originally aimed at identifying world-class energy efficient lighting products before they become part but they are not part of any local or international law or regulation. Lighting manufacturers can show that their products comply with the ELI specifications by bearing the ELI "Green Leaf" logo.

The ELI logo helps purchasers recognize efficient, reliable products that perform according to manufacturer specifications. The ELI logo is a sign of high quality and savings backed by credible performance data. Only lighting products that carry the ELI logo are eligible to participate in the campaigns offered by ELI to the public and in the other market building and promotional activities that ELI conducts.

Interested manufacturers may qualify their lighting products to carry the ELI logo by showing that they comply with the ELI technical specifications. The ELI Quality Certification Institute determines the compliance with the ELI specifications through a review and assessment of all supporting documentation submitted by the applicant as well as product performance data from accredited lighting laboratories (ELI homepage, 2009).

The ELI Voluntary Technical Specifications were developed through an international development and review process involving experts on the local lighting markets in the seven ELI countries, experts in lighting technology, and the lighting industry. The ELI specifications cover efficient lighting technologies that may be promoted through ELI programmes, but not all technologies will be promoted in every country as the needs of the local lighting markets drive the programme design in each country.

The new expanded ELI Programme continues to work in cooperation with government agencies, international organizations, manufacturers, testing laboratories, lighting associations, large retailers and other agencies to accelerate the widespread adoption of energy-efficient lighting products. The ELI Quality Certification Institute led by CSC with assistance from a team of international experts from Asia, North America and Latin America operates the programme. In 2008, ELI focused on the developing

countries of Asia/Asia Pacific, Latin America and Africa and seeks opportunities to harmonize its test methods and performance specifications with other international voluntary labeling programmes.

The ELI Quality Certification Institute is currently promoting the following voluntary technical specifications for energy efficient lighting (ELI homepage, 2009):

- Self-Ballasted Compact Fluorescent Lamps
- Double-Capped Fluorescent Lamps
- Fluorescent Lamp Ballasts
- Street Lighting
- Indoor Lighting System
- First LED Products

For each new product specification, the ELI Quality Certification Institute goes through the following transparent process (ELI homepage, 2009):

- Develop an international contact list for the product.
- Gather and analyze market data and technical specifications on the product from developing and transition economies.
- Review and compare international specifi cations for EE and quality of the product.
- Develop draft specifications and consult with recognized international experts.
- Launch an international consultation process with the suppliers, mediated through the ELI web site (www.efficientlighting.net).

Programme Performance

In 2009, ELI has qualified 103 compact fluorescent lamp (CFL) models coming from fourteen manufacturers. These models meet ELI technical specifications for performance, and have been used in demand side management (DSM) and other programmes in the ELI countries. Over 90 fluorescent lamp and ballast combinations, from one manufacturer, are also qualified (ELI homepage, 2009).

Electric utilities in partnerships with ELI have also begun analyzing or implementing energy-efficient lighting DSM programmes for their customers. These include Edesur (Argentina), Edelnor (Peru), ESKOM (South Africa), CEPALCO (Philippines), and PRE (Czech Republic).

Purchases of CFLs in all ELI countries have also increased as brought about by ELI mass media campaigns. In Peru for example, the percentage of total lighting sales for incandescent lamps had decreased from 68.6 per cent in 2000 to 57.2per cent, while CFLs increased from 2.9 per cent in 2000 to 9.2 per cent in 2002 (ELI homepage, 2009).

In all its countries of operation, ELI has run training courses on energy-efficient lighting for primary and secondary students, for lighting professionals, for municipal lighting decision-makers, for electricians, and for other parties. These usually become part of the regular offerings of participating institutions.

ELI has run ESCO training courses, produced model ESCO contracts, and offered customized project development assistance in order to support the promising lighting ESCO industry in participating countries.

ELI has been promoting energy-efficient streetlighting in Peru, the Czech Republic, Latvia, and South Africa. For example, the ELI-Peru team sponsored the development of a highly efficient streetlighting luminaire and is carrying out pilot projects with several electric companies. In Latvia, ELI pioneered an ESCO-financed streetlighting retrofit.

Some ELI accomplishments are very country-specific. For example, in the Philippines, ELI strengthened the capacity of the Lighting and Appliances Testing Laboratory, and founded the Philippines Lighting Industry Association which has become an independent lobbying group. In South Africa, ELI collaborated with the National Government so that energy-efficient lamps would be part of the package offered to subscribers of the country's Electricity Basic Support Services Tariff (a tariff for the poorest customers).

ELI has won endorsements for energy-efficient lighting from notables and government officials in its countries of operation, including the Prime Minister of Latvia, the Czech Minister of Natural Resources, and former South African president Nelson Mandela.

Based on experience of past energy-efficient lighting programmes, ELI assembled a "toolbox" of approaches that participating countries could adapt to local conditions in order to develop their own energy-efficient lighting markets. These tools are:

- Public Education, Marketing and Standards. ELI has been sponsoring and conducting public education campaigns, facilitating the development of technical S&L, and providing a marketing umbrella under which lighting manufacturers and other partners can launch expanded product promotions and advertising campaigns. It also forms advisory committees to bring together NGOs, government agencies, industry and technical professionals to help structure and support country-specific opportunities.
- Electricity Distribution Utility Programmes where ELI partners with electricity distribution companies to promote investments in energy efficient lighting as part of a DSM strategy for the electricity sector, tailored to prevailing tariff structures, regulatory systems, utility business conditions and electrification programmes in each country.
- Transaction support and financing wherein small projects are aggregated to increase the demand for capital. ELI leverages programme funds through innovative credit structures, and demonstrates commercial models of consumer finance for replication by local financial institutions. Arrangements could include utility bills, microcredit organizations and paycheck billing. ELI also addresses commercial-sector financing issues for ESCOs and other financial vehicles.

ELI is also involved with market aggregation. It pools the purchasing power of residential housing organizations, consumer associations and large employers to lower prices for efficient lighting products and strengthen delivery mechanisms. It also engages lighting manufacturers and suppliers to substitute low-efficiency lighting with high-efficiency products.

Finally, ELI arranges financial incentives by using targeted subsidies as a coordinated element in short-term promotions, to support public education efforts and to overcome initial cost barriers in selected transactions and market aggregation activities.

EUROPE: Energy Efficiency 21 (EE21)

Institutional Background, Motivation and Capacity

Energy Efficiency 21 (EE21) is a region-wide project working with economies in transition to support the formation of an EE market through building the capacity of local experts to develop projects, working with local authorities on government policy reforms, and facilitating opportunities for project finance through externally managed public-private partnership investment funds. Piloted in 1991 as a 4 three-year phased project (1991 to 2003), the Project started as EE 2000, an umbrella project under which the inter-regional, sub-regional and country-oriented projects are developed (EE21 homepage, ECE, EE 21. Presentation to the 16th Session of the EE21 Project Steering Committee, Geneva, 29 June – 1 July 2005). The Project seeks to enhance East-West Trade and cooperation in Europe (EE21 homepage, ECE, EE 21. Presentation to the Implementation of the Kyoto Protocol, EE and Climate Change Mitigation, Geneva, 29 June 2005).

EE21 is designed to develop the skills of the private and public sector experts at the local level to develop EE and renewable energy investment projects. It provides assistance to municipal authorities and national administrations to introduce the economic, institutional and regulatory reforms needed to support these investment projects. The Project has also provided opportunities for banks and commercial

companies to invest in these projects through professionally managed investment funds established within the framework of the EE21 project.

EE21 has been implemented within the United Nations Economic Commission for Europe (ECE). Its objectives have included the improvement of capacities and networking, initiation of policy reforms, and financing of EE investments. EE21 has received funding support from the United Nations trust fund. Support to its sub-projects has been provided by ECE governments, international organizations and private companies. The EE21 Project is guided and monitored by a Steering Committee composed of delegates from national participating ministries and institutions, international organizations and donor agencies. The Steering Committee determines the activities, results, work methods, participation, procedures, budget, calendar of events and timetable of the project, and secures cooperation from other interested parties.

EE21 has been extended in 2003 for another three years; this time it expanded to include the enhancement of regional cooperation on energy market formation and investment project development to reduce GHG emissions in economies in transition. In 2006, it was once again extended for the next three years. The sixth phase of the project (2006 to 2009) extended the 2003 general objective and has adopted three immediate objectives of accelerating regional networking, promoting municipal level projects, and developing and harmonizing regional policies. With the success of EE21, it has been proposed to be extended to its Sixth 3-year phase (2009 to 2012) (EE21 homepage, ECE, EE 21. Presentation to the Implementation of the Kyoto Protocol, EE and Climate Change Mitigation, Geneva, 29 June 2005).

The Programme

EE21 has received supports for its sub-projects from ECE governments, international organizations and private companies whose contributions involved in-kind (such as providing experts, organizing and hosting meetings, etc.), co-financing, and contribution to the trust funds. Sub-projects have their own budgets, cost plans and funding (EE21 homepage, ECE, EE 21: Recent Developments. Presentation to the Steering Committee of the EE 21 Project Twentieth Session, 3-5 June 2009).

The following sub-projects have been completed on the sub-regional and country levels:

- Final Report on EE Investment Project Development for Climate Change Mitigation (sub-regional)
- Green Labels Purchase for greener procurement with energy labels (sub-regional)
- Development of Coal mine Methane Projects in Central and Eastern Europe and the Commonwealth of Independent States (CIS) (sub-regional)
- Biomass Energy for Heating and Hot Water Supply in Belarus (country-oriented)

The following sub-projects are on-going as of June 2009:

- Financing EE Investments for Climate Change Mitigation (sub-regional, and includes Capacity Building, Policy Reforms, and Dedicated Investment Fund)
- The Regional Network for Efficient Use of Energy and Water Resources in South-East Europe (RENEUER) (sub-regional)
- Removing Barriers to EE Improvements in the State Sector in Belarus (country-oriented) (ECE, EE 21: Recent Developments. Presentation to the Steering Committee of the EE 21 Project Twentieth Session, 3-5 June 2009).

New projects in 2009 have included:

- Increasing EE for Secure Energy Supplies (sub-regional)
- Development of the Renewable Energy Sector in the Russian Federation and in CIS Countries: Prospects for Interregional Cooperation (sub-regional)
- Global Energy Efficiency 21 (ECE, EE 21:

Recent Developments. Presentation to the Steering Committee of the EE 21 Project Twentieth Session, 3-5 June 2009).

Global Energy Efficiency 21

Global EE21 is an inter-regional cooperation project building upon the success of EE21. The Project was proposed in 2008 to develop a more systematic exchange of experience on capacity building, policy reforms and investment project finance among countries of region of the world through the five United Nations Regional Commissions in order to promote energy efficient use improvements (Note: The five United Nations Regional Commissions include the ECE, ESCAP, Economic Commission for Latin America and the Caribbean, Economic Commission for Africa, and the Economic and Social Commission for West Asia). It has four objectives:

- strengthening the participation of 12 countries in the project 'Financing EE Investments for Climate Change Mitigation',
- dissemination and extension of project experiences in other countries,
- increasing the capacity of the United Nations Regional Commissions in providing EE services, and
- improving capacity to develop, adjust and implement a global strategy to promote self-financing EE improvements for climate change mitigation (EE21 homepage, ECE, EE21/GEE21: ECE activities in the field of EE. 4 June 2009).

Funding for this project, particularly for the last two objectives, has been provided by the Russian Federation to meet the following short-term activities: network establishment, EE work programmes appraisal, determination of common priorities and synergies between member states, and the development of a global strategy. In 2009, the project has started gathering information about EE programmes, activities and financing mechanisms by region (EE21 homepage, ECE, EE21/GEE21: ECE activities in the field of EE. 4 June 2009).

Programme Performance

Since its implementation, EE21 has involved the services of 10 000 experts working for 150 events in 43 countries. At the conclusion of the project in 2003, it has successfully completed a Carbon Emissions Trading Handbook, a Guide to Investors in EE and Climate Change Projects, Review of Multilateral Institutions, an EE Standards e-Book, and a Guide to EE Policies. Throughout its twelve-year period, EE21 was able to present exhibitions in 38 locations, received an average of 55 000 annual visits in its website, approved financing of around US$ 9 million in Belarus, Russian Federation, Bulgaria and Ukraine (EE21 homepage, UN ECE, EE 21: Recent Developments. Presentation to the Steering Committee of the EE 21 Project Twentieth Session, 3-5 June 2009).

SUMMARY

Tables 3-1 and 3-2 provide the summary of EE institutions, national and inter-national, respectively while Table 3-3 summarizes international EE programmes. Part 3 contains an examination of ten national (in-country), and eight transnational institutions. Based on the 2009 World Bank Country Classification, of the national organizations presented in this Report, eight are from High-Income-OECD countries, one High-Income-Non OECD, and one lower-middle income country. They are also geographically located across the globe: from Europe to Australia, to East Asia and Singapore, to the United States and East Asia. In terms of age, their stages of development are also varying ranging from a 39-year old institution (US EPA) to as young as two years old (Singapore Energy Efficiency Programme Office). The selected international organizations have also come from across: two are global in scope; three are working for European states; two from Asia, and one from Asia-Pacific. The oldest founded institution dates back to 1990 (APEC Experts Group on EE&C) while the youngest is only four years old (SAARC Energy Centre).

Table 3-1 | Summary of National (In-country) EE Institutions

Institution	DEWHA	Beijing Energy Efficiency Center
Country	Australia	China
Date established /Age as of 2010 (in years)	2007/3 *Since March 2010, EE concerns have been transferred to the Department of Climate Change and Energy Efficiency*	1993/17
Founder	Australian Federal Government	Energy Research Institute (China), Battelle Pacific Northwest Laboratory (USA), Lawrence Berkeley Laboratory (USA), World Wildlife Fund for Nature
Mission/ Values/Vision/ Institutional directions	• developing and implementing national policy, programmes and legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture • overseeing EE operations in households and communities, appliances, equipment and fittings, business and industry, and buildings	• Vision: to become China's first class agency in research on energy conservation theory, policy and methodology, information dissemination, and technological extension • to support China's related energy conservation by leading government agencies through major policy consulting and technology support • to broaden the channel for international cooperation and information exchange, and to promote energy conservation and environment protection in China.
Funding sources	Australian Federal Government	
Flagship EE programme	**EE for Government Operations** • improving EE and consequent reducing the whole of life cost and environmental impact of Government operations. • Reduction of Australian government's energy intensity including 20 to 25 per cent reduction in government offices by 2011 • MEPS for office buildings, appliances and vehicles	**China Green Lights Project** (initiated in 1996, started in 2001, concluded and expanded on a nationwide scale in 2005) Objective: to save energy and protect the environment by reducing lighting energy use in China in 2010 by 10 per cent relative to a constant efficiency scenario, and establishing a vibrant, self sustaining market in efficient lighting products and services. Project cost: US$26.20M (funded by GEF with counterpart from Chinese Government and enterprises)
Management and Leadership Structure	Federal staff	Composed of a consultative group (senior Chinese officials in charge of energy conservation), a council (senior experts), and support staff (12 in 2009)

Table 3-1 | Summary of National (In-country) EE Institutions *(continued)*

Institution	ADEME	Energy Conservation Center, Japan
Country	France	Japan
Date established /Age as of 2010 (in years)	1992/18	1978/32
Founder	French Government (jointly supervised by the Ministry for Ecology, Sustainable Development and Spatial Planning, and the Ministry for Higher Education and Research) • Environment code (legislation livre 1, titre III, Chapter 1, section1)	Government of Japan • Energy Conservation Law (1979, amended thereafter) : "Law Concerning the Rational Use of Energy"
Mission/Values/ Vision/ Institutional directions	encouraging, supervising, coordinating, facilitating and undertaking operations with the aim of protecting the environment and managing energy to be the point of reference and privilege partner for the general public, companies and local authorities, acting as the State's tool to generalize the good practices designed to protect the environment and energy saving	promoting the efficient use of energy, protection of the global warming and sustainable development
Funding sources	French Government (2009 Budget: €638M) (2010 Budget: €1 073M)	Government of Japan 2009 Budget : JPY1.68 Billion (operation expansion fund)
Flagship EE programme	Support on research (economical transport systems, EE in buildings, and new technologies) Provision of financial and technical assistance to enable developers to deploy more efficient energy solutions Public information through Espaces Info'Energie (Energy Info Points)	**Top Runner Programme (developed in 1999)** Applies to machinery and equipment in the residential, commercial and transportation sectors. Sets targets by product category
Management and Leadership Structure	Board: 23 representatives (7 are from ministries) Staff: 820 (2009); 930 (300 for EE) (2010)	Chairman, President, 3 Managing Directors, 25 Directors, 2 Auditors, 30 Councilors Staff: 122 (2009)

Table 3-1 | Summary of National (In-country) EE Institutions *(continued)*

Institution	KEMCO	Energy Efficiency and Conservation Authority
Country	Republic of Korea	New Zealand
Date established /Age as of 2010 (in years)	1980/30	2000/10
Founder	Government of the Republic of Korea; Ministry of Commerce, Industry and Energy	New Zealand Government (reports to the Ministry of Energy and Resources) • New Zealand Energy and Conservation Act of 2000
Mission/Values/ Vision/ Institutional directions	• providing a nation-wide energy management services that vary from technical and financial support to administrative services • seeks to create an energy culture to improve EE and to develop and disseminate "next generation energy" • improve EE; diffuse renewable energy; reduce GHG	to encourage, support, and promote EE, energy conservation, and the use of renewable sources of energy in New Zealand
Funding sources	Government of Republic of Korea (2009 Budget: $820M	New Zealand Government
Flagship EE programme	**e-Standby programme** • 1999: Korea became the world's first country to introduce mandatory Standby Power Warning Label in the world • Partner: Ministry of Knowledge Economy • 2007: the programme was made mandatory)	**ENERGYWISE** • EECA's consumer programme that provides information and funding for householders so that they can make the most of EE, energy conservation and renewable energy
Management and Leadership Structure	Government-appointed Board of Directors; Chief Director and 4 teams	8 Board Members appointed by the Minister of Energy, The Board then appoints the chief executive.

Table 3-1 | Summary of National (In-country) EE Institutions *(continued)*

Institution	EE Programme Office	Energy Savings Trust
Country	Singapore	United Kingdom
Date established /Age as of 2010 (in years)	2007/3	1992/18 • Act of British Parliament, 1992
Founder	Government of Singapore	Independent, non-profit making Members: • UK Secretary of State for the Energy and Climate Change, • UK Secretary of State for Transport, • UK Secretary of State for Northern Ireland, • First Minister for Scotland, • The Welsh Assembly Government • and several from the private sector
Mission/Values/ Vision/ Institutional directions	• To develop a holistic EE strategy for Singapore • areas for action: (1) addressing market barriers to EE, (2) capability building and developing local knowledge base, (3) raising public awareness, and (4) supporting research and development	• to help in reducing carbon dioxide emissions by helping people take action to reduce carbon it their homes and lifestyles • The Trust envisions a future that every home is a low-carbon home and everybody leads a low-carbon lifestyle by taking energy-saving behaviours, buying the most energy-efficient products, fitting homes with energy-saving measures, making sustainable travel choices, choosing renewable energy, including microgeneration, and conserving water, reducing and recycling waste
Funding sources	Government of Singapore	Although an independent company, the Trust receives funding support from the government and the private sector (including a number of energy companies) 2005 Funding: €73.6M)
Flagship EE programme/ initiatives/ projects	• The 10 per cent Energy Challenge • Energy Smart Building Labelling Programme • The Green Mark Scheme • Fuel Economy Labelling • ESCOs Accreditation Scheme	**Local advice networks** • Behavior changing programmes to deliver 'low carbon citizens' • Local advice centers to provide citizens with practical advice on sustainable energy • 2009: 21 centers spread across the UK
Management and Leadership Structure	a committee composed of several agencies: National Environment Agency, Energy Market Authority, Economic Development Board, Land Transport Authority, Building Construction Authority, Housing and Development Board, Infocomm Authority of Singapore, Agency for Science, Technology and Research, Ministry of Environment and Water Resources, and Ministry of Trade and Industry	Board of Directors (chairman, executive director, and nine nonexecutive directors (four elected and five independent)

Table 3-1 | Summary of National (In-country) EE Institutions *(continued)*

Institution	EPA	USGBC
Country	United States of America	United States of America
Date established /Age as of 2010 (in years)	1970/40	1993/17
Founder	The US Congress	Richard Fedrizzi (USGBC is non-profit organization)
Mission/Values/ Vision/ Institutional directions	leader in environmental science, research and education efforts in the US by providing objective information and technical assistance	to transform the way buildings and communities are designed, built and operated, and enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life
Funding sources	US Federal Budget	Membership dues ; education ; registration and certification ; conferences and meetings ; grants and sponsorship
Flagship EE programme/ initiatives/ projects	**Energy Star** • 1992: introduced as a voluntary labelling programme • 1996: US Department of Energy joined assuming specific Energy Star programme responsibilities • Adopted in Australia, Canada, Japan, New Zealand, Taiwan (Province of China), and the European Union • Objective: to address CO_2 emissions from residential, commercial and industrial sectors • Partners: more than 15,000 private and public sector organizations	**LEED Green Building Rating System** • Started in 1998 • scores the design, construction and operation of green buildings and certifies it thereafter • voluntary third-party certification programme • scored based on 6 interrelated categories • 4 levels of certification (Certified, Silver, Gold. And Platinum)
Management and Leadership Structure	Governing Council made up of EPA Assistant Administrator for Air and Radiation and the Department of Energy Assistant Secretary for Energy Efficiency and Renewable Energy (new structure included in the Memorandum of Understanding between EPA and the Department of Energy signed in September 2009)	• Five Board of Directors • 78 regional chapters in the US • 200 volunteers on 20 committees and 150 professional staff (2009)

Table 3-2 | Summary of Subregional, Regional and International Institutions

Institution	APEC Experts Group on EE&C	Club E^{n}R
Domicile		Rotated to member agencies
Date established /Age as of 2010 (in years)	1990/20	1991/19
Founder	APEC (built on the framework for cooperation in EE in the Experts Working Group meeting in Peru, 2000)	
Membership/ Scope	APEC's 21 member economies	23 EU Member states (voluntary)
Mission/Values/ Vision/ Institutional directions	promoting energy conservation and the application of energy-efficiency practices and technologies through 'advancing the application of demonstrated energy-efficiency practices and technologies, developing and enhancing trade between APEC Economies in products and services and energy-efficiency practices and technologies, contributing to international efforts to reduce the adverse impacts of energy production and consumption, and improving the analytical, technical, operational and policy capacity for EE and conservation within APEC Economies	to strengthen cooperation between member agencies and other European actors on all issues relevant to sustainable energy (EE, sustainable transport and renewable energy)
Funding source	Annual contribution from APEC member economies	Voluntary membership, doesn't have its own budget
Flagship EE programmes	APEC Energy Standards Information System • the platform provides (1) up-to-date information on energy standards, (2) links to experts, (3) regular news updates. • Funders: Canada, Australia, Taiwan (Province of China), Japan, Republic of Korea, New Zealand, USA, CLASP, USAID	Facilitate communication and exchange of information on the experiences gained from EE policies Provide technical and institutional support and capacity building services for European institutions
Management and Leadership Structure	• Under the APEC Experts Working Group • The APEC Energy Standards Information System is managed by a Steering Committee made up of contributing economies and organizations.	• Troika Management Committee (yearly rotating Presidency and Secretariat) • Eight working groups • Activities rely primarily on 'in-kind' staff time and resources volunteered by member agencies

Table 3-2 | Summary of Subregional, Regional and International Institutions *(continued)*

Institution	Directorate-General for Transport and Energy	CLASP
Domicile	Brussels, Belgium	Washington D.C., USA
Date established /Age as of 2010 (in years)	2000 (fusion of the Directorate-Generals for Transport and DG for Energy)/10	1999/11
Founder	EU Member States	CLASP takes its roots from a 1996 initiative at Lawrence Berkeley National Laboratory
Membership/ Scope	This is a government department in the European Commission	Global in scope. Established partnership in 27 countries (6 in the ESCAP region: Australia, China, India, Nepal, Sri Lanka, and Thailand). Works in several Asian countries, with APEC, and USAID/SARI
Mission/Values/ Vision/ Institutional directions	Developing and implementing European policies in the energy and transport field. Mission: to ensure that energy and transport policies are designed for the benefit of all sectors of the European community Seven Goals: completing the internal market in energy and transport; ensuring sustainable development of transport and energy; deployment of major networks in Europe; space management (including air traffic congestion management); improving transport and energy safety; accomplishing enlargement; and developing international cooperation	to transform the manufacture and sale of appliances, equipment and lighting worldwide by the application of EE S&L so that countries develop in a more environmentally sustainable and economically efficient manner
Funding sources	European Commission (Budget: US$1.2 billion p.a.)	• Diversified sources (governments, foundations and international governmental organizations) • Early funding (USAID and United Nations Foundation)
Flagship EE programmes	• Legislative proposals; Programme management; Project financing; Technological development and Innovation **GreenLight Programme** • Launched in 2000; Voluntary initiative to reduce lighting energy use • Supported by the national energy agencies of 14 European countries • Activities: Reduce lighting electricity consumption by at least 30 per cent (existing spaces); choose installation that consume less electricity (new spaces)	**S&L Project brokerage** • aggregates resources, assembles project teams from diverse organizations, provides technical support to project teams, actively oversees project performance, and provides quality control of project output
Management and Leadership Structure	• 1000 officials, 11 Directorates • Brussels (700 staff); Luxembourg (300 staff)	• International Board of Directors (10 voting members) • Operations managed by a Secretariat in Washington

Table 3-2 | Summary of Subregional, Regional and International Institutions *(continued)*

Institution	SAARC Energy Centre	ASEAN Center for Energy
Domicile	Islamabad, Pakistan	Singapore
Date established /Age as of 2010 (in years)	2005/5	1999/11
Founder	Heads of State or Government at the 13th SAARC Summit	• ASEAN Member Countries • Forerunner: ASEAN-EC Energy Management Training and Research Center
Membership/ Scope	8 SAARC Member States or Governments (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka)	ASEAN member countries (Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam)
Mission/Values/ Vision/ Institutional directions	• to serve as a centre of excellence in energy development cooperation in the SAARC region • Vision: to be a catalyst for the economic growth and development of the South Asia region by initiating, coordinating and facilitating regional as well as joint and collective activities on energy • Mission: to provide technical inputs for the SAARC Working Group (and other) meetings on Energy, and will facilitate accelerating the integration of energy strategies within the region by providing relevant information, state-of-the-art technology and expertise.	to be a catalyst for the economic growth and development of the ASEAN region by initiating, coordinating and facilitating regional as well as joint and collective activities on energy
Funding sources	Contribution from SAARC Member States	Energy Endowment Fund established from equal contributions of the 10 ASEAN member countries
Flagship EE programmes	Activities based on the 2005 SAARC Road Map: Review of EE and conservation policies and legislative frameworks; Strengthening institutions that promote EE; Sharing of experiences, expertise and best practices; Developing and harmonizing standards and labelling programmes; Awareness programmes; Increasing regional cooperation; Promoting public-private partnership; Developing an Energy Conservation Directory	1. Information Sharing and Networking 2. ASEAN Energy S&L 3. Expansion of Private Sector Involvement 4. Capacity Building 5. Promotion of ESCO Business 6. Promotion of EE in the Transport Sector **ASEAN Best Practices Competition Awards (Green Building Awards)**
Management and Leadership Structure	Staff headed by a Director	Staff headed by a Director

Table 3-3 | Summary of Subregional, Regional and International Programmes

Institution	ELI	Energy Efficiency 21
Domicile	Islamabad, Pakistan	United Nations ECE, Geneva
Date established /Age as of 2010 (in years)	1999/11	1991/19
Founder	Set up by the World Bank; designed by IFC	Implemented within the United Nations ECE
Membership/ Scope	1999: Piloted in 7 countries (Argentina, the Czech Republic, Hungary, Latvia, Peru, the Philippines, and South Africa) 2005: Expanded to the developing countries of Asia/Asia Pacific, Latin America and Africa	Economies in transition in Europe; being expanded to other United Nations Regional Commissions.
Mission/Values/ Vision/ Institutional directions	• Pilot to 7 countries: to lower the market barriers to efficient lighting and thereby increasing the use of energy-efficient lighting technologies in 7 countries (1999-2003) • Expansion to global scale: to support the use of highquality energy-efficient lighting (Next Generation of ELI, 2005)	to support the formation of an EE market through building the capacity of local experts to develop projects, working with local authorities on government policy reforms, and facilitating opportunities for project finance through externally managed public-private partnership investment funds
Funding sources	GEF (US$15million)	United Nations Trust Fund; Support to sub-projects provided by ECE governments, international organizations and private companies
Flagship EE programme/s	**Green Leaf logo** to help purchasers recognize efficient, reliable lighting products	**Sub-regional:** • Final Report on EE Project Development for Climate Change Mitigation (completed) • Green Labels Purchase (completed) • Development of Coal Mine Methane Projects in central and Eastern Europe and the CIS (completed) • Financing EE Investments for Climate Change Mitigation (on-going) • RENEUER (on-going) **Country-oriented:** • Biomass energy for heating and hot water supply in Belarus (completed) • Removing barriers to EE improvements in the state sector in Belarus (on-going) **Global EE21**
Management and Leadership Structure	Pilot: GEF Expansion: China Standard Certification Centre	Steering Committee (composed of delegates from national participating ministries and institutions, international organizations and donor agencies)

APPLICABILITY AND REPLICABILITY ANALYSIS

Increasing the efficiency with which energy is extracted/captured, converted, and utilized not only require the improvement of current technology and the development of new transformative ones, but also paying much more attention to improving the management and coordination of EE institutions – be it public, private or mix enterprises. This is the role policymakers have to face and act upon.

In the context of climate change mitigation, energy systems need to be examined and reshaped. This includes an open opportunity to ensure that efficiency improvement is brought forefront among the responsibilities of all countries, rich and poor alike. In this context, it is significant that the management and structure of existing and new EE institutions are improved, better aligned and enhanced in terms of coordination, integration and overall performance. That said, our hypothesis - the transformation of our energy systems is unlikely to succeed without a transformation of our institutions and of the way in which policymakers think about their design - remains the same.

The institutions and programmes tasked to catalyze the change should learn the right lessons from the history of managing efforts. Perhaps the programmes exhibited by Beijing Energy Conservation Center (China Green Lights Project), Energy Conservation Center, Japan (Top Runner Programme), KEMCO (e-Standby Programme), Energy Efficiency and Conservation Authority (ENERGYWISE), Energy Savings Trust (Local advice networks), EPA (Energy Star), USGBC (LEED Green Building Rating System), APEC-Experts Group on EE&C (APEC ESIS), ELI (Green Leaf logo), Directorate-General for Transport and Energy (GreenLight Programme), CLASP (S&L brokerage), and ASEAN Center for Energy (ASEAN Best Practices Competition Awards) had manifested these kinds of efforts. Each had provided a different yet specific example of the values of remarkable streams of products, programmes, and initiatives.

Although we recognize the heterogeneity of EE institutions and the ever-changing nature of their programmes, products and enterprise, we believe that it is still possible to identify elements that are essential to create and run a successful EE institution. Against the framework used to draw lessons from efforts made and performance by some of the world's EE institutions discussed in Section 3.2, we highlight the following four institutional elements that the organizations we examined had exhibited. We believe these are the keys to their effective management and are therefore worthy of replication:

Element 1: Planned institutional strategy. As is clear from examples of the institutions, a clearly-defined institutional mission statement that is informed by, and linked to, a larger system perspective is very important to create a productive environment. The institutions' successful efforts shown by their respective performance highlight particularly well the importance of having a clearly-defined mission.

This said, a well-defined mission enables reaching an institution's objectives more effectively and significantly to the overall integration and coordination of its activities. Moreover, an inspiring and clear mission facilitates the design of an appropriate organizational structure and programmes for the institution. Institutions, however, should be flexible enough and adaptive to reflect the needs, information and context of the times. Adapting quickly to new technologies and complying with new regulations are important in ensuring resilience, relevance, and long term sustainability.

Element 2: Established management and leadership structure. The roster of managerial and scientific/ technical people charged to carry out the functions of the institution is a must to allow it to deliver its activities, projects and programmes well. As such, leaders of energy institutions also need an additional

and exceptional understanding of the role of their institution under the complex energy system, and the ability to integrate their activities not only within but also outside their respective institutions.

Element 3: Buy-in and ownership among stakeholders. Cooperation and coordination between the government and industry have certainly assisted in the success of the foregoing programmes. This coordination, however, will only be meaningful if the various stockholders have a clear understanding of their roles and benefits to be gained in the overall institutional scheme. Ownership by each stakeholder will create a much stronger collaborative spirit to change from a bureaucratic system to a more profit-driven system.

Element 4: Substantial funding. The importance of steady flow of funds could never be overstated. For an organization to function and for programmes to deliver outputs, robust supply of financial resources needs to be injected to keep the institution afloat. This has been an essential lesson learnt in previously failed energy centres which were no longer self-sustaining.

Way forward

In pursuit of energy security policies, a country needs to have effective institutions to develop appropriate energy security policies and to monitor their implementation. Although these capabilities are not always available for all countries, it should be noted that the effectiveness of energy security policies are enhanced with these capacities.

While it is ideal that all four institutional elements are present in the institution and that they must be healthy and in balance with one another to ensure the robustness of their systems, it does not follow that these elements are necessarily present at all times at all institutions discussed in Section 3.2. It must be understood that aside from these four elements, the external political, cultural and policy-enabling environment within which these institutions exist, as well as the continuing evolution of their nature had also determined their performance.

The challenge therefore for EE institutions should be about taking account all of these factors, and encompassing the dynamics of the broader policy, regulatory and legislative frameworks, external intervention management, and adaptation to this dynamism. The process in the development of the institutions considered in Section 3.2 has been complex and nonlinear: complex because it involves a range of actors and factors, and nonlinear because the dynamism occurs between stages of the process.

While it is difficult to generalize, our work has provided information that may be particularly useful to countries at similar stages of development, and/or countries with common cultural roots. Because of the uniqueness of each institution, our approach is rather descriptive rather than prescriptive, and the relative importance given to the various factors in the framework, and the way they are assessed, will depend on the particular contexts in which it is used.

Possible applications range from internal self-assessment to external evaluations, and from comprehensive assessments of every aspect of institutional functioning to the assembling of a few key impressions. It is important to note that while EE institutions have been developed and adopted in a number of countries, there are still some countries which have few ways of learning about the existence of information on this topic, and are currently facing barriers to accessing it. Thus, our possible users could include: a new institution or one at a turning point wanting to stock and formulate a plan for addressing weak areas or gaps; a consortium of organizations wishing to either set up or select an institution to play a specific role, etc. Depending upon the specific EE institution, it is our hope that the reader will extract from these case studies the concepts that are appropriate to their own stage of development and context, and adapt and adjust these to fit their particular circumstances.

Conclusions and Recommendations

CONCLUSIONS AND RECOMMENDATIONS

Progress in promoting EE has markedly been fast in Asia in the past several years as indicated by declining GDP energy intensities. A number of programmes and projects have been carried out for technical modernization and replacement of obsolete energy consuming equipment and buildings. Moreover, training and education on EE issues have been successfully conducted. Most Asian countries (with few exceptions) have also established legal and institutional frameworks for energy conservation policy. Generally, the typical institutional (government) structure for EE promotion in Asia has been represented by:

- a key ministry responsible for energy, industrial or economic policy;
- other ministries (ministries of construction, transportation, environment, forestry, agriculture, trade, industry, science and technology, etc.) involved in the implementation of the state energy conservation policy;
- agencies and committees for state supervision and control over efficient utilization of fuel and energy resources, and EE testing of appliances and equipment; and
- state-owned fuel and energy companies, industrial enterprises, scientific and research organizations and universities.

Despite some weaknesses and shortcomings, these frameworks have provided a number of opportunities to improve EE promotion in key energy consuming sectors of Asian economies. It is also apparent that EE legislation, regulations, standards, policies and programmes which are not systematically synergized need to be shored up.

The general commonalities in the structure, organization and mechanisms of EE institutions in Asia provide the raison d'être for the following recommendations to strengthen the capacity of these institutions in particular and to promote EE in general.

Recommendation 1

Build relevant macro and micro institutions

Strong institutional support from the government is essential for promoting EE improvement. EE programmes usually involve various government agencies with diverse functions. Considering that some agencies have overlapping mandates and conflicting policies, insufficient coordination among these entities (especially government bodies) could be difficult. The coordination of energy conservation activities within the government is extremely important for optimization of decision making related to EE issues. An example of insufficient coordination in the field of EE policy at the government level can be taken from the experience of Russian Federation (Shmatko, 2008) (*see Box 1*).

This rationalizes the creation of a special state institution such as an Energy Conservation Agency (or Committee) under ministerial control to take the lead. This body should be provided with sufficient financing to allow related programmes to thrive. It should also be vested with appropriate authority and clear mandates so that it can promote EE and provide institutional capacity building activities for professionals involved in the policy and planning development, and energy use and management. As much as possible, mandates should be in the form of legislation. Figure R-1 provides the recommended institutional structure for this coordinating body.

Box 1 | Experience from the Russian Federation

Before 2010, the basic principles of energy conservation policy for the Russian Federation were laid down in the Federal Law "On Energy Savings" of 3 April 1996 which included the following:

- prioritizing the efficient use of fuel and energy resources;
- state supervision to ensure the efficient use of energy resources;
- mandatory accounting of produced, obtained or consumed energy resources;
- incorporation of EE indicators in the federal standards for equipment, materials, structures and transport facilities; and
- certification of fuel-and-energy-consuming, energy-saving and diagnostic equipment, materials, structures, transport facilities, as well as energy resources and so on.

As a follow-up to the 1996 law, several state energy savings standards were approved. The implementation of the programme for energy inspections and the preparation of energy passports for enterprises with annual consumption over 6 ktoe began. Between 1998 and 2004, 43 laws on energy conservation were adopted and 75 EE centers and energy conservation agencies were established in constituent entities of the Russian Federation.

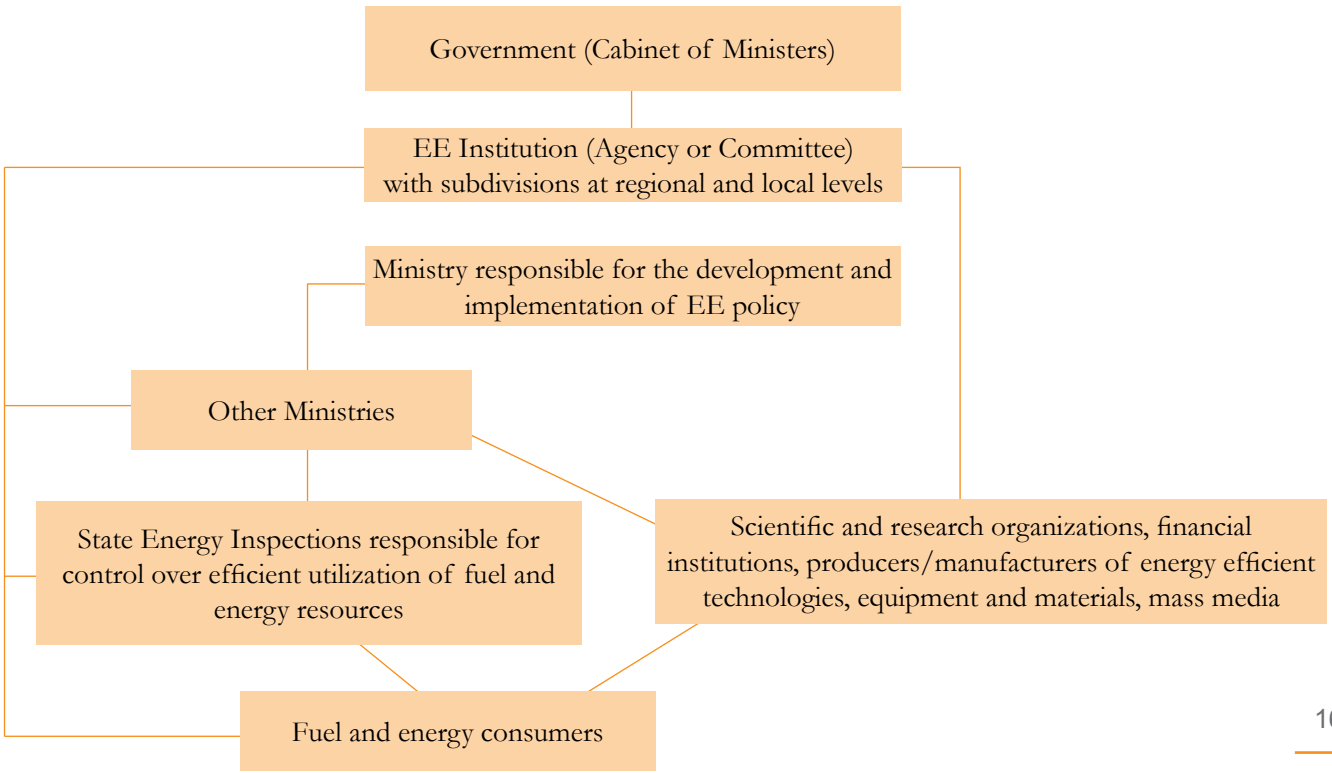
However, in subsequent years, the implementation of energy savings policy slowed down as a result of the following:

- The Federal Law on Technical Regulation of 27 December 2002 abolished mandatory compliance with national standards' requirements (excluding those concerning industrial and ecological safety) and obligatory certification of production. This resulted to the the possibility of regulatory support and state influence on energy savings, the rationing of energy resources, and the improvement of EE in energy-consuming equipment and consumer goods.
- Amendments to the Fiscal and Tax Codes and to other laws hindered state support to energy consumers and producers who are implementing energy saving measures.
- Energy savings policy was terminated as a result of administrative reform in 2004.

However, the main reason for slowing down energy savings policy could be attributed to insufficient coordination among government bodies responsible for the development and introduction of amendments to existing legislation related to EE issues. This could be avoided if there was a special state body responsible for the regular monitoring of the overall direction of energy savings policy, and if there was a mechanism for information sharing and development of response actions.

Note: Learning from this experience, the Russian Federation has recognized the 1996 law as "general and declarative" and replaced it with a new Federal Law "On energy savings and improvement of energy efficiency" in November 2009. The new law creates additional checks, especially for housing. Installation of metering devices for water, gas, heat and electricity is now required in houses and apartments. By 1 January 2012, households are also expected to be equipped with meters to register the amount of energy used and lost. Householders will be required to pay for the 'lost' energy. The new law also enjoins municipalities, regional and federal governments to implement energy savings programmes. Energy audits on enterprises with annual energy consumption amounting to 10 million rubbles (around US$342 000) per year are also required by 31 December 2012. Moreover, the new law amends the Tax Code (article 67 of the first part) by rewarding investment tax credits to renewable energy investments (same credits apply to investments on heat and electric facilities with EE of 57 per cent). In 2010, EE has become one of the priorities within the national strategy for modernisation. The working group on EE was established under the Russian Presidential Commission on Economy's Modernisation. In July 2010, EE issues were included to the scope of the Government Commission lead by the Deputy Prime Minister.

Figure R-1 | Recommended institutional structure for a national EE coordinating institution



The main objectives of the national EE coordinating agency (or committee) should include:

- conduct of regular feedback between all participants of EE policy and programmes (from private and public sectors to final energy consumers);
- providing information support to the government on the development of basic principles of state EE policy and their implementation;
- coordination of activities of government bodies involved in EE promotion; and
- developing priority programmes related to EE issues in cooperation with government and NGOs.

The institution could cover inter-ministerial problems and disputes as well. It would implement regular monitoring and control over EE policy implementation in each sector of the national economy. It could also inform the Government about how EE is promoted, and conduct feedback among the government, relevant ministries and other stakeholders.

If the structure presented in Figure R-1 is realized, it would be easy to monitor a seemingly complex system, to control the state EE policy, and to directly inform central government about the problems and barriers relative to EE promotion.

It is also important that existing energy conservation departments or units at all levels (sectoral ministries, regional administrations, and municipalities) and established new units (in case these are still absent) are legally and financially strengthened. At the same time, it is necessary to identify their targets and objectives and introduce responsibilities.

Along with the improvement of institutional structure at the macro level, Asian countries should also work on the creation of energy conservation management

system at the micro level. Particularly, this means establishing EE departments (or units) in all ministries, regional administrations, and municipalities with adequate financial support.

Recommendation 2

Strengthen subregional cooperation

While there exists energy centres from the three subregions concerned, strengthening their frameworks and capacity is vital to provide an enabling environment to promote EE. The high interdependence of Asian countries in the subregions is still the main driving force for subregional cooperation in EE promotion. The ASEAN Centre for Energy for South-East Asia and the SAARC Energy Centre for South Asia are examples of this cooperation. Central Asian countries which are highly intertwined in terms of energy resources are yet to see more coordination in terms of subregional cooperation. In this case, Box 2 provides a blueprint for a Central Asian centre for EE.

Box 2 | Establishing a subregional centre for EE in Central Asia

The following are the priorities for the development of cooperation in EE among Central Asian:

- harmonisation of legislation, including the regulation of requirements for implementation of EE policy;
- approximation of energy consumption and energy conservation requirements to established EE standards; and
- coordination of EE policy implementation.

The Strategy of Rational and Efficient Use of Water and Energy Resources in Central Asia (ECE/ESCAP, 2005) specifically describes the importance of regional cooperation in EE policy. Central Asian countries have been considering the opportunity to establish an independent Regional Centre for EE which will deal with the:

- technical and consultative support for Central Asian governments and energy consumers in introducing EE programmes and measures for fuel and energy resources utilization (production, storage, transportation, distribution, and final consumption);
- organization of national and international workshops, seminars and training courses on EE for Central Asian experts and policymakers;
- development and implementation of EE programmes at the regional level;
- attracting investment for EE programmes;
- technical, financial and consultative support to national organizations involved in the development and implementation of EE programmes and projects;
- harmonization of tariffs and legislation in the field of energy conservation (particularly in the field of EE standards) in the region;
- selection of priority EE projects in Central Asian economies and full-scale support on their implementation;
- joint implementation of EE projects by Central Asian countries;
- scaling up of existing pilot and demonstration EE projects;
- creation of EE demonstration zones;
- support to R&D in EE and renewable energy technology;
- information support to local governments, financial institutions (potential investors) and energy consumers in the identification of priority areas;

- information exchange on energy efficient technology, equipment and materials;
- cooperation with foreign and international organizations, financial institutions, development programmes, and scientific and research centres involved in the implementation of EE programmes and projects;
- information dissemination on best practices in EE promotion, and organization of trainings for Central Asian experts and policymakers involved in EE policy;
- creation of a database on energy conservation technology and investment projects;
- preparation and organization of international conferences, seminars and workshops on EE issues; and
- development of a joint cooperation programmes in the context of strategies and goals provided for by energy conservation policies in Central Asian countries.

The establishment of a regional center in Central Asia could take a long bureaucratic process. As such, the suggested centre could be created by strengthening the capacity of one existing subregional organization in establishing a special EE division. The framework of CAREC may be utilized for this. CAREC has good experience in the field of EE since it holds on record at least 75 per cent of total quantity of environmental programmes and projects related to EE and renewable energy issues in the subregion. Creating a regional EE centre in Central Asia with the help of CAREC would therefore be ideal.

Moreover, subregional institutions need to put great importance to the development of appropriate legal, technological, institutional and commercial principles of interaction and functioning which would likely involve;

- the creation of a common space to attract investments on EE projects;
- the creation of a common information space for EE through accessible databases and arrangements for exchange of experiences and best practices (the APEC Energy Standards Information System could serve as a model);
- a joint development of engineering industries for EE technology and cooperation aimed at establishing joint ventures for the manufacturing of energy savings equipment, devices, materials, control and management systems;
- the harmonisation of price, tariffs, fiscal and customs policies; and
- cooperation in the field of science and technology (especially R&D and testing), education and training on EE issues, and information dissemination campaigns.

Recommendation 3

Provide enabling policy and legislative measures

Apart from improving institutional structures, Asian economies may also engage with the following measures to promote EE:

- development and adoption of comprehensive legislation and policy regulation to support EE improvement (especially for those countries without fundamental legislation for EE);
- development and adoption of practical (especially financial) mechanisms for implementing the basic principles of existing legislation on EE and renewable energy sources development;
- development and adoption of energy efficient product procurement programme (by learning from well-developed and promoted procurement programmes in many developed countries such as US, Japan and Korea and even in some developing countries like China);
- paying more efforts and locating more resources to enhance legislation, policies and programmes

for EE development and implementation;

- gradual removal of current energy tariffs by "cross subsidizing" beneficiary categories of energy consumers, and transition to "real" market where energy prices reflect the "real" cost of production and distribution;
- improvement of a policy of equity accumulation in the power consuming sectors for them to carry out EE measures;
- improvements in legislation, regulation, policy or programmes especially on EE endorsement and comparative labeling schemes;
- development of legislation in thepower engineering sector envisaging mechanisms for attracting fuel and energy supplying organizations in implementing EE measures (especially DSM);
- determination of a mechanism to attract non-budgetary financing sources;
- development of a mechanism to stimulate the introduction of EE measures, primarily in the building sector and in industry;
- creation of a system of discount and surcharges for energy utilization in enterprises in the domestic market following from results of EE efforts;
- establishment of an energy conservation foundation and identification of its financial sources (energy and fuel taxes, etc);
- creation of efficient EE monitoring system to identify available EE potential at all levels (from separate enterprises and organizations to economic sectors);
- identification of investment policy in EE (beneficial financing for the most efficient EE projects, and grants;
- formulation and implementation of action plans on the introduction of energy efficient and environmentally clean technology and equipment in manufacturing enterprises and in the building and service sectors (with strict control over their implementation);
- establishment and support of ESCOs;
- development and adoption of laws of direct application related to EE issues;
- assistance in establishing complex companies to develop technical documentation of efficient equipment;
- development of robust information system to promote EE; and
- development of educational and training activities with strong participation from scientific and research centres, universities, mass-media and international R&D programmes.

Recommendation 4

Enhance capacity

Over the past ten years, varying degrees of achievement on EE has been accomplished in developing countries. One key element for this achievement is the great support from international agencies and donors. For example, during the last ten years, China, with strong support from GEF, World Bank, ADB, the European Union and United Nations agencies, has successfully implemented a series of technical assistance and capacity building programmes. At the same time, bilateral collaboration and cooperation on EE were also developed.

The successful implementation of these projects hasten the capacity development of institutions, mechanisms and expertise which facilitate the development and implementation of EE particularly MEPS, EE endorsement and comparative labeling programme as well as information distribution and promotion. However in most developing countries in South and South-East Asian region, there still exist inadequate and limited international capacity building projects although a few of these projects have already been carried out at national level. This presents a huge potential for regional collaboration on EE. The countries in these subregions need to seek more opportunities to design and carry out relevant EE capacity building projects and try to leverage support from international donors.

Recommendation 5

Provide expert trainings and scale up information dissemination campaigns

Generally, the development and implementation of EE programmes needs trained personnel with varying kinds of knowledge and expertise on EE, adequate information on energy efficient technologies, and facilities to conduct R&D. Lack of information and skills on energy efficient technology is one of the main barriers to EE promotion in most developing countries in Asia. Obtaining information on energy efficient technologies and practices may be difficult, costly or time-consuming for individual agencies to gather. Therefore, EE training courses for target persons at training facilities preferably at subregional level should be encouraged at various levels and for various target groups to raise their capacity and awareness regarding EE. Through increased awareness and capacity, a higher level of commitment could be obtained for promoting EE.

Recommendation 6

Provide financing

Financing is a universal problem for developing EE programmes in developing countries including most of Asian economies. Financing is straightly related to the accomplishment of overall EE goals. However, the present channel for project financing is relatively limited. There is also a lack of efficient monitoring and evaluation on the excellence and reliability of new technology as well as the estimated energy savings. This situation hampers and makes most of the investors hesitant in investing. Countries need more support from international organizations, financing agencies, foundations and developed countries to help them improve EE. These countries should also establish effective market-based financing mechanisms and channels to increase funding for their EE programmes.

All things considered, the potential for improved EE and its adoption as a way-of-life remains a priority policy direction for energy security in Asia. While a general recommendation has been presented, it does not follow that they are all applicable to all countries. The specific political, economic and social conditions in a particular country should always be considered.

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ANNEX

CONCEPTUALIZING ENERGY EFFICIENCY

The Concept of Energy Efficiency

Energy efficiency (EE) and sustainable economic growth are mutually related and interdependent processes. Thus, governments are encouraged to regularly analyze and streamline their economic policies and practices with the concept of sustainable economic growth. EE and the energy sector play an important role not only in terms of effective use of energy resources, but also as the main factors in building a sustainable society.

The concept of EE was mentioned for the first time in the documents of the "Environment for Europe" Aarhus Conference of Environment Ministers in June 1998. The Declaration adopted at the conference stated that EE policy is one of the most significant steps towards the achievement of national and international goals in economy, environmental protection, sustainable energy supply and technologies that influence quality of life. EE improvements not only improve national economic efficiency and foreign trade, but also enhance people's lives by lowering energy bills which make energy services more affordable, enhancing labour markets, and improving public and environmental health. Nowadays, EE efforts can be mainly classified into three sectors—buildings, industry, and transportation. In all sectors, improving efficiency before increasing energy supply is generally the more economically efficient national strategy. A portfolio of energy policies and programmes is available to governments for this purpose, including strategic energy plan, financing and incentive programmes, regulatory programmes, government purchasing directives, and consumer education. Well-designed EE laws, regulations, policies, programmes, and institutions can strongly support EE improvement.

EE efforts can also be classified into three levels:

- The first level is to make great efforts to improve EE of end-use products/equipment. After many years of efforts, efficiency of household appliances, office equipment, and lighting products has improved significantly.
- The second level is to improve product/equipment system, in other words, to undergo system optimization and reasonable matching as well as to improve the efficiency of the "whole product/equipment system." Among these efforts, improving the efficiency of motor system received the most attention. For example, China's Motor System Energy Conservation Project, supported by United Nations Industry Development Organization obtained noticeable achievements. The effects of energy conservation as realized by improving the efficiency of product/equipment system is comparatively greater than those realized by improving individual end-use product/equipment.
- The third level is to apply the principle of systematic management and improve the efficiency of the whole organization. In the process of establishing an energy management system, the focus is not only limited to the efficiency of single end-use products/equipment, but also on matching system supply with demand and on system optimization. In addition, the implementation of an energy management system emphasizes establishing and maintaining EE among systems so as to maximize reduction of energy consumption of the whole organization.

EE laws, regulations, policies, and programmes can be designed to achieve a number of objectives that

can accelerate the penetration of EE efforts into the marketplace and meet other national goals. These framework include: stimulating the penetration and adoption of new technology; influencing products/equipment development and manufacturing; influencing supply, distribution, and wholesale purchases; and influencing retail purchases. Basically, the following policies/programmes can be adopted to facilitate EE improvement:

- EE Standard and Labeling (EE S&L): As a fundamental element of EE, EES&L can fully support efficiency in all sectors (building, industry and transport) and in all levels (individual end-use product/equipment, products/equipment system and whole organization). EE S&L programme interacts with other EE laws, regulations,policies and programmes to create an integrated, effective, sustainable market-transformation process.
- Energy pricing and metering: Together, energy pricing policies and metering practices provide a sound foundation for all EE mechanisms such as laws, regulations, policies, and programmes. Energy prices have been influential in a number of important ways; thus, pricing policies, metering and billing practices should be designed to strengthen, not detract from, the effects of EE mechanisms. On the other hand, these mechanisms can help consumers to easily choose highly efficient products and equipment to reduce their energy consumption.
- Financing and Incentives: A range of financing and incentive policies and programmes have been used to overcome the financial barrier to implement EE mechanisms. These include rebates, grants, taxes, investments, loans, leases, performance contracts, vendor financing, and utility financing among others.
- Voluntary programme: Voluntary programmes are normally joint efforts of government and industry to encourage end users, including manufacturers, building owners, distributors, retailers and others to reduce their energy consumption. These programmes may include:
  - Quality and/or performance commitment of products/equipment manufacturers, distributors, retailers, installers, and end-users;
  - Voluntary targets that set guidelines for an industry to strive for. An entire industry sector may establish voluntary targets for energy-using products or processes to promote best practices and increase competitiveness and profitability within the industry to gain public relations benefits or to anticipate regulatory pressures which minimize the likelihood of future regulation;
  - Voluntary agreements (VAs) in government agencies and end users, especially manufacturers and building owners, to set up targets for energy consumption and energy savings. Related EE policies usually support VAs.
- Government procurement: Governments have enormous power to stimulate the diffusion of EE products and equipment through their own purchasing power. Public agencies purchase large numbers of energy-using products and equipment for use in facilities such as government offices, state-owned enterprises, public schools, universities, hospitals, street lights, water and other utilities. By adopting EE criteria for products to guide their own purchases, public agencies can save energy and money, set an example for other buyers to follow, and provide a strong market signal to product and equipment suppliers and manufacturers.
- Energy auditing: Energy audits typically identify generic energy-saving options, including operation and maintenance process improvements, as well as site-specific options for capital investments in better equipment and systems. Some programmes offer in-depth energy audits conducted by experts skilled in a particular industrial process or building type. These programmes may also address

industrial waste-reduction or other environmental measures aside from EE. For energy audits of buildings, these elements may include window systems, heating, cooling, lighting, and other energy-using equipment. For industrial energy audits, electric motor improvements are an attractive target, including improved efficiencies and correct sizing and controls.

- Performance contracting: Performance contracting (or third-party financing) has been widely used to finance EE projects in developed countries. In performance contracting, an end user obtains EE products/equipment, technologies or other facility upgrades from an ESCO. ESCO pays for the improvements and receives a share of the savings as a performance-based incentive fee. There are two common models of performance contracting: guaranteed savings (where an ESCO or other partner guarantees the customer a minimum level of energy or cost savings), and shared savings (where an ESCO and customer agree before hand on a formula for sharing whatever savings are realized). Variants and combinations of these basic approaches are also common. Through performance contracting, some technology and management risks are transferred from the end user to ESCO.
- Promotion and education: Promotion and education will strongly support the implementation of EE laws, regulations, policies, and programmes. EE promotion and education target not only the final consumers but also those who have direct contact with customers including retail sales staff, contractors, installers, and maintenance/service personnel. All of whom require the understanding of the benefits of EE and can personally profit from promoting EE to relevant target groups.
- Regional and international cooperation and harmonization: EE policies and programmes, coupled with the growth in the global economy, have led to an increasing number of regional and even global cooperation and harmonization. APEC forum, for instance, has served as a vehicle for advancing the discussion on EE among APEC member-economies with special emphasis on incorporating EE within each economy's energy portfolio and on harmonizing members' related policies. ASEAN, on the other hand, has adopted a Plan of Action for Energy Cooperation that identifies EE&C promotion as one of its key programmes (CLASP, 2005).

The Benefits of EE

With serious concerns of climate change, more and more efforts were contributed to reduce energy consumption and GHG emission. EE improvement is one of the cost-effective options. The following are the benefits gained from EE efforts:

- Reduction of capital investment in energy supply infrastructure. EE improvement in the building, industry and transportation reduces the amount of energy use and therefore reduces future investments in costly power plant construction. The freeing capital for more economically advantageous investments in the EE sector, such as EE projects carried out by ESCOs will also contribute to reduce energy consumption.
- Enhancement of national economic efficiency by reducing energy bills. The reduced future investments apply equally to energy spending. EE reduces future investments in energy acquisition, delivery, and use. The operation and running costs of industry, building and transportation sectors will reduce accordingly. This means that a more efficient energy sector results in a more efficient economy.
- Meeting climate change mitigation goals and reducing pollution. Reducing energy consumption and improving EE decreases carbon emissions from fossil-fuel power plants and end-use energy products and equipment.

Meanwhile, reducing energy consumption also decreases emissions of sulphur dioxide, nitrogen oxides, particulate matter, and other toxic gases and aerosols.

- Reduction of programme costs and fostering global efforts by cooperation and harmonization. As EE programmes proliferate, international cooperation is becoming increasingly advantageous in reducing the resources needed for developing these programmes and in fostering global efforts through harmonization and cooperation. Considering S&L programme as an example, the forms of cooperation and harmonization can include: collaboration in developing the relevant supporting regulations and policies; cooperation in promotion and dissemination; harmonization of test procedures, energy performance S&L programmes; mutual-reorganization of testing and labeling results; and coordination of programme implementation and monitoring efforts (CLASP, 2005).

Resources and Capacity Needed

The development and implementation of EE policies and programmes require legal, financial, human, physical, and institutional resources. Appropriate constitutional, legislative, and administrative authority must therefore exist or be established for conducting EE policies and programmes.

Early in the process of assessing local cultural and political factors, it is important to assess the existing institutional capacity to develop, implement, and maintain EE policies and programmes. Such mechanisms require a variety of institutional skill sets, and the mandate, to carry out the following activities:

- Develop, issue, and maintain EE regulations, policies, energy strategies, energy plan, and road map;
- Conduct research, analysis and forecast of energy and EE, including energy consumption;
- Develop, issue, and maintain EE standards, including MEPS, High Energy Performance Standards (HEPS), Minimum Energy Consumption Standard of equipment and facilities;
- Develop and manage EE policies and programmes including labeling, certification, and energy performance evaluation;
- Develop and carry out EE and consumption measurement and testing;
- Provide energy efficient technologies and services including energy audit, energy performance contracting (such as ESCOs) and DSM;
- Monitor and enforce regulatory requirements;
- Conduct education and information dissemination campaigns; and
- Evaluate programme implementation and impacts.

EE of Appliances and Equipment (A&E)

After transportation, household and office electrical appliances represent the fastest-growing segment of the world's total energy consuming sectors. World purchases of major A&E — refrigerators, clothes washers, lighting products, ACs, computers, fax and photocopying machines are rapidly increasing in line with improved living condition and lifestyle changes in Asia. Generally, the rate of growth in appliance ownership in rapidly industrializing developing countries is much higher than growth in sales of large household electrical appliances mainly due to product replacements. Countries in Asia and the Pacific region account for roughly 35 per cent of appliance demand compared with 23 per cent for Western Europe and North America and 19 per cent for the rest of the world. In Asia, inefficient A&E exacerbates the region's demand for electricity. Meanwhile, improving EE of A&E will also reduce pollution and save money at the same time. EE S&L programme is recognized as a very cost-effective EE option to promote highly efficient A&E.

EE standards

EE standards are procedures and regulations that prescribe the energy performance of end-use appliances. The standards target a particular appliance (or equipment) by means of well-defined protocols where sufficiently accurate estimate of energy performance can be obtained in the ways it is typically used, or at least a relative ranking of its energy performance compared to other models. Generally, EE standards can be classified into three types:

- MEPS serve for market access and governmental supervision. It is a "minimum" requirement of energy performance for the target product, equipment, or building. MEPS should be mandatory and all products, equipment, or buildings that are in the market must meet with MEPS requirement.
- HEPS serve for EE endorsement certification/labeling programme. It sets up the "best" energy performance for the target products, equipment, or buildings. These standards pull the energy performance of relevant appliances or equipment to a higher level.
- EE grading criteria serve for EE comparative labeling programmes which encourage relevant appliances or equipment to elevate its energy performance to a higher level.

EE labeling programmes

EE labels are informative labels affixed to appliances or equipment describing its energy performance. In general, there are two types of EE labels:

- Endorsement label is used to clearly indicate to the consumer that the labeled product saves energy compared to others in the market. These labels are seals of approval indicating that a product meets certain specified criteria. Labels are generally based on a "yes-no" cut off (by indicating that a product uses more or less energy than a specified threshold), and offer little additional information. Typically, endorsement labels are applied to the top tier (e.g., the top 15 to 25 per cent) of EE products in the market. Broadly speaking, endorsement labels are voluntary.
- Comparative label is used to allow consumers to compare energy use among available models in order to make an informed choice. Generally, there are three forms of comparative labels:
  - Categorical Labels use a ranking system that allows consumers to tell how efficient a model is compared to other models in the market. Rather than relying on a simple "yes or no" assessment, categorical labels use multiple classes that progress from either least efficient to most efficient or most energy consuming to least energy consuming. Categorical labels may or may not give detailed information on the operating characteristics, costs, and energy use of the models.
  - Continuous-Scale Labels use a bar graph or line to show the range of models available in the market. The scale allows consumers to see where the labeled unit fits into the full range of similar models without sorting performance into specific categories. Continuous labels typically contain detailed information on the operating characteristics, costs, and energy use of the models.
  - Information-Only Labels, such as the labels used in the Philippines, give data on the technical performance of the labeled product but offer no means to compare energy performance among products (such as a ranking system).

EE in Industry

The industrial sector represents more than one third of both global primary energy use and energy-related CO_2 emissions. In developing countries, the portion of energy supply consumed by the industrial sector is frequently in excess of 50 per cent. Therefore, the opportunity to increase competitiveness in these

countries can be more pronounced if energy efficient best practices are applied in their rapidly growing industries. Industrial EE is determined by the type of processes used to produce a certain commodity, the vintage of the equipment used in production, and production efficiency including operating conditions. Improving industrial EE is recognized as an effective way to reduce energy consumption in this sector and can be accomplished in three levels:

- Level one is to make great efforts to improve the EE of end-use products/equipment, including the development and implementation of product EE standards and to implement EE labeling programmes.
- Level two is to improve the efficiency of "product and equipment system" which means system optimization and reasonable matching of the whole system. By comparison, the energy conservation effect realized by improving the system is greater than those realized by improving individual end-use product/equipment.
- Level three is to apply the principle of systematic management and improve the efficiency of the whole organization, which means establishing an energy management system within the organization. The focus is not limited only to the efficiency of single end-use product or equipment, but also to match system supply with demand including system optimization. Moreover, the implementation of an energy management system emphasizes the establishment and maintenance of EE among systems to maximize energy consumption reduction of the whole organization.

Generally, industrial EE improvement can be achieved through three approaches:

- Management approach refers to EE improve ment achieved by setting up a well-developed energy management system, energy statistic system, and energy utilization monitoring system. This approach helps to streamline and rationalize energy transportation, distribution and consumption. This approach involves a variety of measures in three categories.
  - Measures in the first category include strengthening quota management and drafting rational reward and punishment mechanisms that are easily implemented and mostly related to human behaviour.
  - Measures in the second category include rationalizing the organization of production, balancing the utilization of equipment, and rationalizing the operation of equipment through small adjustment or retrofit.
  - Measures in the third category include deployment of modernized managerial method and optimizing all systems to set up an energy management system based on national and ISO standards. Specific measures include setting up energy management centre and developing energy conservation models which rely on information and electronic control technology adopted to build the energy control, information and decision-making systems.
- Technology approach refers to EE improvement achieved by applying advanced process technologies, energy-saving technologies, high efficiency equipment and other technical measures to directly improve the performance of energy transfer and EE, increase the ratio of secondary energy recovery and utilization, optimize productivity, and reduce the energy consumption per unit of production. These technological advancements include: improving operational control through the monitoring of energy consumption and maintenance methods to improve existing equipment or system operating efficiency; using sophisticated energy saving technology, equipment or system for technical innovation; using advanced technology, updating equipment

and processes; etc. The main measures in this approach include:

- Establishing well-developed key energy conservation technology centres, and developing or introducing advanced energy conservation technologies and high-efficiency energy conservation equipment;
- Inviting professional agencies to play a positive role in promoting EE technology and products by organizing technological exchanges, promotions, consultancies, information dissemination, and training;
- Carrying out energy audits, and promoting new EE mechanisms such as Energy Performance Contract, VAs and DSM; and
- Initiating and enhancing international technological transition and cooperation focusing on the application of advanced technologies and accelerating R&D of EE technologies and products with independent intellectual property rights.

- Re-structural approach includes adjustments in the product, manufacturing and industrial structures. Product structure adjustment involves increasing the production of low-energy-consumption, high-quality, and high-value-added products and reducing the production of high-energy-consumption products. Manufacturing structure adjustment involves rationalizing production technique and eliminating high-energy-consumption technique or equipment. Industrial structure adjustment involves merging, acquisition and eliminating energy-intensive and/or small-scale plants. The main measures include:
  - Controlling the scale of investment and adjusting investment structure with focus on the degree of EE of newly-added productive capacity and restricting energy-intensive industries development;
  - Implementing energy consumption evaluation system for investment projects which will control growth of energy-intensive industries from the start;
  - Applying EE design specification and standards in new fixed-asset investment projects; and
  - Using legislative, economic, technologic and administrative measures comprehensively to eliminate outdated productive capacity.

To facilitate industrial EE improvement, the following policies and programmes are widely used.

- Energy management system aims to set up a comprehensive, effective, and documented energy management system by bringing a mature standard system into effect, following the principle of system management. It requires clarifying responsibilities in each position, setting up baseline and benchmark, setting up energy objectives and targets of energy management and carrying out a series of EE projects. The system needs to be regularly audited and reviewed while energy management performance needs continuous improvement.
- Energy manager training and certification aims to establish a training platform and a certification system for professionals who perform energy management in industrial enterprises to strengthen capacities in industrial enterprises and improve primary energy management. Competent authorities are responsible in training those in-charge of energy management in industrial enterprises, issuance of qualification criteria and conduct of examination and certification. The final objective is to provide qualified energy managers to enterprises.
- Energy audit is the best way to identify energy aspects. It is a series of scientific approaches, which is comprised of analyzing energy system, reviewing energy use patterns, and evaluating energy uses and efficiency. To identify opportunities of energy conservation, energy audits quantify the energy consumption in enterprises, and conduct audit, surveillance, diagnosis and evaluation on EE, energy losses, energy

economy and environment effects.

- Energy conservation planning defines the principle, goal and approaches of energy management, which is one of the critical special plans for industrial enterprises. It focuses on every parts of energy system in enterprises, such as energy production, purchase, processing, transforming, transportation and utilization. Based on current situation analysis of industrial enterprises, strategies and plans can be developed to adopt reasonable measures to control energy consumption and promote EE with the help of a qualified energy conservation consultation agency.
- EE evaluation and energy balance test serve as useful technologies for enterprises to explore opportunities on EE. This includes an evaluation of the balance between utilization and transformation of imported energy by analyzing the raw data at different level (for example, overall enterprise level, energy system level and key-point equipment level) so that energy consumption in different energy systems can be calculated and evaluated. The evaluation and test will also facilitate the valid measurement sponsored by competent authorities and help energy consumers in analyzing and utilizing energy consumption data. The programme will also benefit energy consumers by improving energy management, innovating techniques, renovating equipment, increasing EE, and providing scientific information to determine the amount of investment and period of returns for energy conservation projects.
- Benchmarking is a process where manufacturers compare their own EE performance with a benchmark which is usually set on the basis of advanced efficiency level of either international or domestic manufacturer performance. The process also improves management and technologies to achieve better energy efficiency. It is a scientific, systematic and regulatory approach to energy management in industrial enterprises as well as an important way to learn advance energy managerial experiences. It also helps enterprises to innovate management and to catch up with new technologies. The specific procedure in carrying out benchmarking activity involve: setting one target, setting up two databases and establishing three systems. Setting one target involves a manufacturer identifying one target and planning all its EE activities on the basis of reaching that target; the two databases refer to the criteria database and the best practice database; the three systems include benchmarking criteria, evaluation, and management systems.
- VAs is an energy conservation mechanism to increase EE and to reduce CO2 emission. With enabling public policies, companies voluntarily sign agreements with the government to reach EE targets in a certain period of time. The companies make efforts towards the targets while the government provides necessary assistance. The process will be evaluated by a third-party agency. VAs not only help to achieve goals of energy conservation and environment protection but also benefit companies by improving production, management and technology, increasing cost-efficiency, promoting reputation, and creating positive corporation image.
- EE products and technologies evaluation is organized by a third-party technical certification agency and involves experts evaluating energy saving products and technologies that promote EE. The relationship between investment and product efficiency is analyzed by quantifying energy use and estimating payback period. The evaluation contributes to a list of recommended key energy saving products which will serve as a valid and useful reference for industrial enterprises.

- Eliminating outdated production capacity involves a comprehensive use of administrative, legislative and economic measures to eliminate backward production capacity, technique and technologies, change the economic development pattern, and improve enterprise quality of economic growth and efficiency.
- Energy conservation assessment involves a rational and scientific analysis and evaluation of fixed assets investment projects. During the assessment, energy saving measures are proposed and issued prior to construction. This is an important measure in improving EE, promoting industrial restructuring, and optimizing energy structure.
- Government financial incentives for energy efficient projects include reward objects and procedures to access financial incentives. Incentives rewards energy efficient projects according to the real amount of energy saving.

Building (residential and commercial) EE

Asia is experiencing unprecedented growth which is expected to continue unabated in the coming decades. In terms of energy consumption, the commercial and residential sectors in the region are the heaviest users of energy accounting for 40 per cent of the total consumption in 2001 (ESCAP, 2005). Thus, EE improvement in the building sector is expected to provide the greatest energy reductions, and in many cases, is the most economical option. Along with rapid social and economic advancement, a number of managerial ways and technologies have been developed and used in EE in buildings such as ways targeted at their outer protective structures, auxiliary equipment (including EE innovations, and low-cost and non-cost management), exterior insulation, and the use of solar energy and photoelectric effect as energy source.

However, specific EE technologies and management ways vary in accordance with building categories because of the differences in architectural designs and utilization period. From the perspective of EE, utilization and age are two main factors for classifying buildings. By utilization, buildings can be classified into two: civil buildings including residential buildings (such as apartments and houses) and public buildings (such as schools, office buildings and theatres), and industrial buildings including production and auxiliary buildings (such as warehouses). By age, buildings generally include new buildings (in the process of design or construction, or used for less than one year), and existing buildings (more than one year since first put into use).

In general, major policies and programmes to promote EE in buildings include:

- Incentive policies for building energy efficient buildings. Stipulating and carrying out EE incentives and favorable policies play a fundamental role in ensuring that EE in practiced in building design, construction and maintenance. The Government of China, for instance, has issued the “Administrative means for govern mental organs” which clearly stipulates the goals, specific quotas for, and supervision of EE at government agencies. There are also financial subsidies and low-interest loans to support building highly efficient buildings.
- Measurements and monitoring. Measurements and monitoring systems such as energy consumption monitoring equipment are integral parts in validating the status of efficient buildings. Moreover, benchmarking for EE can only be accomplished if these metrics are available.
- Implementing low-cost and non-cost management. Similar architectural structures and building scales vary in terms of energy consumption because of different management systems and equipment compatibility. Energy consumption can be brought down hugely by using low-cost and non-cost management systems, strengthening operational management, and matching equipment and systems.

Statistics has shown that by using low-cost and non-cost management systems, over 10 per cent reduction potential can be achieved.

- Assessment of energy efficient buildings. More and more people and organizations including government agencies, real estate developers, and consumers are now aware of efficiency in buildings. The government is concerned with the actual situation in building; real estate developers are interested to use EE in sales and promotion; property management companies regard EE as a key factor in their management; whereas, ordinary consumers are focusing more on the direct benefits from efficient buildings. These depend primarily on established standards such as the LEED system.
- R&D of advanced EE technologies, products and equipment. This includes intensifying technical R&D and their applications (in the building itself, air ventilation, and lighting systems), using advance EE technology to carry out management and technical innovations to improve energy efficiency in the building as a whole (including its outer protective structure, exteriors, doors and windows, roof, ventilation and lighting).
- Standards for energy efficient buildings. The efficiency of buildings can only be judged by means of standards in design, energy consumption quotas, etc.
- Energy audits. Audits can effectively lay out the potential for EE in buildings and serve as benchmarks for ESCOs.
- Application of new and renewable energy. One important factor in energy efficient buildings is the utilization of new and renewable energy.

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Environment and Development Division
Energy Security Section
United Nations Economic and Social Commission
for Asia and the Pacific
United Nations Building, Rajadamnern Nok Avenue
Bangkok 10200, THAILAND
Tel: (+66 2) 288-1510
Fax: (+66 2) 288-1048, 1049
E-mail: escap-esdd-ers@un.org
Website : www.unescap.org/esd/energy
Project Website: eeasia.unescap.org

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Assessment Report on Energy Efficiency Institutional Arrangement in Asia

The technical and economic viability of energy efficiency (EE) has become more pronounced as concerns about energy security, climate change and low carbon development intensify. Although the promotion of EE has long been identified as an effective policy tool to manage energy demand, active pursuit of EE still lags behind in many ESCAP countries. This gap can not only be attributed to programmatic, informational and financial barriers, but especially to the weakened capacity of national and regional institutions mandated to promote EE. This Report presents a review of the existing EE institutional arrangements in Central, South, and South-East Asia and includes a presentation of good practices and case studies of some national and international EE institutions.

The Report - produced as an output of an ESCAP- Korea Energy Management Corporation project titled "Strengthening Institutional Capacity to Support Energy Efficiency in Asian Countries" - is relevant to policymakers in understanding the institutional barriers and challenges that hinder the effective promotion and implementation of EE policy.

Environment and Development Division
Energy Security Section
United Nations Economic and Social Commission
for Asia and the Pacific
United Nations Building, Rajadamnern Nok Avenue
Bangkok 10200, THAILAND
Tel: (+66 2) 288-1510
Fax: (+66 2) 288-1048, 1049
E-mail: escap-esdd-ers@un.org
Website : www.unescap.org/esd/energy
Project Website: eeasia.unescap.org

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