Annex 2

Implementation Plan Paper for High Priority Measures

-CONTENTS-

1. Energy Management System

(1) Program Name

Energy Management System (EMS)

(2) Objective

- Improvement of efficiency of factories and buildings in governmental, industrial and commercial sector
- Improvement of energy management skill through certified energy manager system

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	- Receipt of assignment of energy manager - Receipt of annual report (energy use report and middle-term plan) · 1.5% improvement of energy intensity is recommended. - Inputting consumer's report and plan into database - Checking the report and plan - Giving instruction in case of poor management · Expected Penalty: On-site inspection, rationalization guidance, public disclosure and compliance order (under mandatory program)	
Phase 0 (Preparation Stage)	Task	Responsible Agency
	As a preparation stage, around 10 voluntary consumers, who consume much electricity and heat for electricity generation, start the EMS with targeting at purchased and privately generated electricity.	
	(1) Announcement of start of a preparation stage	MOWE
	(2) Develop initial database	MOWE
	(3) Submit letter to voluntary consumers	MOWE
	(4) Introduction/explanation of the Energy Management System	MOWE
	(5) Training of non-certified energy managers	MOWE
	(6) Receipt of assignment of temporary energy manager (non-certified)	MOWE
	(7) Receipt of annual report (energy use report and middle-term plan)	MOWE
	(8) Inputting report and plan into database	MOWE
	(9) Checking the report and plan	MOWE&MOPMR
	(10) Review of scheme design including regulation and legislation	MOWE&MOPMR
	(11) Review of certification system for energy manager	MOWE&MOPMR
	(12) Authorization of review results	MOWE&MOPMR

Phase 1 (Pilot Stage)	Task	Responsible Agency
	After SEEC establishment, as a pilot stage, the former 10 voluntary sites in preparation stage move to a mandatory program after officially getting certified energy manager. A voluntary program will start targeting at consumers who use above 3,000 kL-oe (12 GWh)/year in electricity and heat for electricity generation.	
	(1) Announcement of start of the pilot stage	SEEC
	(2) Training of non-certified energy managers	SEEC
	(3) Receipt from assignment of temporary energy manager (non-certified) by designated consumers (*gradually shifted to certified energy manager)	SEEC
	(4) Receipt of annual report (energy use report and middle-term plan)	SEEC
	(5) Inputting annual report and plan into database	SEEC
	(6) Checking the report and plan	SEEC
	(7) Review of the scheme design including regulation and legislation	SEEC
	(8) Authorization of review results	SEEC
Phase 2 (Final Stage 1)	Task	Responsible Agency
	After review of the pilot stage, a mandatory program will start targeting at electricity and heat for electricity generation who use above 3,000 kL-oe (12GWh)/year in both purchased and privately generated electricity. As for consumers who use above 3,000 kL-oe (12 GWh) in electricity and heat, a voluntary program will start.	
	(1) Announcement of start of the final stage 1	SEEC
	(2) Training of non-certified energy managers	SEEC
	(3) Receipt from assignment of certified energy manager by designated consumers	SEEC
	(4) Receipt of annual report (energy use report and middle-term plan)	SEEC
	(5) Inputting annual report and plan into database	SEEC
	(6) Checking the report and plan	SEEC
	(7) Giving instruction in case of poor management	SEEC
	(8) Review of the scheme design including regulation and legislation	SEEC
	(9) Authorization of review results	SEEC

Phase 3 (Final Stage 2)	Task	Responsible Agency
	After review of the final stage 1, a mandatory program will start with all consumers who use above 3,000 kL-oe (12GWh)/year in both electricity and heat.	
	(1) Announcement of start of the final stage 2	SEEC
	(2) Training of non-certified energy managers	SEEC
	(3) Receipt from assignment of energy manager by designated consumers	SEEC
	(4) Receipt of annual report (energy use report and middle-term plan)	SEEC
	(5) Inputting report and plan into database	SEEC
	(6) Checking the report and plan	SEEC
	(7) Giving instruction in case of poor management	SEEC

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE) and Ministry of Petroleum and Mineral Resources (MOPMR) as Preparation Team
Expected Role	**(Preparation Stage)** - Announcement of start of the preparation stage - Develop initial database - Submit letter from MOWE to voluntary consumers - Introduction/explanation of Energy Management System to voluntary consumers - Training of non-certified energy managers - Receipt from assignment of temporary energy manager (non-certified) by voluntary consumers - Receipt of annual report (energy use report and middle-term plan) from voluntary consumers - Inputting consumer's report and plan into database - Checking the report and plan - Review of scheme design and making detailed regulation - Review of certification system for energy manager - Authorization of review results and preparation of pilot stage
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	**(Pilot and Final Stage 1&2)** - Announcement of start of each stage - Training of non-certified energy managers - Receipt from assignment of temporary or certified energy manager by designated consumers - Receipt of annual report (energy use report and middle-term plan) from designated consumers - Inputting annual report and plan into database - Checking the report and plan - Review of the scheme design - Review of certification system for energy manager - Authorization of review results - Giving instruction in case of poor management

(5) Relating Agency

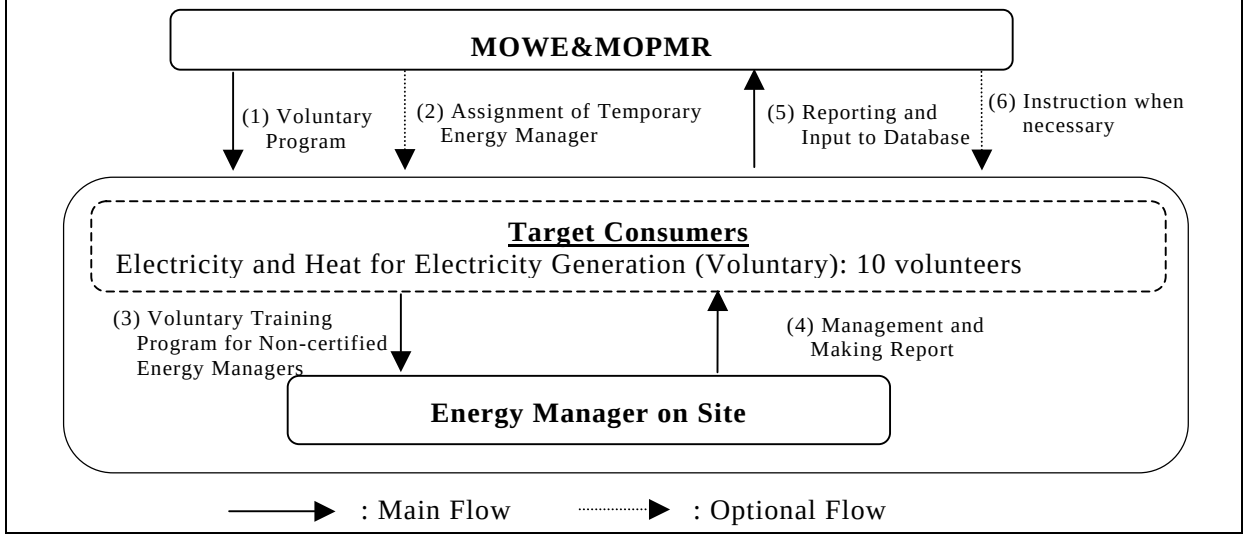
Name of Agency	SEC
Expected Role	- Providing SEC's digital meter (expected 100 thousands) as measuring instruments (essential requirement)

(6) Target of the Scheme

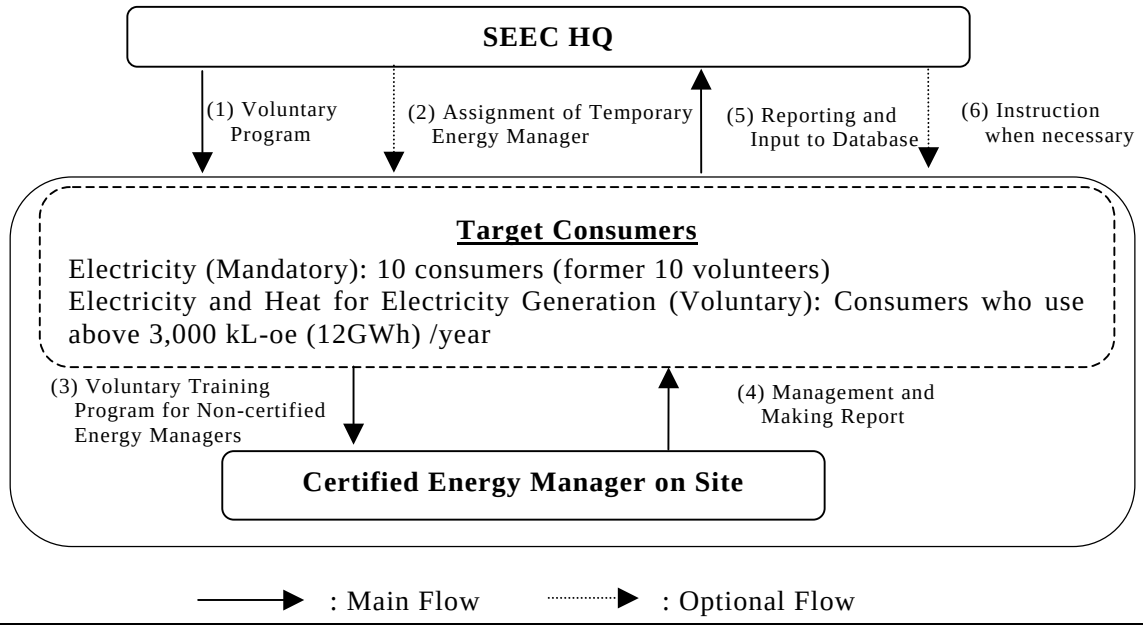
Name of Target	**(Preparation Stage)** Voluntary: 10 voluntary consumers, who consume much electricity and heat for electricity generation, for example: [Government] MOIA, MOWE, [Government Comapny] ARAMCO, SABIC, SEC, SWCC [Commercial] Al-Khalia Market, Kingdom Center, Dallah Hospital [Industry] Saudi Carpet **(Pilot Stage)** Mandatory: Former 10 voluntary consumers Voluntary: Consumers who use above 3,000 kL-oe (12 GWh)/year in electricity and heat for electricity generation **(Final Stage 1)** Mandatory: Consumers who use above 3,000 kL-oe (12 GWh)/year in electricity and heat for electricity generation. Voluntary: Consumers who use above 3,000 kL-oe (12 GWh) in electricity and heat **(Final Stage 2)** Mandatory: Consumers who use 3,000 kL-oe (12GWh) /year in electricity and heat
Expected Action	- Establishment of energy management system in its business place - Receiving training program for energy manager - Assignment of temporary (non-certified) or certified energy manager(s) - Confirmation of "Evaluation Criteria" on energy management - Definition of "Management Criteria" (internal) on each item - Execution of energy management cycle - Submission of an annual reports to SEEC

(7) Workflow

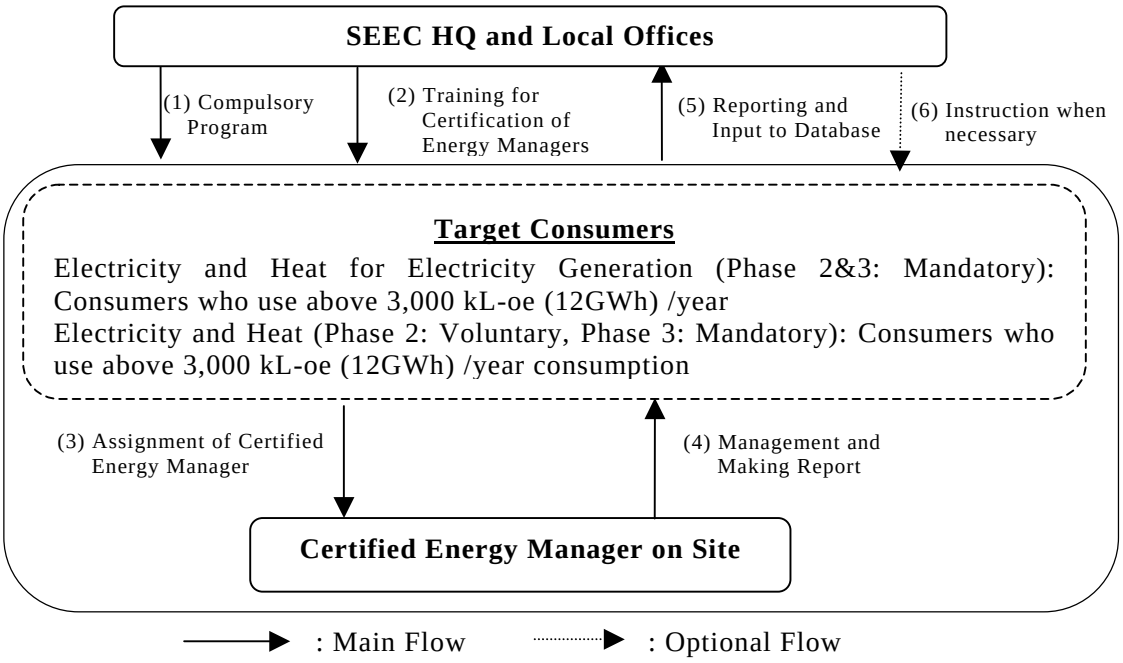
Phase 0 (Preparation Stage)



Phase 1 (Pilot Stage)



Phase 2 (Final Stage 1)
Electricity and Heat for Electricity Generation (Mandatory): Consumers who use above 3,000 kL-oe (12GWh) /year
Electricity and Heat (Voluntary): Consumers who use above 3,000 kL-oe (12GWh) /year consumption
Phase 3 (Final Stage 2)
Electricity and Heat (Mandatory): Consumers who use above 3,000 kL-oe (12GWh) /year



(8) Required Permanent Human Resources

Phase 0 (Preparation Stage)	Human Resources	Financial Cost for Human Resources
	MOWE&MOPMR No incremental staff	No incremental cost
Phase 1 (Pilot Stage)	Human Resources	Financial Cost for Human Resources
	SEEC HQ Energy management staff: 3	Standard Cost: 300,000 SR/year/person 0.3 x 5 = 1.5 million SR/year
Phase 2&3 (Final Stage 1&2)	Human Resources	Financial Resources
	SEEC HQ Energy management staff: 3 SEEC Local Offices Energy management staff: 2x2	Standard Cost: 300,000 SR/year/person 0.3 x 7 = 2.1 million SR/year

(9) Required Items

Phase 0 (Preparation Stage)	Item	Budget
	- Database soft ware (MOWE) - Internet access system to the database (MOWE) - Training for temporary energy manager (20 person)	0.3 million SR 0.1 million SR 0.2 million SR
Phase 1 (Pilot Stage)	Item	Budget
	-	-
Phase 2&3 (Final Stage 1&2)	Item	Budget
	-	-

(10) Expected Legislation for Enforcement

Phase 0 (Preparation Stage)	Items to be stipulated in Act	Relating Order/Regulation
	(Agreement between MOWE and voluntary site)	-
Phase 1-3 (for Mandatory)	Items to be stipulated in Act	Relating Order/Regulation
	Evaluation of Criteria for Business Operators	Detail of evaluation criteria (*1) is prepared by energy-consuming operators in accordance with an Announcement from the Ministry.
	Guidance and Advice	-
	Designation of Designated Energy Management Factories and Buildings	Designation (*2) is specified by a Cabinet Order.
	Energy Managers	Assignment of energy manager (*3) is specified by a Cabinet Order.
	Duty of Energy Manager	Concrete duties (*4) are specified by a Cabinet Order.
	Preparation of Medium Term Plan	Format (*5) is specified by an Announcement from the Ministry.
	Periodical Reports	Format (*6) is specified by an Announcement from the Ministry.
	Instructions and Orders on Rationalization Plans	-
	Penalty	-
	(Remark) "Qualified Energy Manager's License" is defined as "Training Program for Energy Manager"	

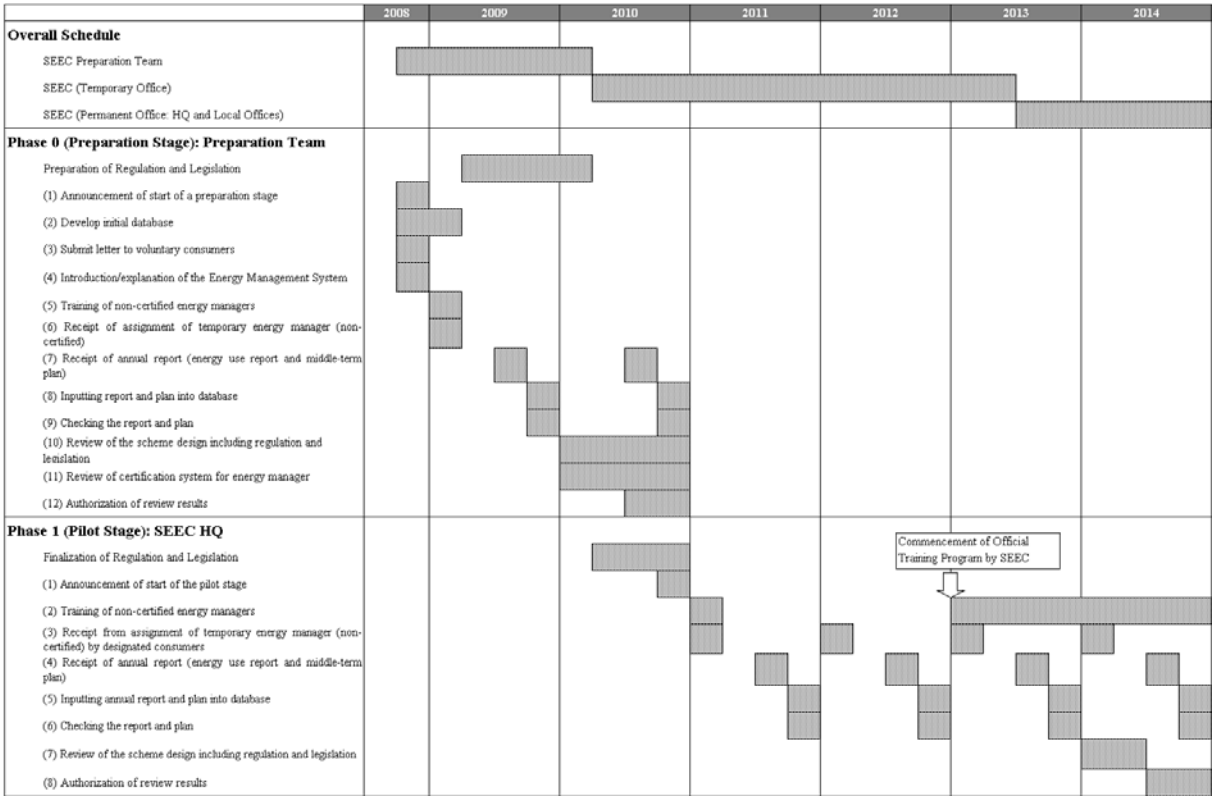
Cabinet Order: In case that decision making can be made among more than 2 ministries.
Ordinance of the Ministry: In case that decision making can be made by 1 ministry.
Announcement from the Ministry: Guideline or notification

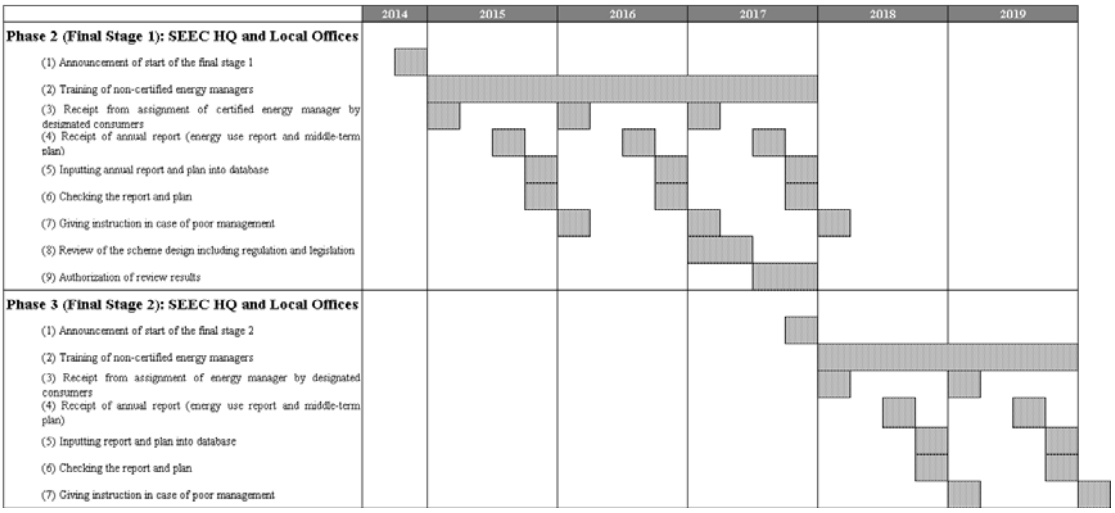
(11) Expected Action Plan

(Summary)

	Phase 0 (Preparation Stage)	Phase 1 (Pilot Stage)	Phase 2 (Final Stage 1)	Phase 3 (Final Stage 2)
	2008/10-2010/12 2+1/4 years	2011-2014 4 years	2015-2017 3 years	2018-
10 Voluntary Consumers	**Voluntary**		**Mandatory**	
Electricity and Heat for Electricity Generation		**Voluntary**	**Mandatory**	
Electricity and Heat			**Voluntary**	**Mandatory**

(Detail)


2008
2009
2010
2011
2012
2013
2014
Overall Schedule
SEEC Preparation Team
SEEC (Temporary Office)
SEEC (Permanent Office: HQ and Local Offices)
Phase 0 (Preparation Stage): Preparation Team
Preparation of Regulation and Legislation
(1) Announcement of start of a preparation stage
(2) Develop initial database
(3) Submit letter to voluntary consumers
(4) Introduction/explanation of the Energy Management System
(5) Training of non-certified energy managers
(6) Receipt of assignment of temporary energy manager (non-certified)
(7) Receipt of annual report (energy use report and middle-term plan)
(8) Inputting report and plan into database
(9) Checking the report and plan
(10) Review of the scheme design including regulation and legislation
(11) Review of certification system for energy manager
(12) Authorization of review results
Phase 1 (Pilot Stage): SEEC HQ
Finalization of Regulation and Legislation
(1) Announcement of start of the pilot stage
(2) Training of non-certified energy managers
(3) Receipt from assignment of temporary energy manager (non-certified) by designated consumers
(4) Receipt of annual report (energy use report and middle-term plan)
(5) Inputting annual report and plan into database
(6) Checking the report and plan
(7) Review of the scheme design including regulation and legislation
(8) Authorization of review results
Commencement of Official Training Program by SEEC


2014
2015
2016
2017
2018
2019
Phase 2 (Final Stage 1): SEEC HQ and Local Offices
(1) Announcement of start of the final stage 1
(2) Training of non-certified energy managers
(3) Receipt from assignment of certified energy manager by designated consumers
(4) Receipt of annual report (energy use report and middle-term plan)
(5) Inputting annual report and plan into database
(6) Checking the report and plan
(7) Giving instruction in case of poor management
(8) Review of the scheme design including regulation and legislation
(9) Authorization of review results
Phase 3 (Final Stage 2): SEEC HQ and Local Offices
(1) Announcement of start of the final stage 2
(2) Training of non-certified energy managers
(3) Receipt from assignment of energy manager by designated consumers
(4) Receipt of annual report (energy use report and middle-term plan)
(5) Inputting report and plan into database
(6) Checking the report and plan
(7) Giving instruction in case of poor management

(12) Attachment

- Sample of Act
- Sample document of management of criteria for Business Operators" (*1)
- Sample document of "Designation of energy management factories and buildings" (*2)
- Sample document of "Assignment of energy managers" (*3)
- Sample document of "Duty of energy manager" (*4)
- Sample document of "Medium term plan" (*5)
- Sample document of "Periodical reports" (*6)
- Sample

(Others)

- Sample of management criteria prepared by each business operator
- Sample of indicators for each sub-sector in industry, and building

(13) Items to be Further Studied

- Reporting from one company with several business units or each business unit?
  - In former case, report from each business unit shall be attached.
- How to provide necessary measuring instruments, especially SMEs.
  - Government supply or self-pay by target site
- Clarification of Penalty under mandatory program: Is penalty charge necessary?

Attachment 1-1. Samples

Sample of Act

Item	Contents	Remark
Article 1 Evaluation of Criteria for Business Operators	(1) The competent Minister shall establish and publicize evaluation criteria by the Announcement from the competent Ministry*1 with regard to the following matter as well as the targets for rational use of energy and the measures to be taken systematically to achieve such targets. ・ Rationalization of combustion of fuels, ・ Rationalization of heating and cooling as well as heat transfer, ・ Recovery and utilization of waste heat, ・ Rationalization of conversion of heat into power, etc., ・ Prevention of Energy loss due to emission, conduction, resistance, etc., ・ Rationalization of conversion of electricity into power, heat, etc.	This item stipulates that the competent Minister shall establish the target fields and the guidance for rational use by the Announcement from the competent Ministry.
	(2) The standards of judgment prescribed in the preceding paragraph shall be established by taking into consideration long-term energy supply-demand forecasts, the technical level related to the rational use of energy, and other circumstances, and shall be revised if necessary depending on any changes in these circumstances.	This item stipulates that the evaluation criteria shall be revised considering energy situation and technology evolution.
Article 2 Guidance and Advice	In order to ensure the proper implementation of the rational use, the competent Minister may provide business operators with necessary guidance and advice by taking into consideration the standards of judgment prescribed in the Article 1.	This item stipulates that the power to correct improper implementation is given to the Minister. Judgment can be done by the Minister by the prescribed standard.
Article 3 Designation of Designated Energy Management Factories and Buildings	(1) The competent Minister shall designate Factories and Buildings with respect to which energy consumption for a given business year is beyond the level specified by a Cabinet Order*2, as Factories and Buildings for which the promotion of the rational use of energy is required.	This item provides the definition of the designated Factories and Buildings specified by a Cabinet Order.

Item	Contents	Remark
Article 3 (continued)	(2) A business operator that has a Factory and Building shall, where energy consumption at the Factory and Building and for the previous business year, as calculated pursuant to the provision of a Cabinet Order mentioned in the preceding paragraph, is beyond the level specified by a Cabinet Order mentioned in the same paragraph, notify the competent Minister of the matters concerning the energy use situation at the Factory and Building.	This item stipulates an obligation of reporting by designated each Factory and Building using common format and calculation rule specified by the Ordinance of the competent Ministry.
Article 4 Energy Managers	(1) Designated Factory and Building Operator shall, pursuant to the provision of an Ordinance of the competent Ministry, appoint Energy Manager(s)*3 for each of its Designated Energy Management Factories from among persons who have a qualified Energy manager's license. (2) Designated Factory and Building Operator shall notify the competent Minister of the appointment, death or dismissal of the Energy Manager.	This item stipulates how to appoint Energy Manager(s) in designated Factory and Building, specified by the Ordinance of the competent Ministry. This item stipulates notification obligation.
Article 5 Duty of Energy Managers	Energy Managers shall, with regard to the rational use of Energy in designated Factories and Buildings, manage the maintenance of Energy-consuming facilities, the improvement and supervision of methods for using energy, and other affairs specified by an Ordinance of the competent Ministry.*4	This item stipulates duty of Energy Managers, specified by the Ordinance of the competent Ministry.

Item	Contents	Remark
Article 6 Preparation of Medium Term Plan	(1) Designated Factory and Building Operator shall, pursuant to the provision of an Ordinance of the competent Ministry, prepare each business year a medium- and long-term plan for achieving the targets for the rational use of energy that are specified for designated Factories and Buildings in the standards of judgment prescribed in Article 1, paragraph (1), and submit the plan to the competent Minister.	This item stipulates preparation of medium and long term plan according to standards of judgment, and submission.
	(2) Designated Business Operator that has appointed an Energy Manager, shall, when preparing a medium term plan pursuant to the preceding paragraph, have a person who has a qualified Energy manager’s license participate in the planning process.	This item stipulates that a licensed Energy Manager has to participate in the planning process of the medium term plan.
	(3) The competent Minister may develop necessary guidelines for contributing to Designated Business Operators' efforts to properly prepare plans set forth in paragraph (1). The competent minister shall, when having developed guidelines set forth in the preceding paragraph, publicize them, by the Announcement from the competent Minister.*5	This item stipulates that the competent Minister develop a guideline for preparation of plans and publicize it.

Item	Contents	Remark
Article 7 Periodical Reports	(1) A designated Business Operator shall report to the competent Minister each business year the matters specified by an Ordinance of the competent Ministry*6 with regard to the energy consumption and other status of energy use in the designated Factories and Buildings (including the matters concerning efficiency in energy use and CO2 emissions from energy use) as well as the status of establishment, modification and abolition of energy-consuming facilities and other facilities relating to the rational use of energy. (2) Designated Business Operator that has appointed an Energy Manager, shall, when preparing a periodical report, pursuant to the preceding paragraph, have a person who has a qualified Energy manager's license participate in the making report process.	This item stipulates that designated Business Operator shall report energy consumption and other status data specified by an Ordinance of the competent Ministry. This item stipulates that a licensed Energy Manager has to participate in the making process of the periodical report.
Article 8 Instructions and Orders on Rationalization Plans	(1) The competent Minister may, when he finds that the status of the rational use of energy in a designated Factory and Building is significantly insufficient in light of the standards of judgment prescribed in Article 1, paragraph (1), instruct the designated Business Operator pertaining to the designated Factory and Building to prepare and submit a plan on the rational use of energy (hereinafter referred to as a "Rationalization Plan"), while presenting the grounds for his judgment.	The competent Minister can instruct a designated Factory and Building who is significantly insufficient in light of the standards of judgment. The competent Ministry can instruct to prepare and submit an additional plan (Rationalization Plan) to improve the performance.

Item	Contents	Remark
Article 8 (continued)	(2) The competent Minister may, when he finds the Rationalization Plan to be inappropriate for the proper implementation of the rational use of energy in the designated Factory and Building, instruct the designated Business Operator to revise the Rationalization Plan. (3) The competent Minister may, when he finds that a designated Business Operator does not implement a Rationalization Plan, instruct the designated Business Operator to properly implement the Rationalization Plan. (4) Where a designated Business Operator that has received instructions prescribed in the preceding three paragraphs has failed to follow the instructions, the competent Minister may publicize this.	This item is more strict instruction for a Business Operator who submit an inappropriate Rationalization Plan This item is also more strict instruction to properly implement the Rationalization Plan. This item is a kind of penalty.
Article 9 Penalty	A person who falls under any of the following items shall be punished by a fine of not more than ## Saudi Riyal. • A person who has violated an order issued under Article 4 (1) and Article 8 (3).	This is penalty clause when a Factory or Building does not appoint Energy Manager properly, and fails to follow the Minister's instructions.

Sample document of management of criteria for Business Operators

* Business Operator should establish actual management criteria in the following manners;

Management	● Operation pattern, points to keep in mind
	● Bundled requirement for similar equip
	● Follows description in “Standards of Judgment
	● Setup of managerial and standard value
	● Specify control concept/feature for automatic/computer control
Measurement & record	● Periodical check with managerial/standard value
	● Periodical output of measurements even in automatic/computer control
Maintenance & inspection	● Procedure and points
	● Periodical
	● Bookkeeping

Sample document of “Designation of energy management factories and buildings”

Annual energy consumption	**Factory and businesses and their owner**	
Fuel (Heat) + Electricity	• All industry	• Buildings e.g. office buildings, department stores, hotels, schools, hospitals, governmental offices and amusement parks • Head office and office building of the left listed industries

Not less than 3,000kL (equivalent to 12 GWh)

Sample document of "Assignment of energy managers"

Coke production, power producer, gas supplier and heat supplier	
< 100,000 kl [400 GWh] in crude oil equivalent or larger	One
>= 100,000 kl [400 GWh] in crude oil equivalent or larger	Two

Other factory and business place	
< 20,000 kl [80 GWh] in crude oil equivalent or larger	One
< 50,000 kl [200 GWh] in crude oil equivalent or larger	Two
< 100,000 kl [400 GWh] in crude oil equivalent or larger	Three
>= 100,000 kl [400 GWh] in crude oil equivalent or larger	Four

Sample document of "Duty of energy manager"

No	Category	Energy Manager's tasks	Examples of documents to be drafted
1	Energy-saving fundamental policies	Gives assistance when drafting the energy-saving fundamental policy. Calculates necessary investments/costs based on the fundamental policy.	Energy-saving fundamental policy and budget document
2	Energy-saving promotion framework	Develops an energy-saving promotion organization plan, and decides on the energy-saving promotion organization framework after oordination with the employer and department heads. Periodically convenes meetings of the energy-saving promotion committee, and acts as the committee's secretariat.	Energy-saving promotion organization chart
3	Management standards	Develops the mandatory management standards as stipulated in the legally established criteria, prepares other management standards necessary for his/her company, and also designates the department responsible for the management criteria. When preparing the management criteria, the energy manager should act as the coordinator and provide related departments with necessary information on the basic philosophy, the format, the responsible department and the deadline.	Management standards drafting Management tandards, etc.
4	Identifying actual energy consumption	Investigates actual energy consumption, and makes out the basic units management chart.	Basic units anagement chart, etc.
5	Energy-saving plan and target setting	Designates the energy-saving tasks for the entire company and for each department once a year, and quantitatively sets out applicable targets.	Energy-saving plan
6	Education and prize-giving for employees	Educates employees on an entire company basis as well as on an each department basis. Works with the employer to establish a prize-giving scheme that honors a department or worker that contributes to energy conservation.	Education plan table
7	Periodic internal reporting on energy-saving efforts	Reports energy-saving efforts to the employer and each department on a monthly and yearly basis by using the energy basic units management chart.	
8	Improvements in energy-saving efforts	Develops an improvement plan (e.g., company-level energy-saving efforts and facility enhancement) after hearing opinions from related departments. Drafts a workplace-level improvement plan after hearing opinions from related departments.	Energy-saving improvement plan
9	Procedures/reporting scheme in accordance with Energy Conservation Law	・Drafts the periodic report ・Prepares a preliminary draft of the medium-to-long term plan.	Periodic report Medium-to-long term plan
10	Self-development by energy managers	Remains informed of state-of-the-art technologies and other firm's best practices.	

Sample document of "Medium term plan"

Form No. 9 (related to Article XXX)

＊Date received	
＊Date processed	

Medium Term Plan

To:

Year Month Day

Address:

Name: Signed/stamped

This report is created according to Clause YYY, Article ZZZ of Law concerning the Rational Use of Energy (including application of Clause VVV, Article WWW of the same law) as follows:

Registered Number of Energy Management Designated Factory								
Registered Number of Designated Emission Factory								
Name of factory								
Address of factory	Phone:（ － － ） FAX:（ － － ）							
Business type of factory								
Responsible document creator								
Registered license number of Qualified Energy Manager or number of Workshop Certificate of the responsible document creator								

Sample document of "Periodical reports"

Form No. 9 (related to Article XXX)

＊Date received	
＊Date processed	

Periodical Report

To:

Year Month Day

Address:

Name: Signed/stamped

This report is created according to Clause YYY, Article ZZZ of Law concerning the Rational Use of Energy (including application of Clause VVV, Article WWW of the same law) as follows:

Registered Number of Energy Management Designated Factory									
Registered Number of Designated Emission Factory									
Name of factory									
Address of factory	Phone:（ － － ） FAX:（ － － ）								
Business type of factory									
Responsible document creator									
Registered license number of Qualified Energy Manager or number of Workshop Certificate of the responsible document creator									

Attachment 1-2. Others

Sample of management criteria prepared by each business operator

	Item			Management Criteria	Note
Operation and mgmt	Mgmt of operation time, room temp and # of ventilation				
	Operation schedule of AC	AC		Ref to op schedule	
		Ventilation		Ref to op schedule	
				Request by phone	Received by CCR
		Overtime hour		Basically FCU	For less power, less area
	Room temp and humidity	Office	Temp	Summer: 28 degree C	Gov. recommendation
				Winter: 20 degree C	Gov. recommendation
				Others: 20-28 degree C	By outside air
			Humidity	Summer: Leave it to nature	No humidity control
				Winter: > 40%	Building mgmt law
				Others: Leave it to nature	No humidity control
			CO2 density	800 – 1000 ppm	Target
		Machine room	Temp	AC inspection table	
	Remarks	•In principle, government recommendation is used. But, it is tried not to exceed value specified building mgmt law (17 – 28 degree C) in all AC area. (Confirmation required by checking monitor display of CCR. •Moderation of room temperature: On request of room temp moderation, after checking room temp by monitor display of CCR and confirming its validity, moderation should by made, less than 27 degree C in summer and 22 degree C in winter as a guide.			
Measurement & record	Figure out condition of temp and etc.				
	Office room	Temp		Once a week, once a hour	Measure at each floor, AC daily report
		Humidity		Once a week	Measure at each floor
		CO2 density		Once two months	Environment & sanitation report
		Temp		Once a hour	AC daily report
		Humidity		Once a hour	AC daily report
		CO2 density		Once a week	AC equip inspection table
	Machine room	General system (upper & lower tier)		Once a hour	Daily load report
	Load at secondary side	Central system (upper & lower tier)		Once a hour	Daily load report
		Hot Water (upper & gen lower tier)		Once a hour	Daily load report
		TR-1,2,3 at underground S/S		Once a hour	Daily load report
	Remarks	•Temp and humidity can be monitored on monitor console in CCR always.			
Maintenance & inspection	Maintain good condition of automatic control system Periodical inspection of temp and humidity sensor			Once a year	
	Remarks				

I. Period of plan

2008 – 2012 KSA fiscal year

II. Content of plan and expected results by rationalization of energy use

Process	Content of plan	Expected results of rationalization of energy use
Co-generation system		
AC		
Lighting		
Process		
Drive power for delivery		

III. Content of plan and expected results by measures on peak shift/cut

Process	Content of plan	Expected results by measures on peak shift/cut
Factory operation		
Schedule of maintenance work		
Thermal storage system		

IV. Comparison with plan of previous year of energy rationalization

Process	Deleted plan	Reason
Co-generation system		
AC		
Lighting		
Process		
Drive power for delivery		

V. Comparison with plan of previous year of peak shift/cut

Process	Deleted plan	Reason
Factory operation		
Schedule of maintenance work		
Thermal storage system		

Sample of indicators for each sub-sector in industry and building

- kWh/m2/y (for building, shopping mall, hospital, …)
- kWh/barrel/y (for refinery)
- kWh/ton/y (for steel maker, cement, …)
- kWh/shipping volume/y
- kWh/sales/y

2. Energy Efficiency Labels and Standards (EELS)

(1) Program Name

Energy Efficiency Labels and Standards (EELS)

(2) Objective

- Promotion of supply of high efficiency appliances to the market
- Raising energy conservation awareness of customers

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	- Test of local/import product in accordance with SASO standard - Sending local/import product information to SASO - Registration of performance data - Display of performance data at retail shops - Making database - Random inspection - Monitoring and awareness survey	
Phase 1 (Pilot Stage)	Task	Responsible Agency
	(1) Making and updating performance standard and test method	SASO
	(2) Authorization of laboratories for performance test	SASO
	(3) Sending local/import product information to SASO periodically	M&Is
	(4) Request of registration of performance data to Manufactures and Importers	SASO
	(5) Registration of performance data obtained from M&Is	SASO
	(6) Request of display of label sheet to retail shops	SASO
	(7) Making database and publication (booklet and internet)	SASO
	(8) Printing label sheet with performance data and putting it on product by M&Is	M&Is
	(9) Monitoring and awareness survey to be improved	SASO
	(10) Dissemination with campaign	SASO
Phase 2 (Final Stage)	Task	Responsible Agency
	(To be added to Phase 1)	
	(1) Enforcement of registration of performance data to M&Is	SASO/SEEC
	(2) Enforcement of display of label sheet to retail shops	SASO/SEEC
	(3) Random inspection of labeled performance data	SASO/SEEC
	(4) Random inspection to retail shops to confirm compliance	SASO/SEEC

(4) Executing Agency

Name of Agency	Saudi Arabian Standards Organization (SASO)
Expected Role	- Making and updating performance standard and test method - Authorization of laboratories for performance test - Request of registration of performance data to M&Is - Registration of performance data obtained from M&Is - Request of display of label sheet to retail shops - Making database and publication (booklet and internet) - Monitoring and awareness - Dissemination with campaign
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	- Enforcement of registration of performance data to M&Is - Enforcement of display of label sheet by retail shops - Dissemination with campaign (transferred from SASO task) - Random inspection of labeled performance data - Random inspection to retail shops to confirm compliance - Monitoring and awareness (transferred from SASO task)
Name of Agency	Ministry of Commerce and Industry (MOCI)
Expected Role	- Establishment of law to be mandatory (inspection, penalty and instruction, etc.)

(5) Relating Agency

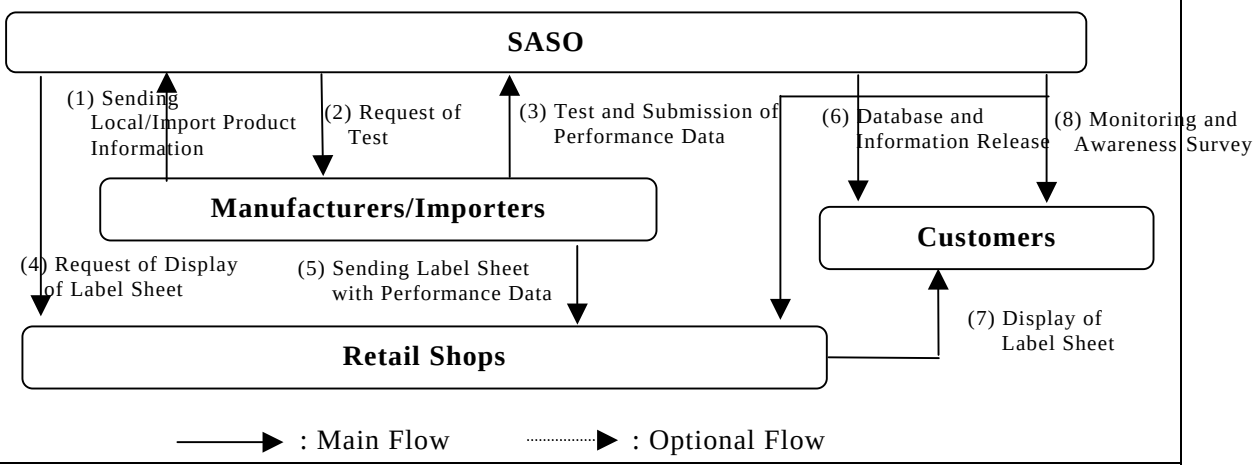
Name of Agency	Ministry of Water and Electricity (MOWE) and SEC
Expected Role	- Dissemination in cooperation with SASO and SEEC

(6) Target of the Scheme

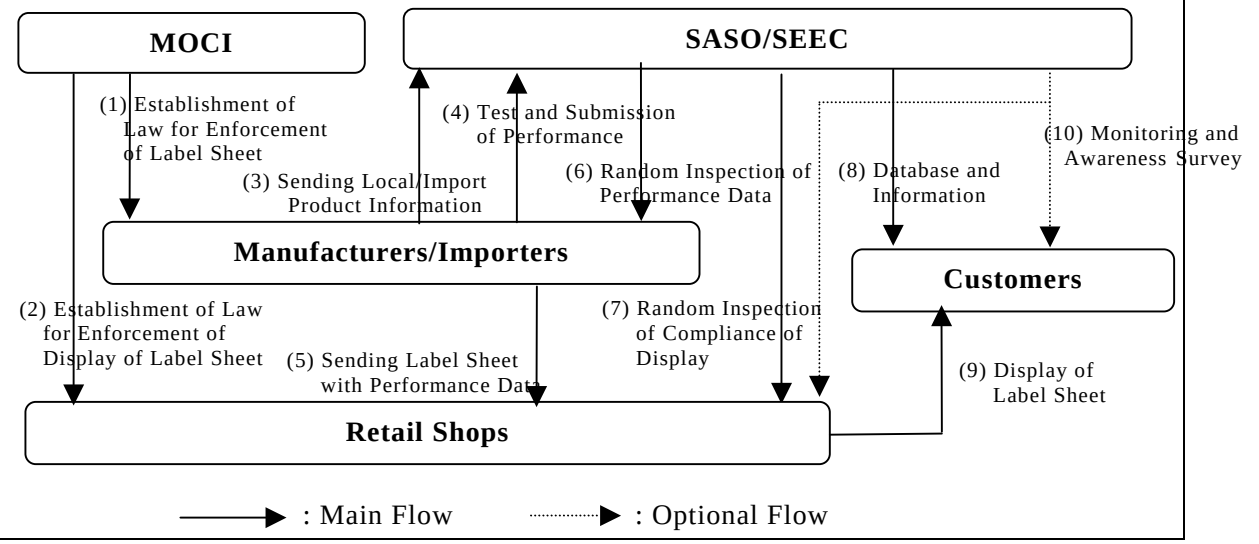
Name of Target	Manufacturers and Importers (M&Is) of AC, Washing Machine, Refrigerator and Freezer
Expected Action	- Sending import product information to SASO periodically - Testing performance of designated products in accordance with SASO standard in authorized laboratories - Printing label sheet with performance data and putting it on product
Name of Target	Retail Shops selling AC, Washing Machine, Refrigerator, and Freezer
Expected Action	- Display of label sheet in shops

(7) Workflow

Phase 1 (Pilot Stage)



Phase 2 (Final Stage)



(8) Required Permanent Human Resources

Phase 1 (Pilot Stage)	Human Resources	Financial Cost for Human Resources
	<u>SASO New Department</u> Registration: 2 Dissemination and publication: 2 Database engineer: 1	Standard Cost: 300,000 SR/year/person 0.3 x 5 = 1.5 million SR/year
Phase 2 (Final Stage)	Human Resources	Financial Resources
	SEEC Inspection: 1 Dissemination and publication: 1	Standard Cost: 300,000 SR/year/person 0.3 x 2 =0.6 million SR/year
	<u>SASO New Department</u> Registration: 1 Database engineer: 1 Some of SASO tasks might be transferred to SEEC.	Standard Cost: 300,000 SR/year/person 0.3 x 2 =0.6 million SR/year

(9) Required Items

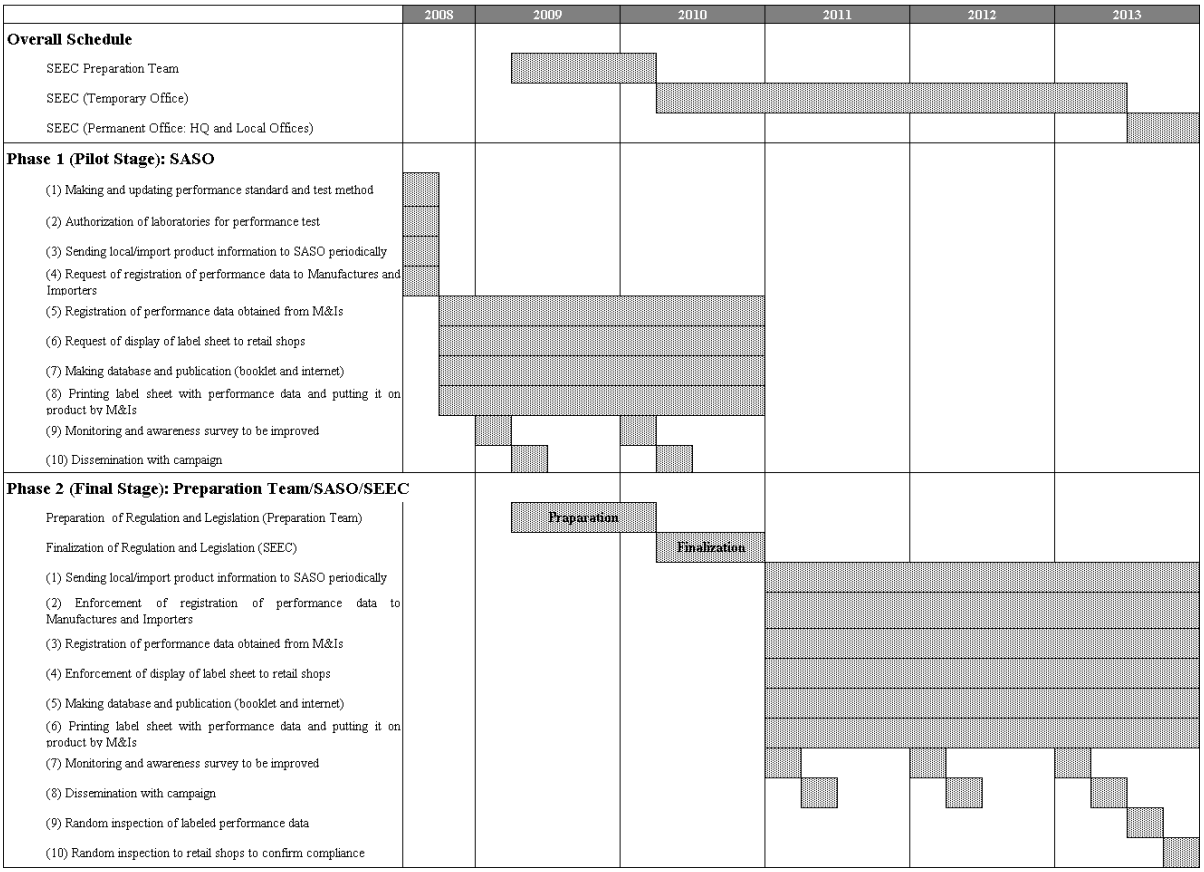
Phase 1 (Pilot Stage)	Item	Budget
	- Database soft ware (SASO) - Internet access system to the database (SASO)	0.3 million SR/time 0.1 million SR/time
Phase 2 (Final Stage)	Item	Budget
	- Testing cost for random inspection of performance data (SEEC)	180,000 SR/year (=60,000 SR x 3 times) AC: 30,000 Washing M: 10,000 Ref&Fre: 10,000 x 2

(10) Expected Legislation for Enforcement

Phase 1 (Pilot Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	Role of Manufacturers and Importers	-
	Standards of Judgment for Manufacturers /Importers and Registration of the Performance	(1) Designated machinery and equipment is specified by a Cabinet Order. (to be prepared by SASO or MOCI) (2) Standards of judgment for each machinery and equipment is specified by an Ordinance of the Ministry. (to be prepared by SASO or MOCI) (3) Designated agency to register the performance is appointed by an Announcement from the Minister. (to be prepared by MOCI)
	Recommendation and Orders concerning Improvement of Performance	Manufacturer/Importer to be recommended is specified by a Cabinet Order. (to be prepared by SASO or MOCI)
	Labeling and Obligation to Manufacturers /Importers	The labeling method to be taken by Manufacturers /Importers is specified by an Announcement from the Ministry. (to be prepared by SASO or MOCI)
	Recommendation and Orders concerning Labeling	-
	Provision of Information to General Consumers	-
	Penalty	-

Cabinet Order: In case that decision-making can be made between more than 2 ministries.
Ordinance of the Ministry: In case 1 ministry can make that decision-making
Announcement from the Ministry: Guideline or notification

(11) Expected Action Plan



(12) Attachment

(Act and Relating Documents to Act to be established)

- Sample of Act (Order and Regulation have been already prepared by SASO)

(Others)

- Japan’s sample database form for designated machinery and equipments (booklet and internet)

Attachment 2-1. Act and Relating Documents to Act to be established

- Sample of Act (Order and Regulation have been already prepared by SASO)

Item	Contents	Remark
Article 1 Role of Manufacturers and Importers	Business operators engaged in manufacturing or importing energy-consuming machinery and equipment hereinafter referred to as "Manufacturers/Importers" shall endeavor to contribute to the rational use of energy for machinery and equipment that they manufacture or import, by improving the performance of machinery and equipment in light of energy consumption.	This item stipulates that all business operators engaged in manufacturing or importing energy-consuming machinery and equipment shall endeavor to improve the performance of machinery and equipment.
Article 2 Standards of Judgment for Manufacturers /Importers and Registration of the Performance	(1) With respect to energy-consuming machinery and equipment that is heavily used in Saudi Arabia and consumes a considerable amount of energy, which is specified by a Cabinet Order*1 in the respect that it is particularly necessary to improve the performance thereof hereinafter referred to as "Specified Equipment", the competent Minister shall establish and publicize standards of judgment, specified by an Ordinance of the Ministry*2, for Manufacturers/Importers, with regard to the improvement of the performance for the respective Specified Equipment.	This item stipulates that designated machinery and equipment is specified by a Cabinet Order. The standards of judgment is specified by the competent Ministry. The standards of judgment stipulates the performance data to be indicated, the test methods, and the lowest level of the performance (minimum standard level).
	(2) The standards of judgment prescribed in the preceding paragraph shall be established by taking into consideration the lowest level of the performance as prescribed in the preceding Article for the respective Specific Equipment.	This item stipulates the minimum standard level of the Specific Equipment.
	(3) The Manufacturers/Importers shall send the performance of Specific Equipment to a designated agency appointed by the competent Minister*3.	This item stipulates an obligation of sending the performance data to a designated agency.

Item	Contents	Remark
Article 3 Recommendation and Orders concerning Improvement of Performance	(1) The competent Minister may, when he finds it necessary for a Manufacturer/Importer whose production or import volume of Specified Equipment satisfies the requirements specified by a Cabinet Order*4 to improve the performance prescribed in Article 1, with respect to the Specified Equipment that the Manufacturer/Importer manufactures or imports, to a considerable extent in light of the standards of judgment prescribed in paragraph (1) of the preceding Article, recommend the Manufacturer/Importer to improve the performance of the manufactured or imported Specified Equipment, setting targets for improvement.	This item specifies manufacturers and importers who shall comply with this Act, by a Cabinet Order. Besides the competent Minister can recommend to improve the performance when necessary.
	(2) Where a Manufacturer/Importer that has received recommendations made under the preceding paragraph has failed to follow the recommendations, the competent Minister may publicize this.	This item is a kind of penalty.
	(3) Where a Manufacturer/Importer that has received recommendations prescribed in paragraph (1) has failed to take the measures recommended without justifiable grounds, the competent Minister may, when he finds that such failure significantly affects the rational use of energy for the Specified Equipment, order the Manufacturer/Importer to take the measures recommended.	This item is stronger treatment for Manufacture /Importers who has failed to take the measures recommended without justifiable grounds even after the above recommendation.

Item	Contents	Remark
Article 4 Labeling and Obligation to Manufacturers /Importers	The competent Minister shall specify the following matters for the respective Specified Equipment*5, and make public notice of them. • Matters to be indicated in labels by Manufacturers/Importers with regard to energy efficiency of Specified Equipment the value calculated pursuant to the provision of an Ordinance of the Ministry. • The labeling method and other matters to be observed by Manufacturers/Importers when indicating energy efficiency.	This item stipulates the labeling method for Specific Equipment, specified by an Announcement from the Ministry. Besides, it stipulates the labeling obligation to the Manufacturers/Importers.
Article 5 Recommendation and Orders concerning Labeling	(1) The competent Minister, when he finds that a Manufacturer/Importer does not affix labels indicating energy efficiency in accordance with the public notice made under the preceding Article with respect to Specified Equipment, recommend the Manufacturer/Importer to affix labels indicating energy efficiency, in accordance with the public notice, to the manufactured or imported Specified Equipment.	The competent Minister can recommend a Manufacturer/ Importer to affix labels indicating energy efficiency when necessary.
	(2) Where a Manufacturer/Importer that has received recommendations made under the preceding paragraph has failed to follow the recommendations, the competent Minister may publicize this.	This item is a kind of penalty.
	(3) Where a Manufacturer/Importer that has received recommendations prescribed in paragraph (1) has failed to take the measures recommended without justifiable grounds, the competent Minister may, when he finds that such failure significantly affects the rational use of energy for the Specified Equipment, order the Manufacturer/Importer to take the measures recommended.	This item is stronger treatment for Manufacturers /Importers who has failed to take the measures recommended without justifiable grounds even after the above recommendation.

Item	Contents	Remark
Article 6 Provision of Information to General Consumers	Business operators engaged in retailing energy-consuming machinery and equipment, and other business operators capable of cooperating, through their business activities, in general consumers' efforts towards the rational use of energy shall endeavor to provide information that contributes to general consumers' efforts towards the rational use of energy, by making notifications on the status of energy use by consumers and indicating the performance of machinery and equipment in light of energy consumption.	This item stipulates that retail shops shall endeavor to provide information.
Article 7 Penalty	A person who falls under any of the following items shall be punished by a fine of not more than ## Saudi Riyal. • A person who has violated an order issued under Article 3 (3) and Article 5 (3).	This is penalty clause when a Manufacturer/Importer does not improve even after recommendation and order of the Minister.

***1 Energy-consuming machinery and equipment (Cabinet Order)**

To be prepared by SASO or MOCI

***2 Standards of judgment (Ordinance of the Ministry)**

To be prepared by SASO or MOCI

***3 A designated agency appointed by the competent Minister (Announcement from the Ministry)**

To be announced by a competent Ministry

***4 Production or import volume of Specified Equipment satisfies the requirements (Cabinet Order)**

To be prepared by SASO or MOCI

***5 Matters for the respective Specified Equipment (Announcement from the Ministry)**

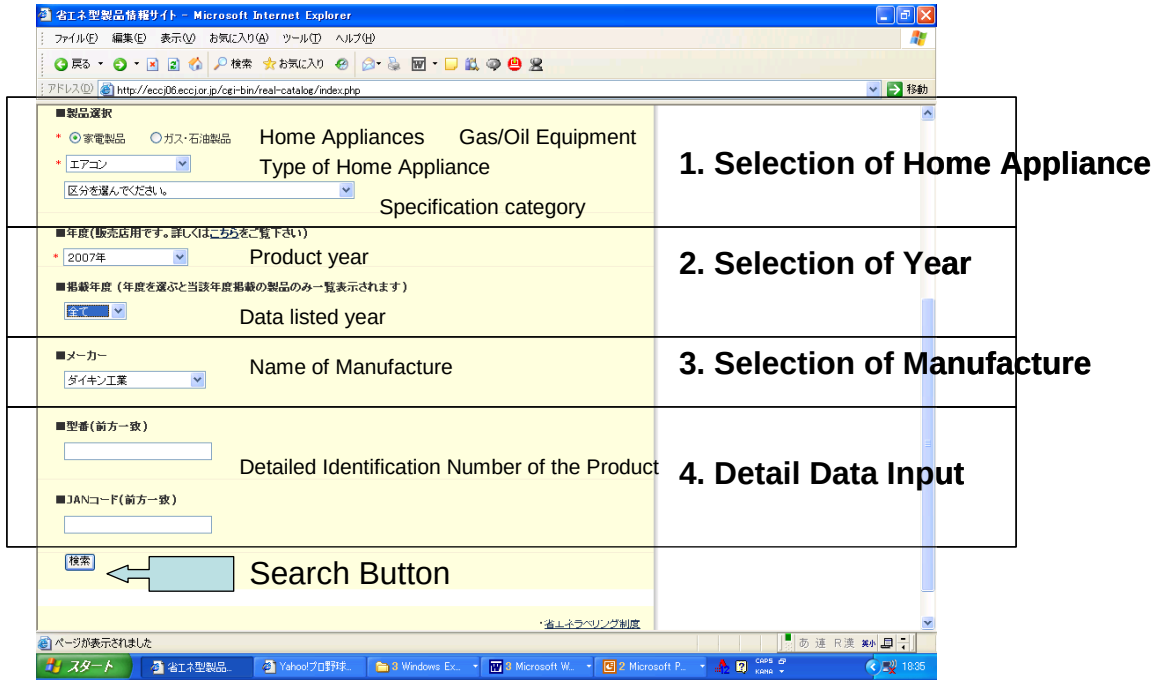
To be formulated by SASO or MOCI

Attachment 2-2. Others

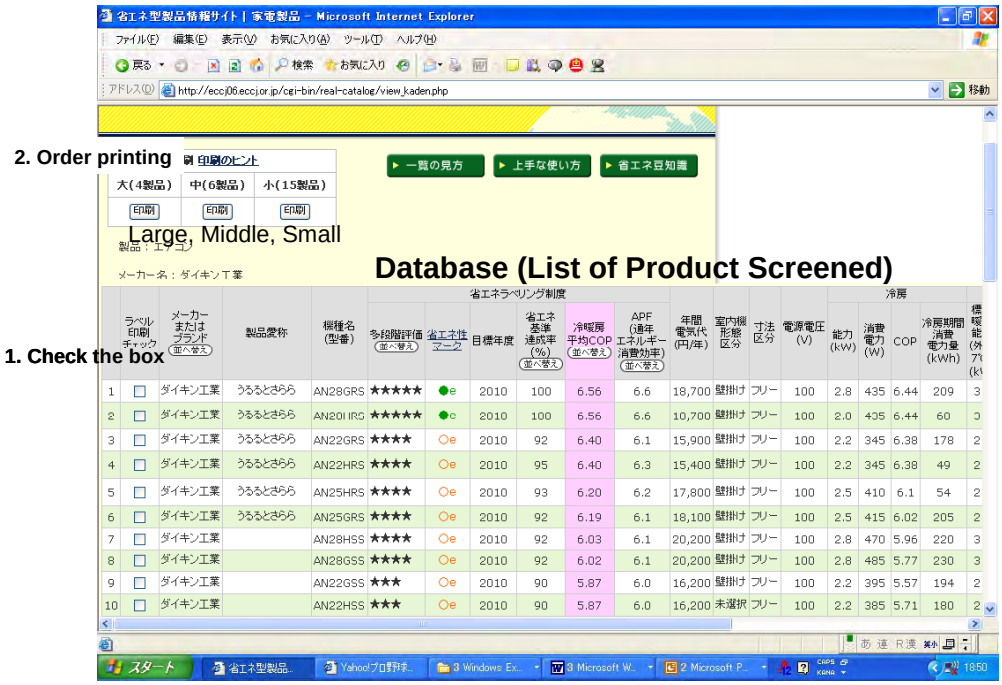
Japan's sample database form for designated machinery and equipments (booklet and Internet)

(1) Internet Access Database (Printing System in End-User's Computer)

(a) Input Data for Searching

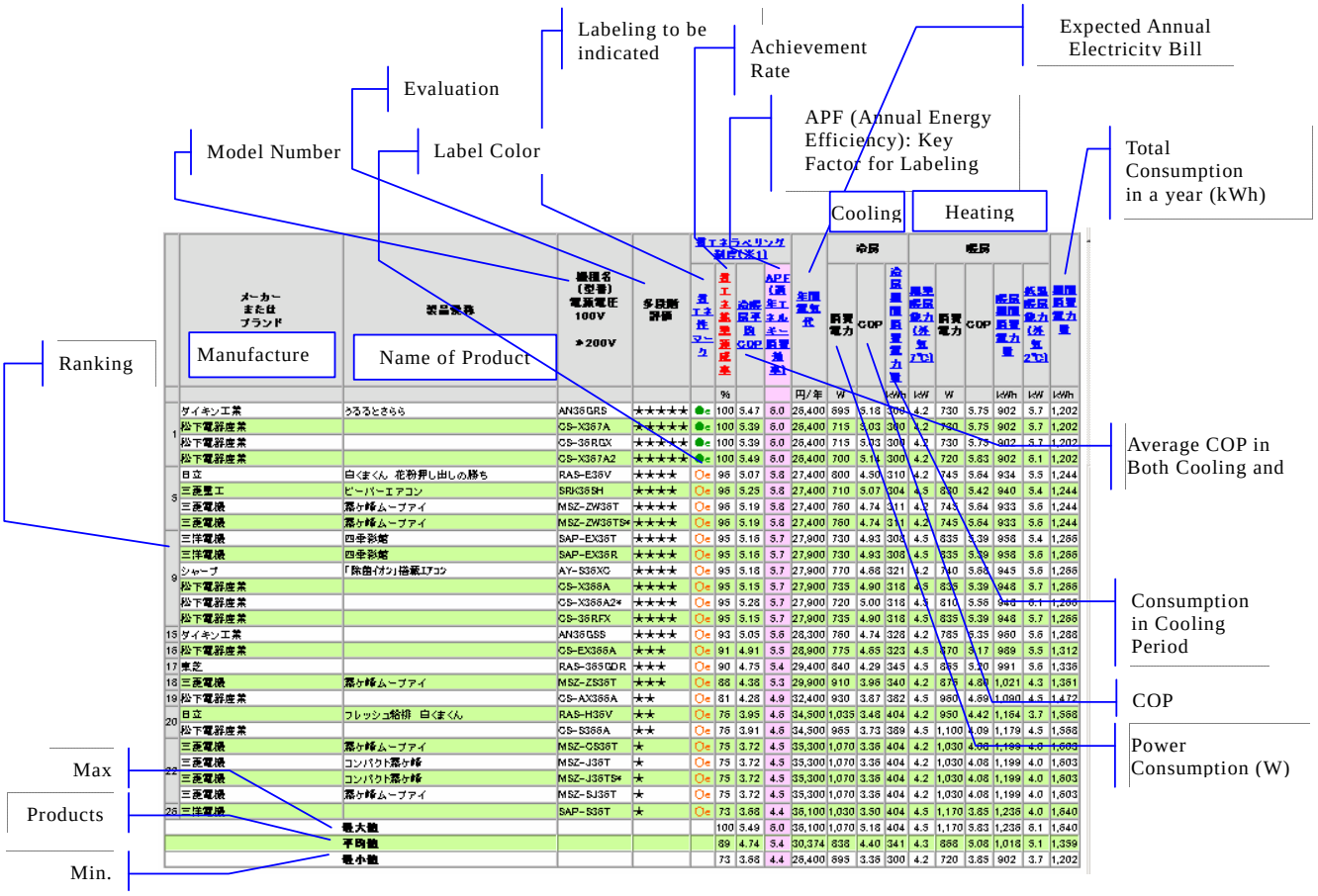


(b) Selection of Printing Label



(c) Confirmation of Label Sheet and Printing

(2) Booklet Database (in case of AC 3.6kW Class)



	メーカー または ブランド	機種名（型番） 電源電圧 100V ※200V	多段階評価	省エネラベリング対応(※1)				年間電気代	冷房			暖房				通年エネルギー消費量
				省エネ性マーク	省エネ基準達成率	通年エネルギー消費効率 APF	COP		消費電力	COP	冷房能力	消費電力	COP	暖房能力	低温暖房能力（外気2℃）	
					%			円/年	W		kW	W		kW	kW	kWh
1	ダイキン工業	AN36GRS	★★★★★	●	100	5.47	6.0	26,400	695	5.18	3.6	730	5.75	4.2	3.7	1,202
	松下電器産業	CS-X367A	★★★★★	●	100	5.39	6.0	26,400	715	5.03	3.6	730	5.75	4.2	3.7	1,202
	松下電器産業	CS-X36RDX	★★★★★	●	100	5.39	6.0	26,400	715	5.03	3.6	730	5.75	4.2	3.7	1,202
	松下電器産業	CS-X367A2	★★★★★	●	100	5.49	6.0	26,400	700	5.14	3.6	720	5.83	4.2	3.7	1,202
5	日立	白くまくん 花粉押し出しの勝ち	★★★★	○	95	5.07	5.8	27,400	800	4.90	3.6	745	5.84	4.2	3.5	1,244
	三菱電工	ピーバーエアコン	★★★★	○	95	5.25	5.8	27,400	710	5.07	3.6	730	5.82	4.2	3.5	1,244
	三菱電機	霧ヶ峰ムーブアイ	★★★★	○	95	5.19	5.8	27,400	760	4.74	3.6	745	5.84	4.2	3.5	1,244
	三菱電機	霧ヶ峰ムーブアイ	★★★★	○	95	5.19	5.8	27,400	760	4.74	3.6	745	5.84	4.2	3.5	1,244
	三洋電機	四季彩館	★★★★	○	95	5.16	5.7	27,900	730	4.93	3.6	735	5.39	4.3	3.4	1,266
	三洋電機	四季彩館	★★★★	○	95	5.16	5.7	27,900	730	4.93	3.6	735	5.39	4.3	3.5	1,266
9	シャープ	「除菌イオン」搭載エアコン	★★★★	○	95	5.18	5.7	27,900	770	4.68	3.6	740	5.84	4.2	3.5	1,266
	松下電器産業	CS-X366A	★★★★	○	95	5.15	5.7	27,900	735	4.90	3.6	735	5.39	4.3	3.5	1,266
	松下電器産業	CS-X366A2	★★★★	○	95	5.28	5.7	27,900	720	5.00	3.6	730	5.56	4.3	3.5	1,266
	松下電器産業	CS-36RFX	★★★★	○	95	5.15	5.7	27,900	735	4.90	3.6	735	5.39	4.3	3.5	1,266
15	ダイキン工業	AN36GSS	★★★★	○	93	5.05	5.6	28,300	760	4.74	3.6	785	6.35	4.2	3.5	1,288
16	松下電器産業	CS-EX366A	★★★	○	91	4.91	5.5	28,900	775	4.65	3.6	770	5.17	4.3	3.5	1,312
17	東芝	RAS-365GDR	★★★	○	90	4.75	5.4	29,400	840	4.29	3.6	845	5.20	4.3	3.6	1,338
18	三菱電機	霧ヶ峰ムーブアイ	★★★	○	88	4.38	5.3	29,900	910	3.95	3.6	875	4.88	4.2	3.4	1,361
19	松下電器産業	CS-AX366A	★★	○	81	4.28	4.9	32,400	930	3.87	3.6	960	4.69	4.3	3.5	1,472
20	日立	フレッシュ脱臭 白くまくん	★★	○	76	3.95	4.6	34,500	1,035	3.48	3.6	950	4.42	4.2	3.7	1,568
	松下電器産業	CS-S366A	★★	○	76	3.91	4.6	34,500	965	3.73	3.6	1,100	4.09	4.3	3.5	1,568
22	三菱電機	霧ヶ峰ムーブアイ	★	○	75	3.72	4.5	33,300	1,070	3.36	3.6	1,030	4.08	4.2	3.6	1,603
	三菱電機	コンパクト霧ヶ峰	★	○	75	3.72	4.5	33,300	1,070	3.36	3.6	1,030	4.08	4.2	3.6	1,603
	三菱電機	コンパクト霧ヶ峰	★	○	75	3.72	4.5	33,300	1,070	3.36	3.6	1,030	4.08	4.2	3.6	1,603
	三菱電機	霧ヶ峰ムーブアイ	★	○	75	3.72	4.5	33,300	1,070	3.36	3.6	1,030	4.08	4.2	3.6	1,603
26	三洋電機		★	○	73	3.68	4.4	36,100	1,030	3.50	3.6	1,170	3.85	4.3	4.0	1,640
		最大値			100	5.49	6.0	36,100	1,070	5.18	3.6	1,170	5.83	4.3	6.1	1,640
		平均値			89	4.74	5.4	30,374	838	4.40	3.6	841	5.08	4.3	5.1	1,399
		最小値			73	3.68	4.4	26,400	695	3.36	3.6	720	3.85	4.2	3.7	1,202

Class name: Cooling Capacity 3.6 kW and Free Dimension

3. Training Program for Energy Manager (TPEM)

(1) Program Name

Training Program for Energy Manager (TPEM)

(2) Objective

- Qualifying Energy Managers in line with the Energy Management System (EMS)
- Improving technical level on energy conservation in factories and/or buildings
- Promoting basic understanding of legislation regarding energy conservation

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	- Dissemination of the training programs in line with EMS - Preparation of training materials - Making arrangements and implementation of free training programs (at pilot stage) - Making arrangements and implementation of chargeable training including hands-on practice (at final stage) - Issuing Qualified Energy Manager's license	
Phase 0 (Preparation Stage)	Task	Responsible Agency
	(1) Formulating 4 training programs; i.e. Energy Manager qualification training, electrical EC technology training, heat EC, technology training and AC maintenance training	MOWE
	(2) Sourcing and registration of instructors	MOWE
	(3) Execution of Training of Teacher (TOT)	Relating Agency
	(4) Formulating the energy manager certification system	MOWE
	(5) Dissemination of the training programs in line with EMS	MOWE
Phase 1 (Pilot Stage)	Task	Responsible Agency
	(1) Establishment of energy conservation training center in SEEC HQ	SEEC
	(2) Preparation of training materials	SEEC
	(3) Making arrangements for free training programs	SEEC
	(4) Implementation of free training programs	SEEC
	(5) Issuing Qualified Energy Manager's license	SEEC
	(6) Dissemination of the mandatory EMS	SEEC
	(7) Plan, design and construction of facilities for hands-on practice training	SEEC

Phase 2 (Final Stage)	Task	Responsible Agency
	(To be added to Phase 1) (1) Establishment of EC training center in SEEC local offices (2) Making arrangements for chargeable training including hands-on practice (3) Implementation of chargeable training (4) Issuing Qualified Energy Manager's license	 SEEC SEEC SEEC SEEC

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE) as Preparation Team
Expected Role	**(Preparation Stage)** - Formulating 4 training programs; i.e. Energy Manager qualification training, electrical EC technology training, heat EC, technology training and AC maintenance training - Establishment of EC training center(s) - Plan and Execution of TOT - Formulating the Energy Manager certification system - Dissemination of the training programs in line with EMS
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	**(Pilot and Final Stage)** - Preparation of training materials - Plan, design and construction of facilities for hands-on practice training - Making arrangements and implementation of free training programs (at pilot stage) - Making arrangements and implementation of chargeable training programs including hands-on practice (at final stage) - Issuing Qualified Energy Managers' licenses in accordance with the procedure to be stipulated in the EC Act.

(5) Relating Agency

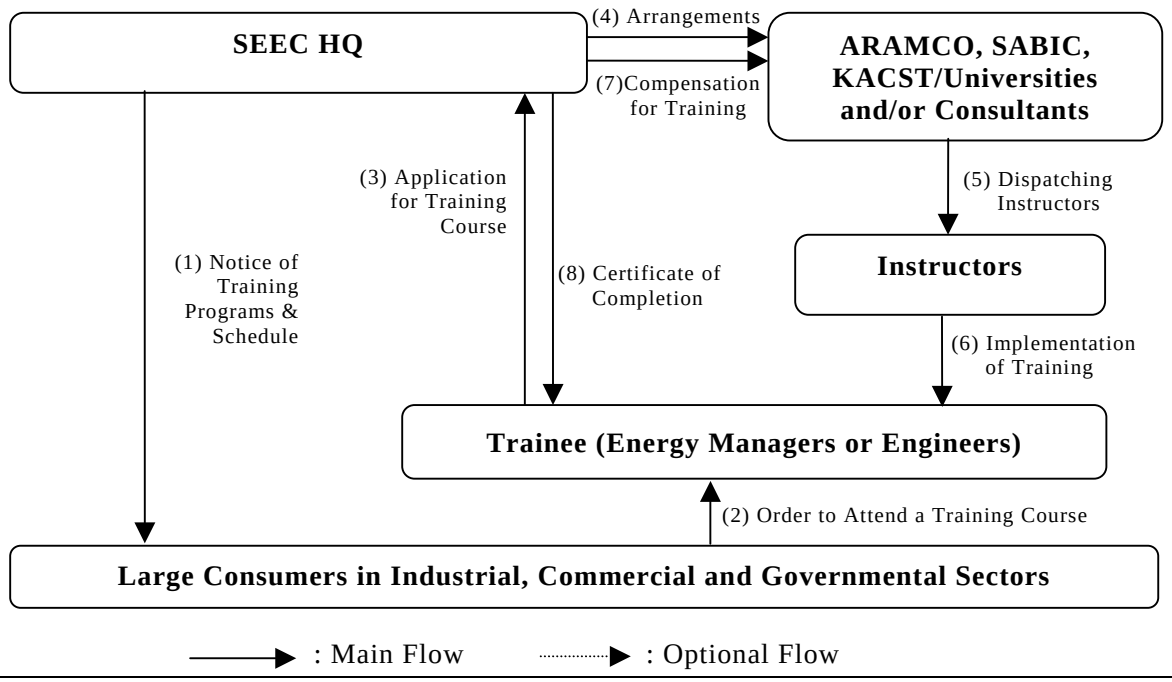
Name of Agency	ARAMCO, SABIC, KACST, Universities, and Consultation service companies
Expected Role	- Sourcing and registration of instructors - Implementation of free training programs - Implementation of chargeable training programs
Name of Agency	TVTC (former GOTEVOT)
Expected Role	- Working out a plan for establishing school(s) for industrial EC and/or building EC in cooperation with SEEC
Name of Agency	Saudi Council of Engineers (SCE)
Expected Role	- Coordinating in formulating the Energy Manager certification system

(6) Target of the Scheme

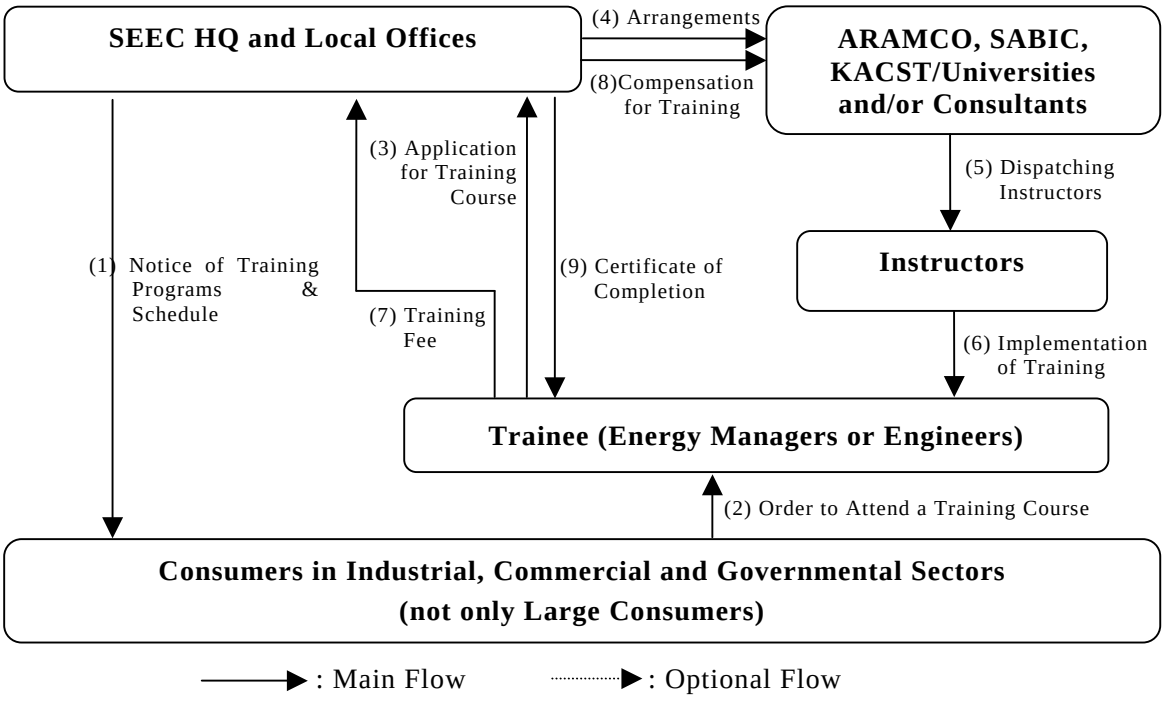
Name of Target	- Managers and engineers
Expected Action	- Playing a role as Energy Managers defined in the EMS - Implementation of EC activities in factories and/or buildings
Name of Target	- Field engineers from AC maintenance service companies
Expected Action	- Providing appropriate maintenance services for ACs

(7) Workflow

Phase 1 (Pilot Stage)



Phase 2 (Final Stage)



(8) Required Permanent Human Resources

Phase 0 (Preparation Stage)	Human Resources	Financial Cost for Human Resources
	MOWE No incremental staff	No incremental cost
Phase 1 (Pilot Stage)	Human Resources	Financial Cost for Human Resources
	SEEC HQ Planning and administration: 1 Arrangement staff: 1 EC technology information staff: 1	Standard Cost: 300,000 SR/year/person 0.3 x 3 = 0.9 million SR/year
Phase 2 (Final Stage)	Human Resources	Financial Resources
	SEEC HQ Planning and administration: 1 Arrangement staff: 1 EC technology information staff: 1	Standard Cost: 300,000 SR/year/person 0.3 x 3 = 0.9 million SR/year
	SEEC Local Offices (Dammam/Jeddah) Arrangement staff: 1x2	Standard Cost: 300,000 SR/year/person 0.3 x 2 = 0.6 million SR/year

(9) Required Items

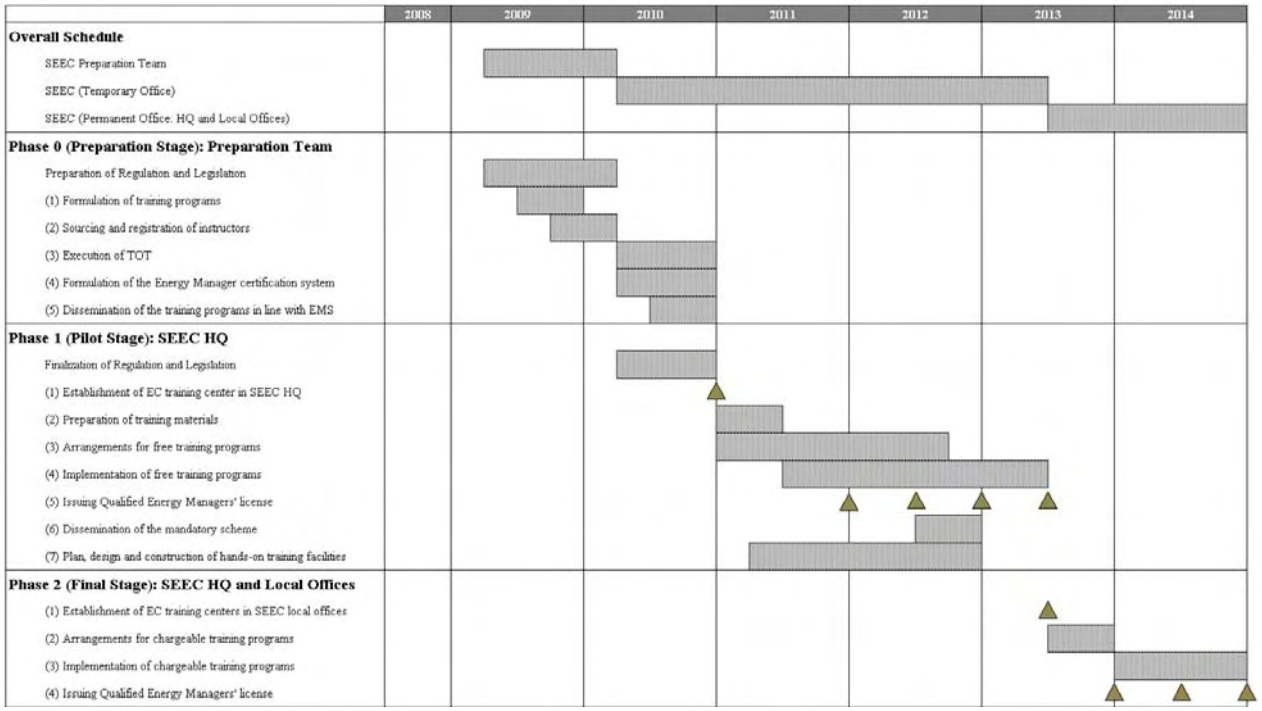
Phase 0 (Preparation Stage)	Item	Budget
	- TOT fee based on 1 month training for 3 groups each	0.36 million SR (= 4,000 SR/day x 30 days/group x 3 groups)
	- TOT expenses based on 1 month overseas training (travel, accommodation, allowance, etc.)	0.9 million SR (= 75,000 SR/person x 4persons/group x 3 groups)
Phase 1 (Pilot Stage)	Item	Budget
	- Training equipment (Interactive Whiteboards (IWBs) including basic software, AV, PCs and others for lecture and/or practice excluding lecture rooms) at HQ	0.35 million SR
	- Design and construction of training facilities for hands-on practice	5 million SR (in case of construction)
	- Material preparation (textbooks and brochures)	0.05 million SR/year
	- Compensation for instructors	0.24 million SR/year (= 3,000 SR/day x 80days/year)
	- Direct expenses for local site training (venue lease and others)	0.024 million SR/year (=120 SR/day/person x 20 persons x 10 days/year)
	- Operating and maintenance cost for hands-on training facilities	0.03 million SR/year
Phase 2 (Final Stage)	Item	Budget
	- Training equipment (IWBs including basic software, AV, PCs and others for lecture and/or practice excluding lecture rooms) for SEEC local offices (Dammam and Jeddah)	0.3 million SR (= 0.15 million SR x 2)
	- Material preparation (textbooks and brochures)	0.05 million SR/year
	- Compensation for instructors	0.3 million SR/year (=3,000 SR/day x 100 days/year)
	- Operating and maintenance cost for hands-on training facilities	0.03 SR/year
	(Expected Income) Training fee: 0.28 million SR/year (= 1,000 SR/trainee/course x (20 trainee x 12 courses/year + 10 trainee x 4 courses/year))	

(10) Expected Legislation for Enforcement

Phase 0 (Preparation Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 1 (Pilot Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	Qualified Energy Manager's License	Qualified Energy Manager's license (*1) shall be granted in accordance with an Ordinance of the competent Ministry.

Cabinet Order: In case that decision making can be made among more than 2 ministries.
Ordinance of the Ministry: In case that decision making can be made by 1 ministry.
Announcement from the Ministry: Guideline or notification

(11) Expected Action Plan



(12) Attachment

(Act and Relating Documents to Act to be established)

- Items to be regulated in Qualified Energy Manager's License (*1)

(Others)

- Training Program Concept Paper (for each)
- Sample of hands on training facilities

(13) Items to be Further Studied

- What are the criteria for instructor qualification?
- Hands on facilities should be a rental basis using existing facilities in university, school or factory. In this case, facilities cost can be included in training fee.

Attachment 3-1. Act and Relating Documents to Act to be established
Items to be regulated in Qualified Energy Manager's License (*1)

(1) Act (it will be one part of the Act of Energy Management System)

Article 10 Qualified Energy Manager's License (* Article 1-9 are EMS)	The qualified Energy Manager's license shall be granted by the competent Minister to a person who is qualified in accordance with the procedures concerning the grant of the qualified Energy Manager's license specified by an Ordinance of the competent Ministry*1.	This article stipulates that the qualified Energy Manager's license shall be granted in accordance with an Ordinance of the competent Ministry.

(2) Procedures concerning the grant of the qualified Energy Manager's license (Ordinance of the competent Ministry)*1

Item	Expected Contents	Remark
Item 1 Criteria for the Qualification of Energy Manager	● A person who has passed the examination for the qualified Energy Manager's license. ● A person who has been authorized by the competent Minister upon completing the qualification course of Energy Manager's license (hereinafter referred to as the "Qualification Course").	This item stipulates criteria for granting the qualified Energy Manager's license. It is suggested that a qualification training be adopted during the initial stage and the state exam be introduced in the future if need be.
Item 2 Examination for the Qualified Energy Manager's License	● The "Designated Examining Body" to administer the affaires concerning the examination for the Qualified Energy Manager's License. ● The subjects of the examination for the Qualified Energy Manager's License, and other details concerning the examination for the Qualified Energy Manager's License	This item stipulates the executing body of the examination for the qualified Energy Manager' license. SEEC is expected as the Designated Examining Body.
Item 3 Qualification Course	● The "Designated Examining Body" to administer the affaires concerning the Qualification Course. ● The subjects of the Qualification Course and other details concerning the Qualification Course.	This item stipulates the executing body of the qualification training for the Energy Manager's license to be executed SEEC is expected as the Designated Examining Body.

Attachment 3-2. Others

Training Program Concept Paper

(1) **Concept Paper for Training Program for Energy Manager Qualification**

<table>
<tr><td>Program</td><td>Training Program for Energy Manager Qualification</td></tr>
<tr><td>Target</td><td>Managers and Engineers in the Governmental, Commercial and Industrial Sectors</td></tr>
<tr><td>Purpose</td><td>Smooth enforcement of the Energy Conservation Act by qualifying Energy managers.
Improvement of energy management level in the relevant sectors.</td></tr>
<tr><td>Duration</td><td>5 day training (from 8:00-15:00)</td></tr>
<tr><td>Venue</td><td>Utilization of Private/Government Sector’s Training Facility
(or SEEC Training Office)</td></tr>
<tr><td>Frequency</td><td>4 times in a year (2 times in Riyadh and once in Dammam and Jeddah each).</td></tr>
<tr><td>Max. Capacity</td><td>20 trainees in 1 time</td></tr>
<tr><td>Fee</td><td>Ex. 1,000 SR/person (excluding trip cost, lunch, daily allowance, etc.)
(Free for the pilot stage. In the final stage, fee should be set at a reasonable rate.)</td></tr>
<tr><td>Certification</td><td>At the final day of the training program (the 5th day), a completion examination shall be done. Qualified trainees can receive a SEEC’s certification, with which the trainees can apply for the national qualification to the competent minister.</td></tr>
<tr><td>Summary of Program</td><td>
Training Program
<table>
<tr><th></th><th>1st Day</th><th>2nd Day</th><th>3rd Day</th></tr>
<tr><td>AM (8:00-11:00)</td><td>- Orientation
- Comprehensive Energy Management
- Overview of the Energy Conservation Act</td><td>- Electricity related Energy Conservation: Electric Energy Conservation Technologies</td><td>- Heat related Energy Conservation: Heat Energy Conservation Technologies</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Building related Energy Conservation</td><td>- Electricity related Energy Conservation: Electrical Measurement</td><td>- Heat related Energy Conservation: Heat Calculation and Heat Measurement</td></tr>
</table>
Training Program
<table>
<tr><th></th><th>4th Day</th><th>5th Day</th></tr>
<tr><td>AM (8:00-11:00)</td><td>- Energy Conservation in factories</td><td>- Qualification Examination</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Energy Conservation in factories: Practice</td><td>- Wrap-up
- Closing</td></tr>
</table>
Detailed contents of each lecture are proposed as the Annex
</td></tr>
</table>

Annex: Contents of Each Lesson (Training Program for Energy Manager Qualification)

Lesson	Contents	Purpose
Orientation	◆ Opening address by instructors; ◆ Introduction of trainees; ◆ Presentation of the course objectives; ◆ Special remarks.	Raising trainees motivation; Clarification of the course objectives.
Comprehensive Energy Management	◆ Energy situation and energy conservation policy in the KSA; ◆ Unit energy consumption management; ◆ Energy conservation activities in factories and/or business premises.	Acquisition of fundamental knowledge of energy management
Overview of the Energy Conservation Act	◆ Background of Energy Conservation Act. ◆ Periodical reporting; ◆ Designated Factory and Energy Manager; ◆ Evaluation Criteria and Management Standard.	Promotion of proper understanding of the Energy Conservation Act
Building related Energy Conservation	◆ Building energy conservation overview; ◆ Lighting related energy conservation; ◆ AC related energy conservation; ◆ Others.	Acquisition of basic skills in building related energy conservation
Electricity related Energy Conservation: Electric EC Technologies	◆ Pump related EC technologies; ◆ Fan related EC technologies; ◆ Compressor related EC conservation technologies.	Acquisition of basic knowledge of electric EC technologies
Electricity related Energy Conservation: Electrical measurement	◆ Voltage, electric current, and temperature measurement; ◆ Electric power measurement; ◆ Measuring methods.	Acquisition of basic knowledge of electrical measurement required to implement electric EC measures
Heat related EC: Heat EC Technologies	◆ Combustion improving technologies; ◆ Heat transmission technologies; ◆ Heat loss control technologies; ◆ Exhaust heat recovery technologies.	Acquisition of basic knowledge of heat EC technologies
Heat related EC: Heat Calculation and Measurement	◆ Heat balance calculation; ◆ Furnace control and measurement; ◆ Heat flow and pressure measurement; ◆ Exhaust gas analysis.	Acquisition of basic skills required to implement heat EC measures
Energy Conservation in Factories	◆ Approach to EC in factories; ◆ Basic data acquisition, recording and grasping energy intensity; ◆ Sample format for periodical reporting.	Promotion of appropriate reporting required in the EC Act
Energy Conservation in Factories: Practice	◆ Practice of developing Management Standards.	Promotion of proper development of MS
Qualification Examination	◆ Examination on each training curriculum	Accrediting successful completion
Wrap-up	◆ Release of correct answers to each question of the examination; ◆ Explanation of the procedure to apply for Energy Manager certification; ◆ Q&A	Reminding trainees of future schedule and procedure regarding the Energy Manager qualification
Closing	◆ Closing address; ◆ Questionnaire survey concerning the program.	Collection of trainee feedback

(2) **Concept Paper for Training Program for Electricity related Energy Conservation**

<table>
<tr><td>Program</td><td>Training Program for Electricity related Energy Conservation</td></tr>
<tr><td>Target</td><td>Managers and Engineers responsible for EC regarding electrical systems in the Governmental, Commercial and Industrial Sectors</td></tr>
<tr><td>Purpose</td><td>Promotion of EC regarding electrical systems in factories and/or buildings</td></tr>
<tr><td>Duration</td><td>5 day training (from 8:00-15:00)</td></tr>
<tr><td>Venue</td><td>Utilization of Private/Government Sector’s Training Facility
(or SEEC Training Office)</td></tr>
<tr><td>Frequency</td><td>4 times in a year</td></tr>
<tr><td>Max. Capacity</td><td>20 trainees in 1 time</td></tr>
<tr><td>Fee</td><td>Ex. 1,000 SR/person (excluding trip cost, lunch, daily allowance, etc.)</td></tr>
<tr><td>Certification</td><td>At the final day of the training program (the 5th day), a completion examination shall be done. Qualified trainees can receive a SEEC’s certification.</td></tr>
<tr><td>Summary of Program</td><td>
Training Program
<table>
<tr><td></td><td>1st Day</td><td>2nd Day</td><td>3rd Day</td></tr>
<tr><td>AM (8:00-11:00)</td><td>- Orientation
- Electrical Measurement</td><td>- Compressor related EC: Technologies</td><td>- Pump & Fan related EC: Technologies</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Electric Power Measurement: Hands-on Practice</td><td>- Compressor related EC: Hands-on Practice</td><td>- Pump & Fan related EC: Hands-on Practice</td></tr>
</table>
Training Program
<table>
<tr><td></td><td>4th Day</td><td>5th Day</td></tr>
<tr><td>AM (8:00-11:00)</td><td>- Building related Energy Conservation</td><td>- Completion Examination</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Case Study on Electrical Energy Conservation</td><td>- Wrap-up
- Closing</td></tr>
</table>
Underlined: Hands-on Training
Detailed contents of each lecture are proposed as the Annex
</td></tr>
</table>

Annex: Contents of Each Lesson (Training Program for Electricity related Energy Conservation)

Lesson	Contents	Purpose
Orientation	◆ Opening address by instructors ◆ Introduction of Trainees; ◆ Presentation of the course objectives; ◆ Special remarks.	Raising trainees motivation; Clarification of the course objectives.
Electrical measurement	◆ Voltage, electric current, and temperature measurement; ◆ Electric power measurement; ◆ Measuring methods.	Acquisition of basic knowledge required for electrical energy management.
Electric Power Measurement: Hands-on Practice	◆ Measurement practice – Pump, Fan; ◆ Lighting measurement practice; ◆ Practice using high-efficiency transformer; ◆ AC related measurement practice.	Capacity building in electric power measurement required for electrical energy management.
Compressor related Energy Conservation: Technologies	◆ Types and characteristics of compressors ◆ Compressor and shaft power; ◆ Leak prevention and its effects; ◆ Piping-related pressure loss; ◆ Measuring instruments and method; ◆ EC using control measures; ◆ Compressor-related EC.	Acquisition of basic knowledge regarding compressor related EC.
Compressor related Energy Conservation: Hands-on Practice	◆ Power measurement at time of pressure setting change; ◆ Leak measurement; ◆ Measuring piping-related pressure loss; ◆ Consideration of energy efficiency improvement measures.	Capacity building in implementing compressor related EC.
Pump & Fan related Energy Conservation: Technologies	◆ Type and characteristics of pump & fan; ◆ Selection of appropriate types; ◆ EC technologies (cutting impeller, revolution control, damper control, etc.)	Acquisition of basic knowledge regarding pump & fan related EC.
Pump & Fan related Energy Conservation: Hands-on Practice	◆ Pump performance measurement; ◆ Fan performance measurement; ◆ Data summary and review.	Capacity building in implementing pump & fan related EC.
Building Energy Conservation	◆ Building EC overview; ◆ Lighting-related energy conservation; ◆ AC-related energy conservation; ◆ EC related to power receiving and transformer facilities.	Acquisition of basic knowledge regarding building related EC.
Case Study on Electrical Energy Conservation	◆ Explanation of electrical equipment and facilities related EC examples (AC, lighting, compressor, pump and fan, power receiver and transformer, etc.)	Capacity building in electricity related EC by acquiring practical know-how.
Completion Examination	◆ Examination on each training curriculum.	Confirming proper understanding of the training program
Wrap-up	◆ Announcement of test performance and awarding; ◆ Q&A and individual consultation.	Incentive giving and awareness raising by awarding
Closing	◆ Closing address; ◆ Questionnaire survey concerning the program.	Collection of trainee feedback

(3) **Concept Paper for Training Program for Heat related Energy Conservation**

<table>
<tr><td>Program</td><td>Training Program for Heat related Energy Conservation</td></tr>
<tr><td>Target</td><td>Managers and Engineers responsible for energy conservation regarding heat systems in the Governmental, Commercial and Industrial Sectors</td></tr>
<tr><td>Purpose</td><td>Promotion of energy conservation regarding heat systems in factories and/or buildings</td></tr>
<tr><td>Duration</td><td>5 day training (from 8:00-15:00)</td></tr>
<tr><td>Venue</td><td>Utilization of Private/Government Sector’s Training Facility
(or SEEC Training Office)</td></tr>
<tr><td>Frequency</td><td>4 times in a year</td></tr>
<tr><td>Max. Capacity</td><td>20 trainees in 1 time</td></tr>
<tr><td>Fee</td><td>Ex. 1,000 SR/person (excluding trip cost, lunch, daily allowance, etc.)
(Free for the pilot stage. In the final stage, fee should be set at a reasonable rate.)</td></tr>
<tr><td>Certification</td><td>At the final day of the training program (the 5th day), a completion examination shall be done. Qualified trainees can receive a SEEC’s certification.</td></tr>
<tr><td>Summary of Program</td><td>
Training Program
<table>
<tr><th></th><th>1st Day</th><th>2nd Day</th><th>3rd Day</th></tr>
<tr><td>AM (8:00-11:00)</td><td>- Orientation
- Energy Conservation Technologies and Field Application</td><td>- Steam related Energy Conservation: Technologies</td><td>- Heating Facilities and Heat Measurement</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Fuel and Combustion Calculation
- <u>Combustion related Hands-on Practice</u></td><td>- <u>Steam related Energy Conservation: Hands-on Practice</u></td><td>- <u>Heating Facilities and Heat Measurement: Hands-on Practice</u></td></tr>
</table>
Training Program
<table>
<tr><th></th><th>4th Day</th><th>5th Day</th></tr>
<tr><td>AM (8:00-11:00)</td><td>- Case Study on Heat related Energy Conservation</td><td>- Completion Examination</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Case Study on Heat related Energy Conservation</td><td>- Wrap-up
- Closing</td></tr>
</table>
<u>Underlined: Hands-on Training</u>
Detailed contents of each lecture are proposed as the Annex.
</td></tr>
</table>

Annex: Contents of Each Lesson (Training Program for Heat related Energy Conservation)

Lesson	Contents	Purpose
Orientation	◆ Opening address by instructors; ◆ Introduction of Trainees; ◆ Presentation of the course objectives; ◆ Special remarks.	Raising trainees motivation; Clarification of the course objectives.
Energy Conservation Technologies and Field Application	◆ Combustion technologies; ◆ Heat transfer technologies; ◆ Heat loss control technologies; ◆ Waste heat recovery technologies.	Acquisition of basic knowledge required for heat energy management.
Fuel and Combustion Calculation	◆ Types and characteristics of fuels; ◆ Combustion calculation of gas fue;l ◆ Combustion calculation of liquid fuel; ◆ Oxygen concentration, air ratio, heat transfer efficiency of exhaust gas.	Acquisition of basic knowledge regarding fuel and combustion.
Combustion related Hands-on Practice	◆ Prevention of gas explosion; ◆ Method of confirming and adjusting the right flame; ◆ Burner combustion exercise.	Capacity building in heat management by acquiring practical know-how.
Steam related EC: Technologies	◆ EC through efficient use of stem; ◆ Selection, installation and management of steam traps; ◆ Drain recovery.	Acquisition of basic knowledge regarding steam related EC.
Steam related EC: Hands-on Practice	◆ Practice using engineering software; ◆ Steam piping design, calculation of pressure loss and steam consumption.	Capacity building in steam related EC by acquiring practical know-how.
Heating Facilities and Heat Measurement	◆ Heat efficiency improving measures (management of facilities, combustion, preheating air temperature and/or furnace pressure) ◆ Heat balance and diagnosis. ◆ Measuring instruments and method.	Acquisition of basic knowledge regarding heating facilities related EC..
Heating Facilities and Heat Measurement: Hands-on Practice	◆ Heat calculation practice; ◆ Collection of heat balance data; ◆ Analysis of collected data.	Capacity building in heating facilities related EC by acquiring practical know-how.
Case Study on Heat related Energy Conservation	◆ Fuel efficiency improvement examples; ◆ Heat transfer improvement examples; ◆ Heat radiation improvement examples; ◆ Waste heat recovery improvement examples.	Capacity building in heat related EC by enhancing practical knowledge.
Completion Examination	◆ Examination on each training curriculum.	Confirming proper understanding of the training program
Wrap-up	◆ Release of correct answers to each question of the examination; ◆ Q&A and individual consultation.	Incentive giving and awareness raising by awarding
Closing	◆ Closing address; ◆ Questionnaire survey concerning the program.	Collection of trainee feedback

(4) **Concept Paper for AC Maintenance Training Program**

<table>
<tr><td>Program</td><td>AC Maintenance Training Program</td></tr>
<tr><td>Target</td><td>Operators and Maintenance Staff for AC in Buildings</td></tr>
<tr><td>Purpose</td><td>Well Understanding for AC Basic Theory
Obtaining Energy Conservation Know-how (Operation and Maintenance)
Encouraging Awareness of Operators and Maintenance Staff</td></tr>
<tr><td>Duration</td><td>5 days training (from 8:00-15:00)</td></tr>
<tr><td>Venue</td><td>Utilization of Private/Government Sector’s Training Facility
(or SEEC Training Office)</td></tr>
<tr><td>Frequency</td><td>4 times in a year</td></tr>
<tr><td>Max. Capacity</td><td>10 trainees in 1 time</td></tr>
<tr><td>Fee</td><td>Ex. 1,000 SR/person (excluding trip cost, lunch, daily allowance, etc.)
(Trainees pay for training program fee. However, fee should set at a reasonable price.)</td></tr>
<tr><td>Certification</td><td>At the final day of the training program (the 5th day), a test will be done. Qualified trainees can receive a SEEC’s certification as an award. (not national qualification)</td></tr>
<tr><td>Summary of Program</td><td>
Training Program
<table>
<tr><th></th><th>1st Day</th><th>2nd Day</th><th>3rd Day</th></tr>
<tr><td>AM (8:00-11:00)</td><td>- Orientation
- Principles of Refrigeration
- Classification of Air Conditioner</td><td>- Energy Conservation by Equipment:
- Energy Conservation by Maintenance.
- Operation Data Collection</td><td>- Heat Load Calculation and AC Model Selection</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Components of AC;
- Hands-on Practice: Model Facility</td><td>- Hands-on Practice Data Collection;
- Hands-on Practice on Energy Conservation by Maintenance</td><td>- Practice of Heat Load Calculation and Selection</td></tr>
</table>
Training Program
<table>
<tr><th></th><th>4th Day</th><th>5th Day</th></tr>
<tr><td>AM (8:00-11:00)</td><td>- General Theory for Trouble Shooting</td><td>- Examination
- Introduction of a new Air Conditioner</td></tr>
<tr><td>PM
(11:00-12:00,
13:00-15:00)</td><td>- Practice of Trouble Shooting using a Model AC Facility</td><td>- Award Ceremony for Certification
- Closing</td></tr>
</table>
Underlined: Hands-on Training
Detail contents of each lecture are proposed as the Annex.
</td></tr>
</table>

Annex: Contents of Each Lesson (AC Maintenance Training Program)

Lesson	Contents	Purpose
Orientation	◆ Opening address by instructors ◆ Introduction of Trainees; ◆ Presentation of the course objectives; ◆ Special remarks	Raising trainees motivation; Clarification of the course objectives.
Principles of Refrigeration	◆ Explanation of the refrigeration principle, mechanism and basic units to study refrigeration;	Promotion of understanding of AC mechanism and various type of ACs.
Classification of AC	◆ AC type, uses and feature of each type.	
Components of AC	◆ Explanation of AC components and their functions	
Hands-on Practice: Model Facility	◆ Observation of a model AC facility; ◆ Explanation of the AC mechanism and components.	Promotion of better understanding of AC mechanism.
Energy Conservation by Equipment	◆ General energy conservation measures by AC equipment	Acquisition of know-how in AC related energy conservation
Energy Conservation by Maintenance	◆ General energy conservation measures by AC maintenance; ◆ Effects of EC measure implementation.	
Operation Data Collection	◆ Method of AC data collection under normal operating conditions; ◆ Equipment for measurement.	Acquisition of basic knowledge of data collection
Hands-on Practice on Data Collection	◆ Practice of data collection using the model facility.	Capacity building in data collection
Hands-on Practice on Energy Conservation by Maintenance	◆ Practice of effective energy conservation by measuring and comparing data between a normal operation and an AC with unclean filter and/or heat exchanger.	Capacity building in EC by maintenance method.
Heat Load Calculation and AC Model Selection	◆ Heat load calculation; ◆ Selection of appropriate AC type.	Capacity building in planning AC systems.
Practice of Heat Load Calculation and Selection	◆ Practice of load calculation and AC type selection using example problems.	
General Theory for Trouble Shooting	◆ Fundamentals of P-h chart required for troubleshooting; ◆ Procedures for dealing with AC failure and troubleshooting using P-h chart	Acquisition of basic knowledge required for troubleshooting
Practice of Trouble Shooting using a Model AC Facility	◆ Forced trouble (with a high frequency) generation on a model AC facility and practice of troubleshooting.	Capacity building in dealing with troubles
Examination	◆ Test to confirm the achievement of the program	Making a check of understanding
Introduction of a new Air Conditioner	◆ Introduction of a new AC; e.g. a hi-COP system, VRV, an ice heat storage system. ◆ Q & A	Promotion of understanding of latest trend.
Award Ceremony for Certification	◆ Announcement of test performance and awarding	Incentive giving and awareness raising by awarding
Closing	◆ Closing address; ◆ Questionnaire survey concerning the program	Collection of trainee feedback

Samples of Hands-on Facilities and Equipments

(1) Intended Objectives of Installation of Each Equipment and Facilities

(a) Facilities for practices on rotating machinery

- ✓ Practice on rotating machinery-related EC technologies;
- ✓ Demonstration of the principle of inverter and its EC effects;
- ✓ Practice on removing factors increasing energy consumption such as pressure losses through the piping;
- ✓ Practice on power measurement by three-phase connection measuring equipment such as a clamping power meter;
- ✓ Acquisition of knowledge on the principle of optimal control by a PID control system.

(b) Facilities for practices on an air compression system

- ✓ Practice on a method of searching places where air leaks;
- ✓ Practice on estimating the volume of air leakage and setting the optimum pressure of compressed air;
- ✓ Practice on removing factors increasing energy consumption such as pressure losses through the piping;

(c) Facilities for practices on a combustion system

- ✓ Practice on heat balance calculation on an industrial heating furnace;
- ✓ Practice on EC operation of industrial burners;
- ✓ Practice on operation of EC equipment (economizer, cooling water recovery system);
- ✓ Practice on handling EC measuring instruments;
- ✓ Practice on calculating EC effects of heat insulation materials for industrial furnaces;
- ✓ Practice on combustion management technologies.

(d) Facilities for practices on steam trap

- ✓ Learning the operating principles and optimal conditions of various kinds of steam traps;
- ✓ Practice on diagnosis of a failure or a malfunction of a steam trap by using dedicated diagnostic equipment;
- ✓ Practice on operating a steam condensate recovery system.

(e) Power supply system

- ✓ Power supply for other equipment and facilities for hands-on practice.

(f) Small once-through boiler

- ✓ Steam supply for other equipment and facilities for hands-on practice;
- ✓ Practice on EC operation of boilers;
- ✓ Education in boiler water management technologies;
- ✓ Practice on heat balance calculation on an industrial boiler.

(g) Measuring instruments and analyzers

- ✓ Practice on measuring operation;
- ✓ Practice on simplified measurement during factory audits.

(2) Specifications for Major Equipment

	Name	No. of Unit	Specifications
A.	Rotating equipment		
	a) Fan	1 set	Air volume: 30 m^3/min.
	b) Pump	1 set	Single suction centrifugal pump Total pump head: 33 m; Discharge rate: 0.4 m^3/min.
	c) Auxiliary equipment		PID control system on flow and vessel level
B.	Air compression system	1 set	Single stage screw compressor with an oil feeding system; Working discharge pressure: 0.7 MPa; Discharge air capacity: 2.0 m^3/min. Auxiliary facilities: piping and instrumentation.
C.	Combustion furnace	1	Combustion volume: 200,000 kcal/h; Fuel: Natural gas and heavy oil
D.	Steam trap	8 lines	Bucket type, Disc type, Float type, Thermostatic type; The system to contain failure equipment.
E.	Power supply system	1 set	
F.	Boiler	1	Once-through boiler; Capacity: 300 kg/h; Steam pressure: 10 kg/cm^2G; Fuel: heavy oil A, light oil.
G.	Measuring instruments and analyzers		
	a) Hot-wire anemometer	1	
	b) Data logger	1	Portable type with transducer; Service temperature: -20 - +70℃.
	c) Ultrasonic flow meter	1	Portable type; Pipe diameter: 12.5-1,000 mm; Flow velocity: 0-10 m/s; Service temperature: -20 - +150℃
	d) Pitot tube anemometer	1	Measuring pressure: 0-2,500 Pa; Flow velocity: 0-50 m/s.
	e) Infrared thermometer	1	Noncontact type with LASER sighting mechanism; Measuring temperature: max. 2,000 ℃; Measuring range: 0-600℃ and 600-2,000℃.
	f) Portable thermometer	10	Measuring temperature: -50 - +1,200℃.
	g) Clamp power meter	Large: 1 Small: 5	Voltage: 600 V; Current: 1,000 A; Power factor: 0-1
	h) Flue gas analyzer	1	Electric power: kW Measuring component: O^2, CO, SO^2, NOx

4. Energy Assessments Service (EAS)

(1) Program Name

Energy Assessment Service

(2) Objective

- Encouraging energy conservation activities in private enterprises
- Dissemination of energy conservation technology

(3) Outline of the Scheme and Each Phase

	Contents	
Overall Scheme	- Making consultant list and recruiting stand-by consultants to implement the assessment and consultation - Announcement of the program to industrial and commercial sector in cooperation with COC - Application from industrial and commercial sector to SEEC - Selection from applicants - Requesting required data (basic information, single line diagram, energy & electricity data, etc) in advance to selected applicants - Dispatching suitable two consultants to the site of selected applicant for one day survey - Making an EC recommendation report within one month by the consultants - Conducting follow-up questionnaire within 2 years and urging actions if necessary	
Phase 0 (Preparation Stage)	Task	Responsible Agency
	(1) Preparation of document forms for assessment implementation	MOWE
	(2) Recruiting consultants for the EAS activities and making a consultant list	MOWE
	(3) Training course of EC consultants (if necessary)	MOWE
	(4) Preparation of information brochures on EAS activities	MOWE
	(5) Notification of assessment and consultation activities	MOWE
	(6) Planning of EC measure database establishment	MOWE
Phase 1 (Final Stage)	Task	Responsible Agency
	(1) Announcement of the program to industrial and commercial sector in cooperation with COC	SEEC
	(2) Application from industrial and commercial sector to SEEC	Applicants
	(3) Selection from applicants	SEEC
	(4) Requesting required data (basic information, single line diagram, energy &electricity data, etc) in advance to selected applicants	Consultant
	(5) Dispatching suitable two consultants to the site of selected applicant for one day survey	Consultant
	(6) Making an EC recommendation report within one month by the consultants	Consultant
	(7) Conducting follow-up questionnaire within 2 years and urging actions if necessary	SEEC

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE) as Preparation Team
Expected Role	**(Preparation Stage)** - Preparation of document forms for assessment implementation - Recruiting consultants for the EAS activities and making a consultant list - Training course of EC consultants (if necessary) - Preparation of information brochures on EAS activities - Notification of assessment and consultation activities - Planning of EC measure database establishment
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	**(Final Stage)** - Making an implementation plan of EAS next year, and a budget draft - Making budget through MOWE and/or MOPMR - Making consultant list and recruiting stand-by consultants to implement the assessment and consultation - Announcement of the program to industrial and commercial sector in cooperation with COC - Selection from applicants - Requesting required data in advance to selected applicants - Dispatching suitable two consultants to the site of selected applicant for one day survey - Verification of the quality of report by SEEC - Sending a final report to the applicant. - Conducting follow-up questionnaire within 2 years and urging actions if necessary
Name of Agency	Consultant (in the name of SEEC)
Expected Role	- Registration to consultant list - Site survey - Making an EC recommendation report within one month by the consultants

(5) Relating Agency

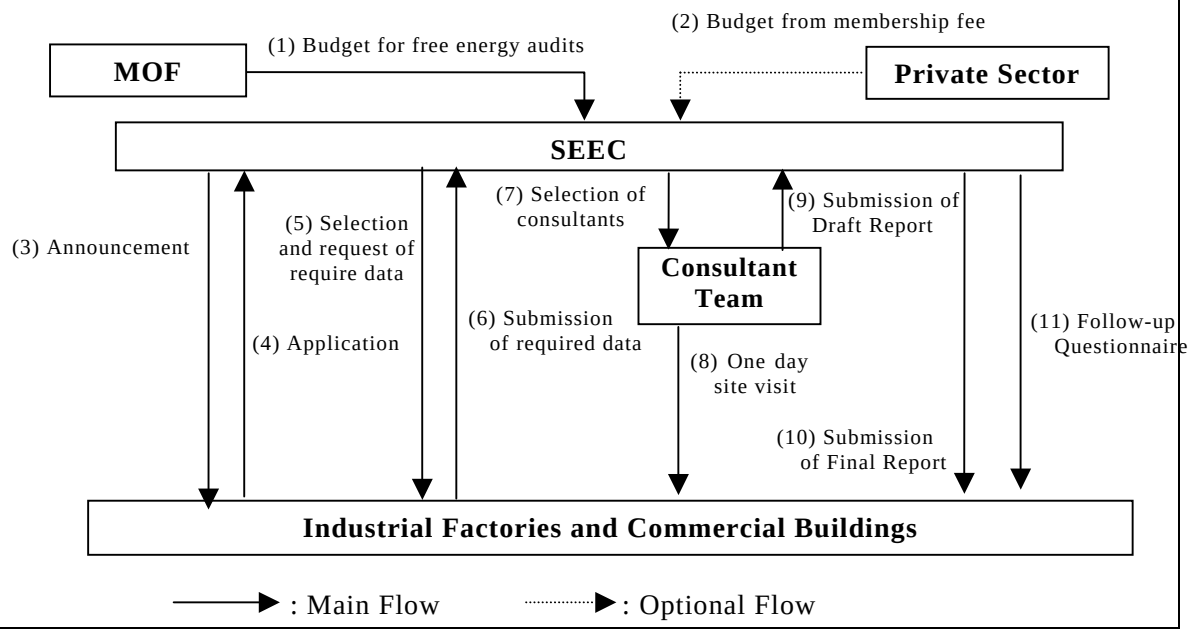
Name of Agency	Chamber of Commerce (COC)
Expected Role	- Cooperation of announcement the program to private sector

(6) Target of the Scheme

Name of Target	Factories and commercial buildings
Expected Action	- Application with an application form to SEEC - Submission of required data - Site arrangement for dispatched consultants and assigned persons to facilitate the one day survey - Receiving EC recommendation report and examine possibility to implement - Answering follow-up questionnaire

(7) Workflow

Phase 1 (Final Stage)



(8) Required Permanent Human Resources

Phase 0 (Preparation Stage)	Human Resources	Financial Cost for Human Resources
	MOWE No incremental staff	No incremental cost
Phase 1 (Final Stage)	Human Resources	Financial Resources
	SEEC HQ Assessment management: 2 Consultant management: 1 Database engineer: 1	Standard Cost: 300,000 SR/year/person 0.3 x 4 =1.2 million SR/year

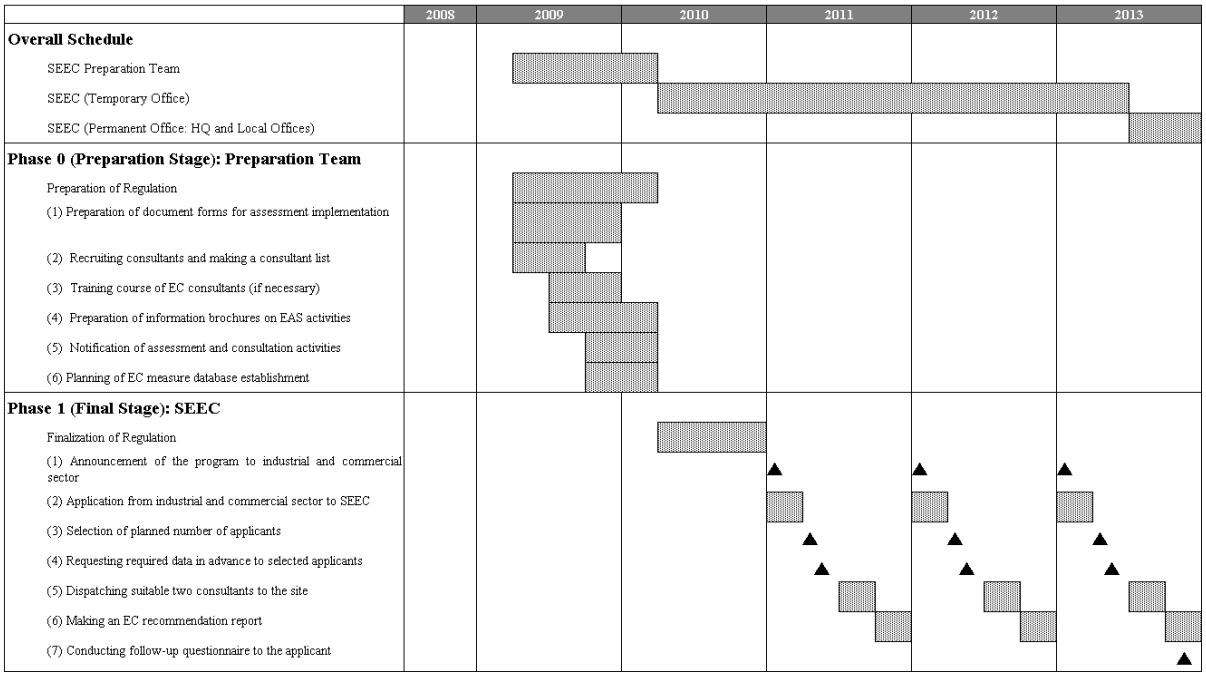
(9) Required Items

Phase 0 (Preparation Stage)	Item	Budget
	(MOWE) - Budget for training course of consultants: 10 days course	40,000 SR
Phase 1 (Final Stage)	Item	Budget
	(SEEC) - Budget for free assessment service (MOF): 10 cases/year - Database software	(0.03 million SR/case) 0.3 million SR/year 0.13 million SR

(10) Expected Legislation for Enforcement

Phase 1 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan



(12) Attachment

- Sample form of required data to applicant
- Sample from of follow-up questionnaire sheet
- Sample form of EC recommendation report

Attachment 4. Energy Assessments Service (EAS)

Sample form of required data to applicant

1. INFORMATION REGARDING FACILITY	
Date:	
Name of the factory:	Industrial sector:
Address: Person who completes the form:	Telephone: Telex: Fax:
	Title:
Address of The General Directorate: Person to be interviewed:	
Operation starting date of the factory:	
No. of employees:	No. of Shifts:

2. AREA OF ACTIVITY
Please list main production activities and equipments which consume big amount of energy and the important auxiliary systems. Please specify the energy production and consumption amounts on the basis of units. (Refer to examples below)

3. EXAMPLE OF THE AREA OF ACTIVITY		
Raw materia1 Preparation	4500 kg/ hour steam	10hours/day
	325 kW/ electricity	10hours/day
Chemical reactors	3200 kg /hour steam	16hours/day
Product separation	2500 kg /hour steam	24hours/day
Boilers with 3 — 8 bars	10800 kg /hour steam	24hours/day
	815 kg /hour Fuel oi1	24hours/day
Air compressors	225kW	24hours/day
Air conditioning	100kW	16hours/day
Office heating	4500 kg hour steam	10 hour/day during winter

4. ENERGY USAGE

Please complete the following table with the previous year's values.

Please attach photocopies of all electric and fuel bills.

Year: .....

Energy Type	Amount of Consumption	Unit	Unit cost	Annual cost
Electric				
Natural gas				
LPG				
Gas oil				
Light Fuel oil				
Heavy Fuel oil				
Petrol coke				
Hard coal				
Lignite				
Other				
Other				

The monthly consumption values and monthly average unit prices of the fuels of which the types and annual consumption values are given in this table are to be printed in the tables in the following pages based on the same year.

Please print the fuel types and their consumption units (Ton / month, Kg / month, kWh / month, etc.) in the given blanks.

3-1	YEAR CONSUMPTION VALUES			
	CONSUMPTIONS			
	ELECTRICITY		.....	
MONTHS	Consumption unit ..... / month	Unit Price $/.....	Consumption unit ..... / month	Unit Price $/.....
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
TOTAL				
Calorific value		Kcal/kWh	Calorific value	

Note : Please print the type, consumption unit (Ton / month, Kg / month, kWh / month etc.), monthly average unit price ($ / ton, $ / kg) of fuel which is consumed and then fill out the related columns according to this data.

: Please print the calorific value of the consumed fuel including its unit (Kcal/kg, Kcal / NM_3, Kcal / ton etc.) if known.

3-2	.....YEAR CONSUMPTION VALUES			
	CONSUMPTIONS			
	FUEL.....			
MONTHS	Consumption unit ..... / month	Unit Price $/.....	Consumption unit ..... / month	Unit Price $/.....
JANUARY				
FEBRUARY				
MARCH				
APRIL				
MAY				
JUNE				
JULY				
AUGUST				
SEPTEMBER				
OCTOBER				
NOVEMBER				
DECEMBER				
TOTAL				
Calorific value			Calorific value	

Note : Please print the type, consumption unit (Ton / month, Kg / month, kWh / month etc.), monthly average unit price ($ / ton, $ / kg) of fuel which is consumed and then fill out the related columns according to this data.

: Please print the calorific value of the consumed fuel including its unit (Kcal / kg, Kcal / NM3, Kcal / ton etc.) if known.

: In case this table is not sufficient please copy it.

4. PRODUCTION DATA

Complete the following table with the previous year's values.

Year: .....

Type of product	Amount of production	Unit

Note : Please print the type of product, and then print the related production value and production unit in the corresponding column.

The monthly production values of the products of which the types and annual production values are given in this table are to be printed in the tables in the following pages based on the same year.

4-1	YEAR PRODUCTION VALUES		
	PRODUCTIONS		
	Name of product	Name of product	Name of product .....
MONTHS	Production unit	Production unit	Production unit .....
JANUARY			
FEBRUARY			
MARCH			
APRIL			
MAY			
JUNE			
JULY			
AUGUST			
SEPTEMBER			
OCTOBER			
NOVEMBER			
DECEMBER			
TOTAL			

Design Capacity			

Note: If it is possible to use different production units for the same type of product, please specify the correlation between these units (For example, it is possible to use m2 and ton as units in square flagstone production.

In that case, specify the correlation as;

m2 flagstone = Ton flagstone

: In case this table is not sufficient please copy it.

: Print the annual or monthly planned production capacity in the related column by specifying the unit (Ton / month, ton / year)

5. MISCELLANEOUS SUBJECTS
Please express your comments on the following subjects. Problems related to the control of environmental pollution: Possible process changes: Maximum grace periods which can be accepted for the investments:
6. ENERGY MANAGEMENT
Is there an energy management program in your factory? If yes, since when ? Is an energy manager assigned?: If yes, how long has he been working?: Is there any effort in order to Increase the Energy Efficiency, and to Decrease the Energy Consumption ?: Are energy consumption and production values examined in terms of energy efficiency ?: Are specific energy values etc., calculated ?: Are these results checked in terms of problems and causes ?: What are your other comments ?:

7. BOILERS

No. of boilers in the facility

Boiler No.	Capacity	Unit [1]	Production [2]	Pressure	Temperature
1					
2					
3					

1 Ton / h, Kcal / h, m2, please specify the type of heating surface

2 Specify as steam, hot oil etc.

Is flue gas analysis made in the boilers? :

If yes, how often? :

Are the necessary regulations made in the boilers? :

Is the analyzer fixed type or portable? :

Type of the flue gas analyzer (Electronic etc.) :

Results of the flue gas analysis

	Date	Date	Date	Date
Unit				
T gas				
T atmosphere				
O2				
CO				
(*)				
Fuel characteristics				
Type				
H top				
H bottom				
C				
H2				
H2O				
O2				
N2				
S				
Ash				
Results of Slag Analysis (**), if necessary.				
Grate discharge temperature ° C				
Un-burnt carbon rate %				

(*) : The other parameters (SO2, NOX, ETC.) that the device is capable of measuring may be written.

(**) : Please fill out only in case solid fuel is used

Note : Please attach the unit prices of the fuels which have been purchased lately and send the form.

8. ELECTRIC ENERGY USAGE		
Of the existing power transformers:		
Operation voltage (KV)	Installed power (KVA)	Power usage rate (Derived power / installed power)
..... /		
..... /		
..... /		
..... /		
Please print the amount of electric energy consumption according to the area of consumption.		
Manufacturing		
Lighting		
Heating and Ventilation		
Other (specify)		
Purchased electric energy		

Electric tariff

What is the contracted electric power? :

The peak power range of electric energy: ..... kW (min. power) - .....kW (max. power)

Is charge management implemented in your factory? : Yes No

Is there a charge management system in your factory? : Yes No

Power factor value ($\cos \phi$) :

Type of compensation :

Single compensation unit Independent compensation unit

Are the static patching circuits applied to electric motors?

Yes No

Are variable speed control units applied to the pumps and fans?

Yes No

Please specify the usage percentages of the lighting armatures in the factory		
Type of armature	Usage Percentage	Place of usage
Glow filament armatures		
Fluorescent armatures		
Compact fluorescent armatures		
Low pressure- High pressure Sodium vapor armatures		
Mercury vapor armatures		
Other (specify)		
Other (specify)		

How is the lighting control done in the factory?

.....% Armature manual control

.....% Armature automatic control

Is electric energy produced in the factory? Yes No

Please specify the type of facility that you use for electricity production

Steam turbine Piston

Gas turbine Other (specify)

Combination of gas turbine and steam turbine

What is the total amount / installed power of the electric energy that is produced?

.....KVA / ..... KWh / year

9. FIXED MEASUREMENT DEVICES IN THE FACTORY

Water Meters:

Places of usage

a) Factory ..... pieces

b) other building (specify)..... pieces

Electricity Meters

Places of usage

a) Factory ..... pieces

b) other (specify)..... pieces

Steam Meters

Places of usage

a) Boiler house ..... pieces

b) other (specify)..... Pieces

10. PORTABLE MEASUREMENT DEVICES IN THE FACTORY
Flue gas analyzer
Thermometer and its props (including infrared demo meter)
Conduct meter
Energy analyzer (for electricity measurements)
Pliers ammeter
Lux meter (Light)
Hygrometer (Humidity)
Tachometer (Rotating speed)
Recorder
Thermographic camera (Temperature Indicator)
Ultrasonic liquid flow meter
Manometer (Pressure drop)
Steam trap test device
Dissolved oxygen meter
Sound analyzer
Other (specify)

11. COMPRESSOR TYPES AND COMPRESSED AIR SYSTEMS

Type of Compressor:

Brand of Compressor:

Capacity of Compressor:..... (m^3/minute)

Annual operation period of the compressor: ..... (hour / year)

Compressor outlet pressure: ..... (bar)

Air pressure needed in at the final usage point: ..... (bar)

Pressure loss along the line: ..... (bar)

No. of similar compressors: .....

How is the cooling done: With air With water With oil

Cooling (water, air, oil) inlet temperature: ..... ° C

Cooling (water, air, oil) outlet temperature: ..... ° C

Power which is used by the compressor at full load: .....kW,..... hour / month

Power which is used by the compressor at No - load:..... kW, ... hour / month

Is there any compressed air dryer:

Type of the dryer: Cooling Adsorption

Compressor control system: Modulating On /off load Start / stop

Is the compressor working connected to a successive (sequential) system? :

From which direction does the compressor get inlet air (suction air) ?:

Where does the compressor get inlet air? :

What is the type of compressed air line? : Single line Ring line Other

Is there any test for air leakage? : Yes No

If yes, how often? : Weekly Monthly Other

Is there any waste heat recovery system? : .....

Where is the energy recovered from waste heat, used? :

Boiler feed water pre - heating Field heating Bathroom, kitchen

Other (specify).....

Note: Please copy this form and fill the copies out for each of the existing compressors.

12. OTHER INFORMATION		
Please attach the following information to this form if possible; 1. Factory settlement' plan 2. Brief description of process 3. Basic flow chart 4. Detailed information regarding auxiliary facilities (boilers, turbines, air compressors, waste cleaning, cooling towers, water supply, cooling units) 5. Distribution lines chart (steam, water, gas, air) 6. Electric energy single line and distribution charts		
Total area of the factory	m2	Heating time
Total heating area *	m2	Month / year
Total heating volume *	m2	Month / year
Total air conditioning area	m2	Month / year
Total air conditioning volume	m2	Month / year
Working period s of the main sections		
Name of the section	hour / day	day / year
(example)Boiler House		
Hour / day : Working period of the section per day (in hours) Day / year : Working period of the section per year (in days)		

13. AREA OF AUDIT WORK
Please specify the units of the factory to be worked in How long should the working period be? : Convenient dates for work :
(In case the space is not sufficient for the information in the questionnaire, please use this page)

Sample from of follow-up questionnaire sheet

(Date)

Please fill the following form on energy conservation activities after energy assessment implemented on_____in_____.

(1) Did you implement the improvement of energy conservation advised with the energy assessment report?

(2) Please explain effects of energy conservation implementation individually.

(3) Please show improvement of energy intensity of fuel and electricity respectively.

(4) Please show energy consumption comparing before energy conservation activities.

(5) Please explain present activities of energy conservation in your enterprise, for example EC activity items, organization, and others.

Organization _____

Address _____

Telephone_____

Responsible person to entry this form_____

Thank you very much for your cooperation.

Sample form of EC recommendation report

-Content-

5. Publication and Award System (PAS)

(1) Program Name

Publication and Award System (PAS)

(2) Objective

- Dissemination of promising energy conservation practice an/or measure by publishing successful energy conservation cases
- Giving award for superior energy conservation activity and effort conducted by organization

(3) Outline of the Scheme and Each Phase

<table>
<tr><td>Overall Scheme</td><td colspan="2">Contents
- Establishment of national and local referee committees
- Collection of the following EC activity information on a routine basis through associations / organizations, such as Chamber of Commerce (COC) and Saudi Council of Engineers (SCE), Ministry of Commerce and Industry (MOCI) Ministry of Islamic Affairs (MOIA) and Ministry of Education (MOE), etc.
• EC practices and measures applied in industrial, commercial, electricity equipment, school and mosque sector (5 categories)
- Establishment and maintenance of database by adding collected EC information periodically
- Announcement to collect applicants
- Receiving application
- Selection of superior ones as the local successful cases at local referee committee
- Evaluation of the local awardees and selection of the most superior ones as the national successful cases at national referee committee
- Publishing the outlines of awardees at SEEC homepage and compiling in annual awarding pamphlet
- Holding awarding ceremony at 3 Days Big Fair in the “EC month”</td></tr>
<tr><td>Phase 0 (Preparation Stage)</td><td>Task</td><td>Responsible Agency</td></tr>
<tr><td></td><td><u>Trial of award system in “Electricity” in Riyadh</u>
(1) Establishment of a referee committee in Riyadh
(2) Setting target for the trial (electricity, Riyadh, industry and commercial, etc.)
(3) Setting an application format
(4) Request application to COC and other channels
(5) Collection of application and selection by the referee committee
(6) Award ceremony</td><td>
MOWE
MOWE

MOWE
MOWE
Referee C
MOWE</td></tr>
</table>

Phase 1 (Pilot Stage)	Task	Responsible Agency
	<u>Award system in "Electricity, Heat and Equipment"</u> (1) Establishment of national committee in Riyadh (2) Setting target (electricity and heat, Riyadh and Dammam, sector, etc.) (3) Collection of EC activity information on a routine basis through Associations / organizations (4) Establishment and maintenance of database (5) Announcement to collect applicants (6) Receiving application (7) Selection by the referee committee (8) Publishing the outlines of awardees at SEEC homepage (9) Holding awarding ceremony at 3 Days Big Fair in the EC month (10) Dissemination of awarded cases	 SEEC SEEC SEEC SEEC SEEC SEEC Referee C SEEC SEEC SEEC

Phase 2 (Final Stage)	Task	Responsible Agency
	<u>Award system in all 5 sectors in the whole KSA</u> (1) Establishment of local referee committees in Riyadh, Jeddah and Dammam (2) Setting target of all award (3) Collection of EC activity information on a routine basis through Associations / organizations (4) Maintenance of database (5) Announcement to collect applicants for award (6) Receiving application (7) Selection of superior ones as the local successful cases and contributors at local referee committee (8) Evaluation of the local awardees and selection of the most superior ones as the national successful cases (9) Publishing the outlines of awardees at SEEC homepage and compiling in annual awarding pamphlet (10) Holding awarding ceremony at 3 Days Big Fair in the EC month (11) Dissemination of awarded cases	 SEEC SEEC SEEC SEEC SEEC SEEC Local RC National RC SEEC SEEC SEEC

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE) as Preparation Team
Expected Role	**(Preparation Stage)** - Establishment of a referee committee in Riyadh - Setting target for the trial (electricity, Riyadh, sector, etc.) - Setting an application format - Request application to COC and other channels - Collection of application and selection by the referee committee - Award ceremony
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	**(Pilot Stage and Final Stage)** - Establishment of national committee in Riyadh - Setting target (electricity and heat, Riyadh and Dammam, sector, etc.) - Collection of EC activity information on a routine basis through Associations / organizations - Establishment and maintenance of database - Announcement to collect applicants for award - Receiving application - Publishing the outlines of awardees at SEEC homepage - Holding awarding ceremony at 3 Days Big Fair in the EC month - Dissemination of awarded cases
Name of Agency	National and Local Referee Committee
Expected Role	**(Pilot Stage)** - Selection by the referee committee **(Final Stage)** - Selection of superior ones as the local successful cases and contributors at local referee committee - Evaluation of the local awardees and selection of the most superior ones as the national successful cases and contributors at national referee committee

(5) Relating Agency

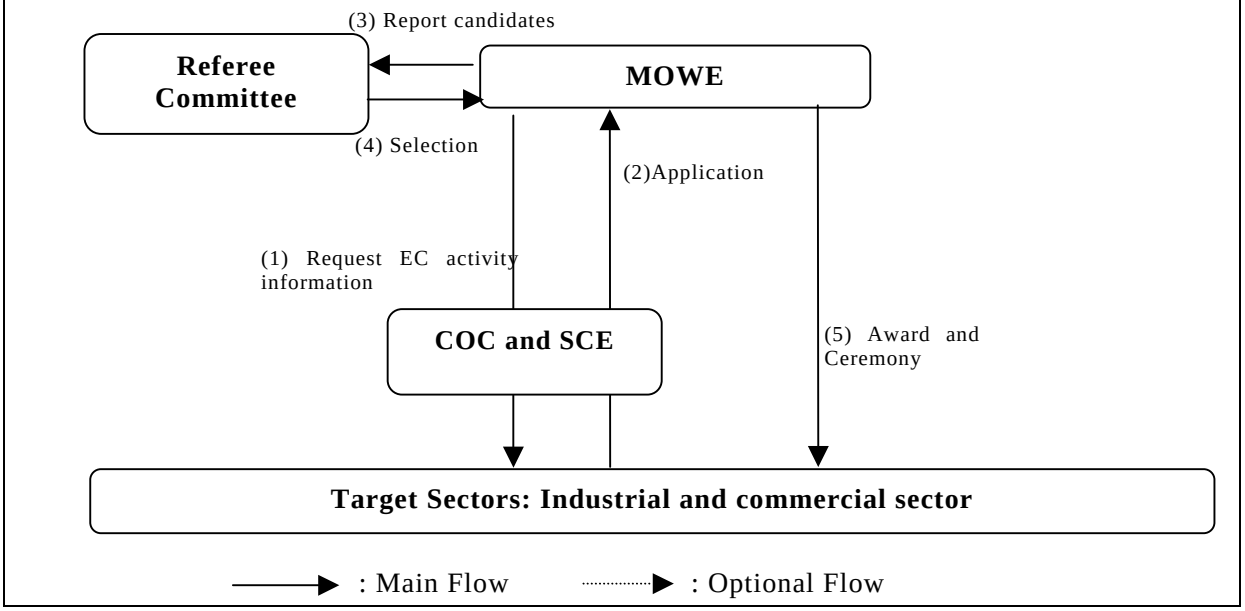
Name of Agency	COC in each city, Saudi Council of Engineers (SCE), Organizations for University, MOIA and MOE
Expected Role	- Providing information on their EC activity/project/product/person to SEEC local office

(6) Target of the Scheme

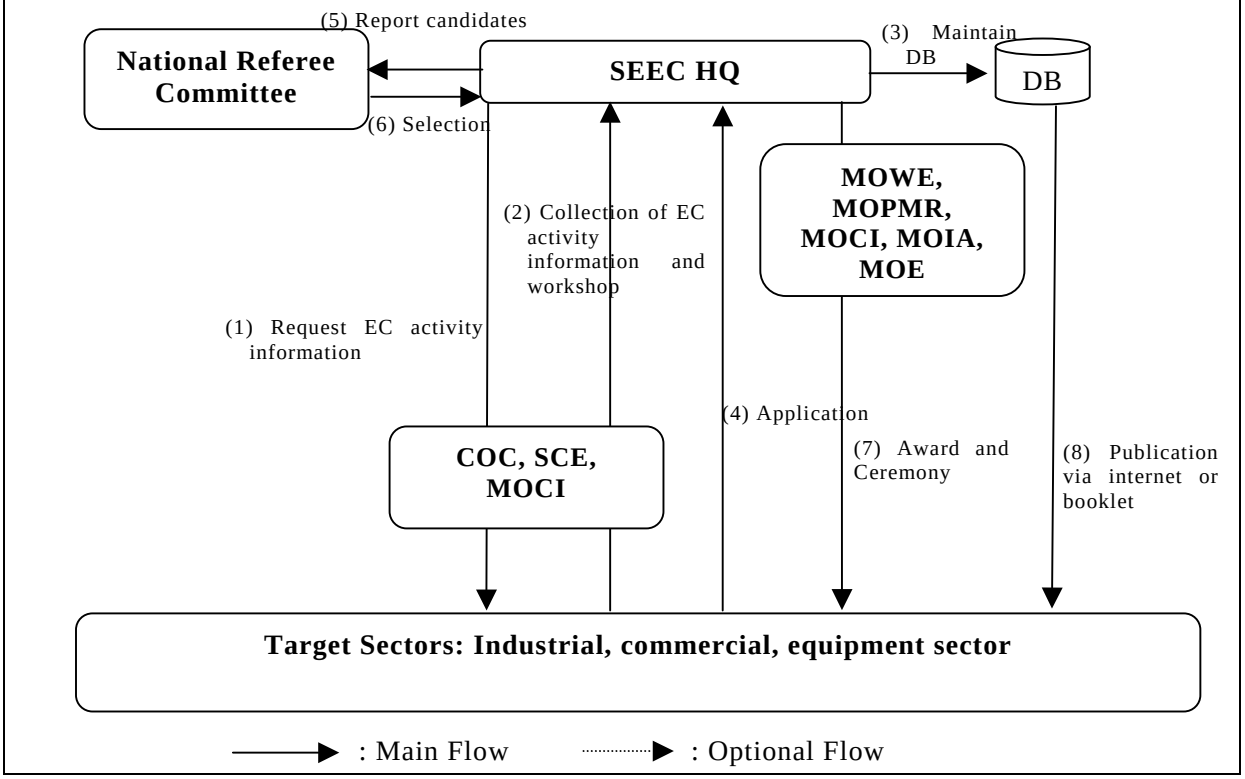
Name of Target	Successful case in industrial/commercial/equipment/school/university/ mosque sector
Expected Action	- Information release of their EC activity/project/product/practice to SEEC actively

(7) Workflow

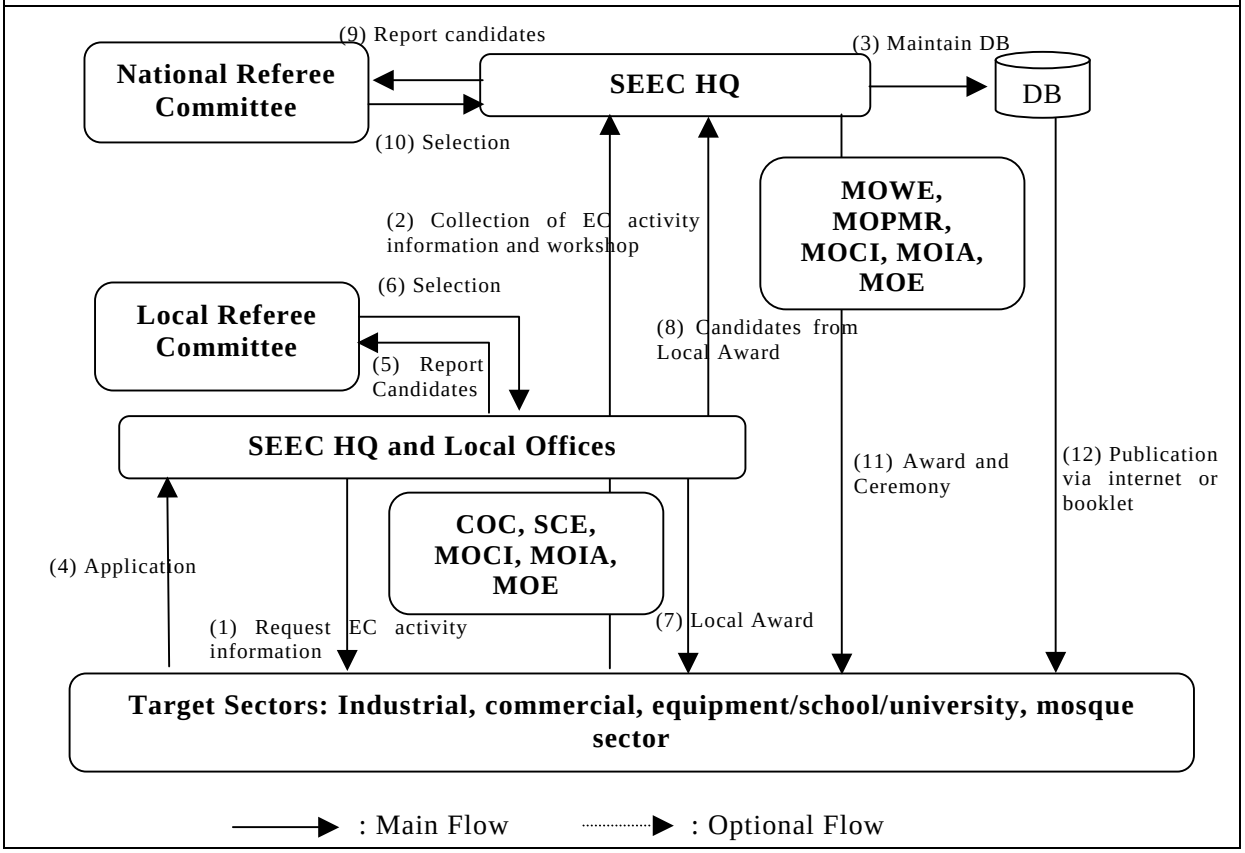
Phase 0 (Preparation Stage)



Phase 1 (Pilot Stage)



Phase 2 (Final Stage)



(8) Required Permanent Human Resources

Phase 0 (Preparation Stage)	Human Resources	Financial Cost for Human Resources
	MOWE No incremental staff	No incremental cost
Phase 1 (Pilot Stage)	Human Resources	Financial Cost for Human Resources
	SEEC HQ Dissemination and publication staff: 1 Database Engineer: 1 EC activity monitor: 1	Standard Cost: 300,000 SR/year/person 0.3 x 3 =0.9 million SR/year
Phase 2 (Final Stage)	Human Resources	Financial Resources
	SEEC HQ Dissemination and publication: 1 Database engineer: 1 EC activity monitor: 1 SEEC (Local Offices) EC activity monitor: 1x2	Standard Cost: 300,000 SR/year/person 0.3 x 5 = 1.5 million SR/year

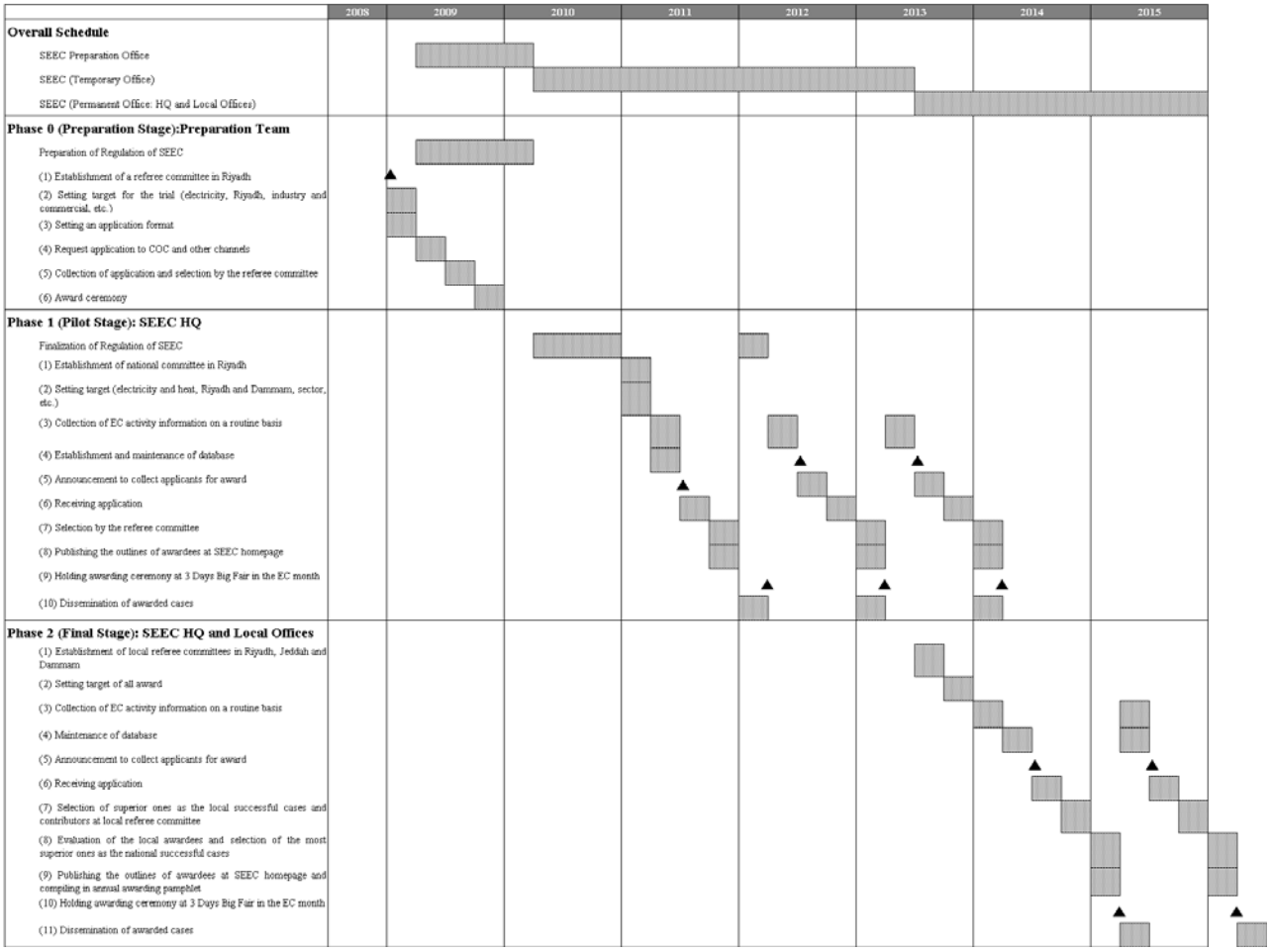
(9) Required Items

Phase 0 (Preparation Stage)	Item	Budget
	-	-
Phase 1 (Pilot Stage)	Item	Budget
	- Database software (SEEC) - Internet access system to the database (SEEC)	1 million SR 0.5 million SR
Phase 2 (Final Stage)	Item	Budget
	- Database software (SEEC) - Internet access system to the database (SEEC)	- -

(10) Expected Legislation for Enforcement

Phase 0 (Preparation Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 1 (Pilot Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan



(12) Attachment

- Sample of application format
- Sample of evaluation criteria

(Remark) Award Category

	MOWE	**MOPMR**	**MOCI**	**MOIA**	**MOE**
Target	Electricity	Heat	Equipment	Mosque	School
Award	Project	Project	EC appliance	Activities	Activities
Phase 0	x				
Phase 1	x	x	x		
Phase 2	x	x	x	x	x

Attachment 5. Publication and Award System (PAS)
Sample of application format

1. Application Theme and Project Outline

（1）Name of Theme:_____

（2）Outline:

_____

_____

_____

_____

2. Outline of Application Group

（1）Company and Factory Name:_____

（2）Address:_____

（3）Business Category:_____

（4）Scale of Building: About _____㎡ Floor Number:_____Floors

（5）Capital:_____Saudi Riyal

（6）Name of Application Group:_____

Name of Group Representative:_____

Belonging Department and Section:_____

Number of Group Member:_____

（7）Contact Person

Name:_____

Belonging Department / Section / Position:_____

Telephone:_____ FAX:_____

E-mail:_____

Application Sheet (1)

Award Criteria (Example)

No.	Items	Contents		
1	Theme Outline			
2	Implementation Period	Planning Period		
		Implementation Period		
		Monitoring Period		
3	Outline of Factory	Factory Name		
		Products		
		Production Capacity		
		Power Generation Capacity		
		Number of Employees		
		Yearly Energy Consumption	Kind of Fuel	Consumption
		Private Power Generation		
4	Target Process			

5	Reason of Theme Selection		
6	Comprehension and Analysis of Current Situation	Current System	
		Current Problem	7. Technological Difficulty
7	Process of Activity	Working Organization	6. Management Involvement
		Establishment of Target	
		Problems and Countermeasures	1. Originality 2. Dissemination
8	Environmental Protection	4. Environmental 5. Occupational Health and	

9	Results of Project Implementation	Technical Effects	
		Conserved Energy	3.
		Economics	
10	Summary		
11	Future Activity	8. Consistencies and Future	

Filled Example of Application Format

1. Theme Outline, 2. Implementation Period, 3. Outline of Factory

ブロワーのインバーター化と諸改善による省エネ活動

住友金属工業株式会社　鋼板・建材カンパニー
鹿島製鉄所　製鉄部　製鉄原料工場

◎キーワード：電気の動力、熱変換の合理化（電動力応用設備・電気加熱設備等）

◎ テーマの概要

大型ブロワーの高効率運用による電力削減
（非効率な吸い込みダンパー制御で運転されていた為、電力に大幅な無駄が発生していた。今回最新型で高効率のIGBTインバーターを導入、また現場の知恵を結集して諸改善を積重ね少ない投資で更なる省エネを行ない、使用電力の削減を図った。）

◎ 当該事例に対する実施期間　平成11年 2月 ～ 15年 3月

・企画立案の期間	平成11年 2月 ～ 12年 1月（延べ12ヶ月）
・対策の実施期間	平成12年 2月 ～ 14年10月（延べ32ヶ月）
・対策の確認期間	平成14年11月 ～ 15年 3月（延べ 5ヶ月）

◎ 事業所の概要

・生産品目　鋼板、鋼管、形鋼 等

・従業員　3,070 名（平成15年3月末現在 鹿島製鉄所在席社員数）

エネルギー年間使用量（ 14 年 度　実 績 ）

燃 料 3,109,477 KL（ 原 油 換 算 ）
電 力 2,708,372 MWh

4. Target Process

◎ 対象設備の工程

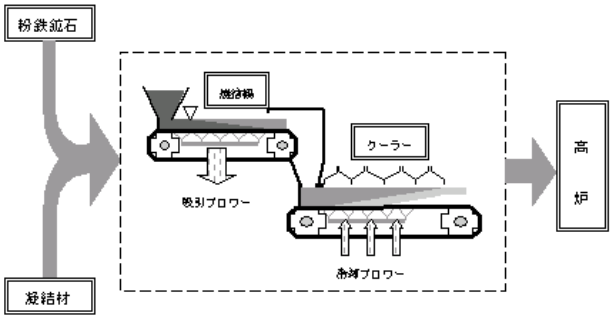


図1　粉鉄鉱石を焼き固め、高炉原料を造るプロセス

[TOP]

1．テーマ選定の理由

当工場は、大型溶鉱炉の原料製造プラントで30,000t/日の焼結鉱を製造している。工程は粉鉄鉱石に石灰粉・コークス粉を混合し水分添加、ガスで着火焼成し固めた物を破砕・整粒し成品としている。製造過程には種々（焼成用，成品冷却用，集塵用等）の電力消費量が多い大型ブロワーが複数ある。

H9年頃よりブロワーの使用目的に合わせ省エネ活動を進めた結果、入口ダンパーを絞り操業出来るようになった。そのブロワー特性から見ると、効率の悪い運転を行っている。そこで風量をコントロール出来るVVVFへの改造を行い更なる省エネ活動推進を目標に取り組む事にした。

6. Comprehensions and Analysis of Current Situation

2. 現状の把握および分析

(1) 現状の把握

鹿島製鉄所
平成8年～10年平均実績
電力使用量
2，642，093MWH／年
燃料使用量
3，396，459KL／年

製鉄原料工場
平成8年～10年平均実績
電力使用量
316，401MWH／年
当工場の使用比率
12%

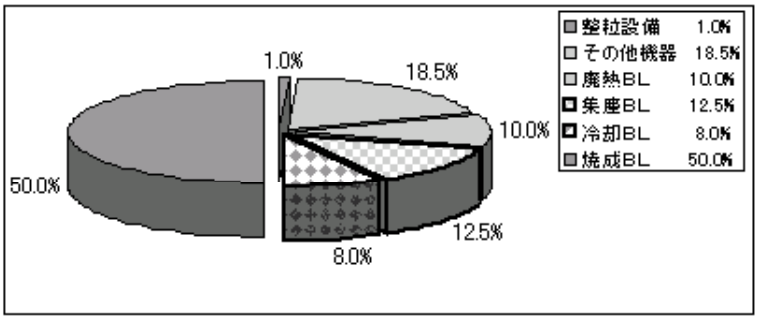


図2 H9年実績 焼結電力使用割

焼結工場の電力消費個所の内訳を大別すると、ブロワー・整粒設備・その他機器(ベルトコンベア、スクリーン、ミキサー等)となっている。
ブロワーは粉鉄鉱石を焼成する【吸引ブロワー】、焼結鉱を風冷する【冷却ブロワー】、原料・成品搬送時の発塵を防止する【集塵ブロワー】、廃熱を蒸気回収する【廃熱ブロワー】に分けられる。その中で今回ダンパーを絞って操業している集塵(8.0%)・冷却(12.5%)ブロワーを対象に省エネ活動に取組む事にした。

7. Process of Activity

3. 活動の経過

(1) 取組み体制

平成11年2月	:製鉄原料工場内で職場代表者が日頃考えている省エネ・コスト改善案件を出し合って討議
平成11年4～6月	:省エネ W/G結成 活動開始 工場で発掘した案件について 〔株〕住金マネジメント(省エネ診断業務委託)で 現状ブロワーダンパー開度での電力風量測定
平成11年7～10月	:設備・工事費見積もり算出(インバーター購入費・電気室改造費・ケーブル配線工事費)
平成11年9～10月	:集塵個所周辺の降下粉塵測定
平成11年11月	:起業申請
平成11年12月～平成12年2月	:インバーターの競争見積もり
平成11年12月～平成12年10月	:改造工事実施(インバーター導入)
平成12年12月	:ブロワー共振点測定
平成13年1月～平成14年10月	:回転数制御による諸改善実施

(2) 目標の設定

表1 各ブロワーにインバーター設置による削減目標

No	設 備 名	台数	削減量目標(MWh/年)
1	2焼結 1防塵ブロワー	1	2，755
2	2焼結 3･4クーラーブロワー	2	3，828
3	2焼結 排鉱ブロワー	1	1，689
4	2焼結 押し込みブロワー	1	2，663
5	3焼結 2･3防塵ブロワー	2	3，662
6	3焼結 7･8クーラーブロワー	2	3，291
合 計		9	17，888MWh/年

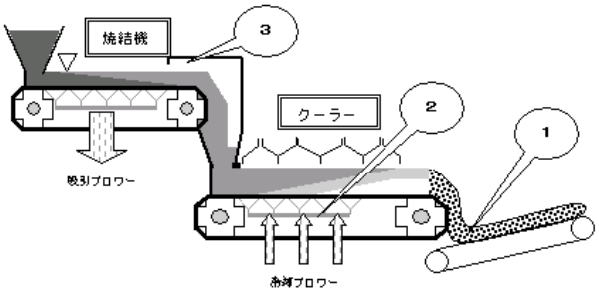
工場総使用電力量 316，401MWh/年
目標削減率 5．65%

インバーター設置により吸引風量・環境を変化させないでダンパーを全開にし回転数を下げブロワーの使用電力を削減する。

(2) 問題点とその検討

	問 題 点	そ の 検 討
操業関係	・発塵防止の為にキッチリ焼き込んだ場合に 生産量はキープ出来るのか？ ・急激な温度変化が発生した場合にベルト焼損 事故は起きないのか？	・生産性の向上改善案検討(給鉱部通気性の向上) ・ベルト温度管理の検討(温度センサー取り付け、ベルト温度管理方案作成)
冷却効率	・冷却ゾーンで完璧に冷却出来るのか？ ・急激な温度変化が発生した場合に冷却しきれるのか？ ・バッグ焼損防止用冷風ダンパー全開にして入口温度が90℃以下を確保出来ないか？	・冷却集合ダクトの有効活用案の検討(仕切板撤去による風量ムラの改善) ・排ガス温度が一定になるような制御装置設置検討(温度監視装置設置) ・集塵ダクトの効率的使用方法検討 (保温材の取り外し)
発塵関係	・防塵ブロワー改造後の吸引風量で環境対策に問題はないのか？ ・現状の集塵率は適正なのか？また改善により更に高効率集塵は出来ないのか？ ・工場運転・停止時の発塵は ないのか？	・吸引風量測定と環境測定実施 ・発塵個所の発塵防止対策 (発塵個所の密閉化)・クーラー発塵対策 (クーラー押込みブロワーの 圧力制御実施)
運用方法	・省エネになるブロワーの運転、停止方法が 解らない ・VVVFブロワーの共振点が良く解らない ・ブロワー温度設定の設定温度が解らない	・ブロワーについての周知徹底(運転・停止の勉強会実施)・共振点測定 (回転数と共振点の明確化)・設定温度の取り決め実施 (使用方法の勉強会実施)

4. 対策の内容



9. Result of Project Implementation

5. 対策後の効果

(1) 設備別電力削減量と削減率

表2 削減量と削減率

No	改 善 項 目	改善前→改善後の削減率	削 減 量 (MWh/年)
1	2焼結 1防塵BL	49%	2,755
2	2焼結 3,4クーラーBL	54%	3,828
3	2焼結 排鉱BL	83%	1,689
4	3焼結 2,3防塵BL	37%	3,662
5	3焼結 7,8クーラーBL	66%	3,291
6	2焼結 押込みBL	63%	2,663
7	3焼結 クーラー集合ダクト仕切板改造	53%	1,173
8	3焼結 クーラーフード密閉化	12%	724
9	3焼結 BL運用改善	7%	90
10	2焼結 焼結機フード改善	4%	115
合 計			19,990

(2) 工場消費電力と生産量年度別推移表

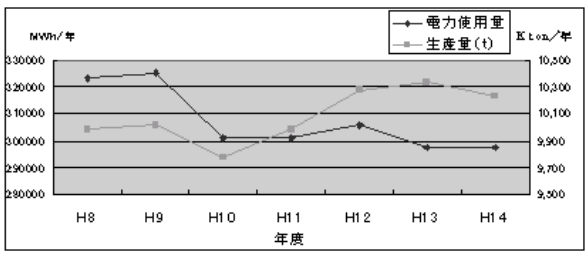


図4 電力使用量と生産量

活動前の平成8，9年は、約325000MWh/年の電力使用であった。
平成10年は生産量の減産により吸引ブロワーを数ヶ月間、低出力モーターで使用した。
平成11年より省エネ取組み推進により生産量が大幅に増加しても電力使用量は300000MWh/年以下で推移している。

Sample of evaluation criteria

No.	Criteria	Allotted Score
1	Originality	10
2	Applicability to Others	10
3	Effect	40
4	Environmental Impact	10
5	Occupational Safety and Health	5
6	Involvement of Management	5
7	Technological Difficulty	10
8	Consistency and Future Development	10
Total		100

6. EC Campaign

(1) Program Name

EC Campaign

(2) Objective

- Raising energy conservation awareness of all consumers
- Check of annual energy conservation activities
- Strengthening a connection between private sector and government sector to promote EC technology

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	(Existing Program) - MOWE has already implemented the "National EC Campaign", but it is not periodically. - MOWE launched the water and electricity exhibition, "WE-Power" at 2003. The 4th Exhibition holds in April 2008. **(New Program to be merged into the Existing Program)** - Establishment of "Saudi Energy Conservation Month (the EC Month)" in annual basis - Special EC events concentrated in the EC Month as follows: ➢ "3 Days Big Fair" which can be merged into the existing WE-Power. ➢ Workshop for Mosque Campaign ➢ EC Education for Schools, etc. - Holding the "3 Days Big Fair (to be merged into the WE Power)" including EC technology exhibition, announcement of some campaign, award ceremony, workshop/seminar, etc.	
Phase 1 (Final Stage)	Task	Responsible Agency
	(1) Establishment of "Saudi Energy Conservation Month (the EC Month)" in annual basis	MOWE
	(2) Coordination of the existing "National EC Campaign" with the EC Month	MOWE
	(3) Allocation a budget for the National EC Campaign and special events in the EC Month by annual basis	MOF
	(4) Start of the National EC Campaign at the same timing of the EC Month	MOWE
	(5) Strengthening the National EC Campaign in the EC Month	MOWE
	(6) Special EC events concentrated in the EC Month as follows: ➢ "3 Days Big Fair" which can be merged into the existing WE-Power. ➢ Workshop for Mosque Campaign ➢ EC Education for Schools, etc.	MOWE
	(7) Holding the "3 Days Big Fair (to be merged into the WE-Power)" including EC technology exhibition, announcement of some campaign, award ceremony, workshop/seminar, etc.	MOWE
	(8) Monitoring and awareness survey for the campaign	MOWE

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE)
Expected Role	- Establishment of "Saudi Energy Conservation Month (Saudi EC Month)" in annual basis - Coordination of the existing "National EC Campaign" with the EC Month - Start of the National EC Campaign at the same timing of the EC Month and strengthening the National EC Campaign in the EC Month - Special EC events concentrated in the EC Month - Holding the "3 Days Big Fair (to be merged into the WE Power)" including EC technology exhibition, announcement of some campaign, award ceremony, workshop/seminar, etc. - Monitoring and awareness survey for the campaign
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	- Joint implementation with MOWE's campaign

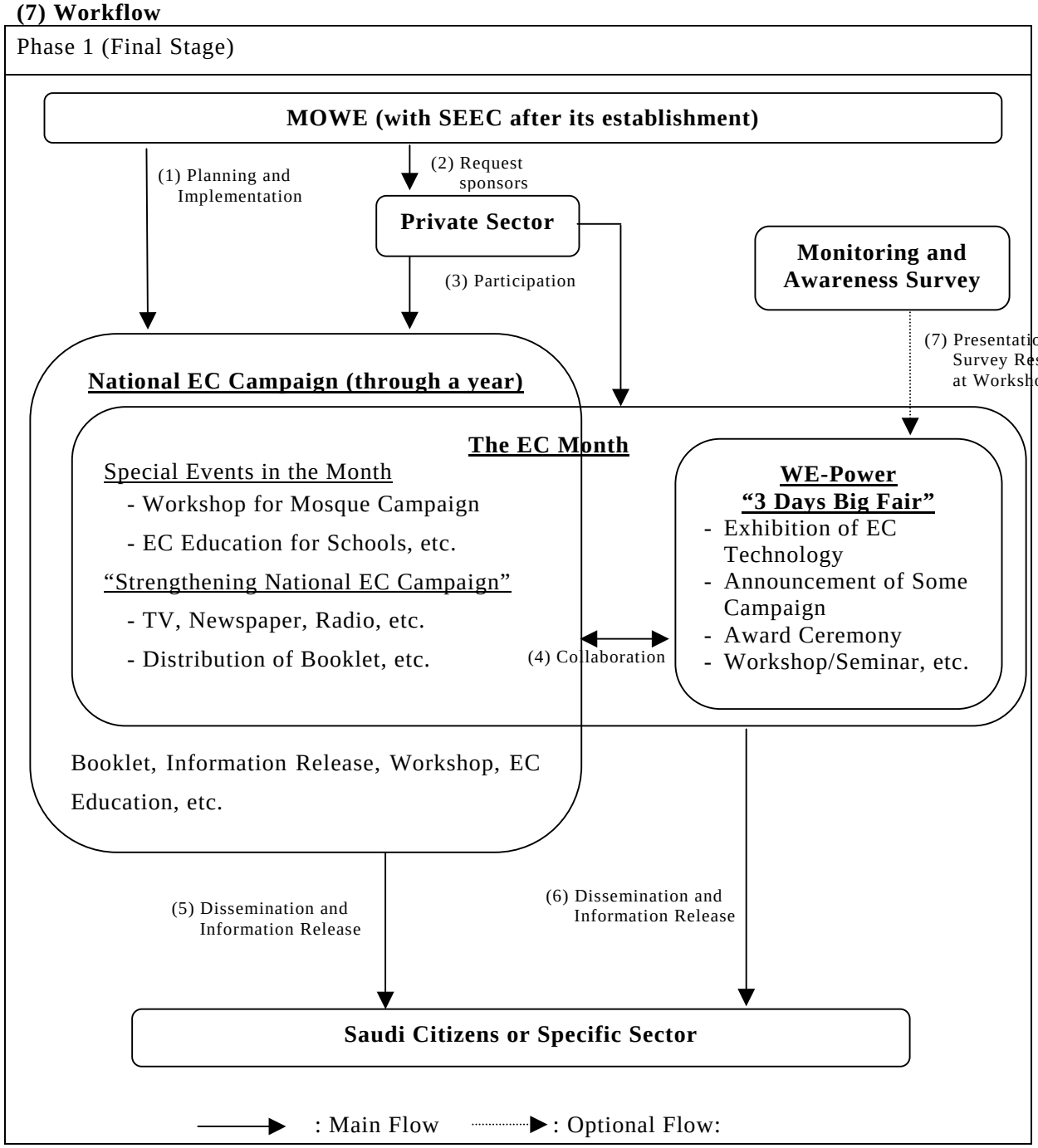
(5) Relating Agency

Name of Agency	Ministry of Finance (MOF)
Expected Role	- Allocation a budget for the National EC Campaign and special events in the EC Month by annual basis
Name of Agency	Saudi Electricity Authority (SEC)
Expected Role	- Cooperation for the activities of MOWE's campaign - Synchronizing SEC's campaign and MOWE's campaign
Name of Agency	Ministry of Islamic Affairs (MOIA)
Expected Role	- Cooperation for the activities relevant to Mosque campaign
Name of Agency	Private Sector
Expected Role	- Sponsor for campaign and 3 Days Big Fair

(6) Target of the Scheme

Name of Target	All sectors
Expected Action	- Participation in the EC Campaign and the "3 Days Big Fair"
Name of Target	Private Sectors
Expected Action	- Participation in the "3 Days Big Fair" by exhibition of their products - Presentation in workshop/seminar in the "3 Days Big Fair"

(7) Workflow


Phase 1 (Final Stage)
MOWE (with SEEC after its establishment)
(1) Planning and Implementation
(2) Request sponsors
Private Sector
(3) Participation
Monitoring and Awareness Survey
(7) Presentation of Survey Results at Workshop
National EC Campaign (through a year)
The EC Month
Special Events in the Month
- Workshop for Mosque Campaign
- EC Education for Schools, etc.
"Strengthening National EC Campaign"
- TV, Newspaper, Radio, etc.
- Distribution of Booklet, etc.
(4) Collaboration
WE-Power
"3 Days Big Fair"
- Exhibition of EC Technology
- Announcement of Some Campaign
- Award Ceremony
- Workshop/Seminar, etc.
Booklet, Information Release, Workshop, EC Education, etc.
(5) Dissemination and Information Release
(6) Dissemination and Information Release
Saudi Citizens or Specific Sector
: Main Flow
: Optional Flow:

(8) Required Permanent Human Resources

	Human Resources	Financial Resources
Phase 1 (Final Stage)	MOWE No incremental staff SEEC HQ Dissemination and publication: 1	Standard Cost: 300,000 SR/year/person 0.3 x 1 = 0.3 million SR/year

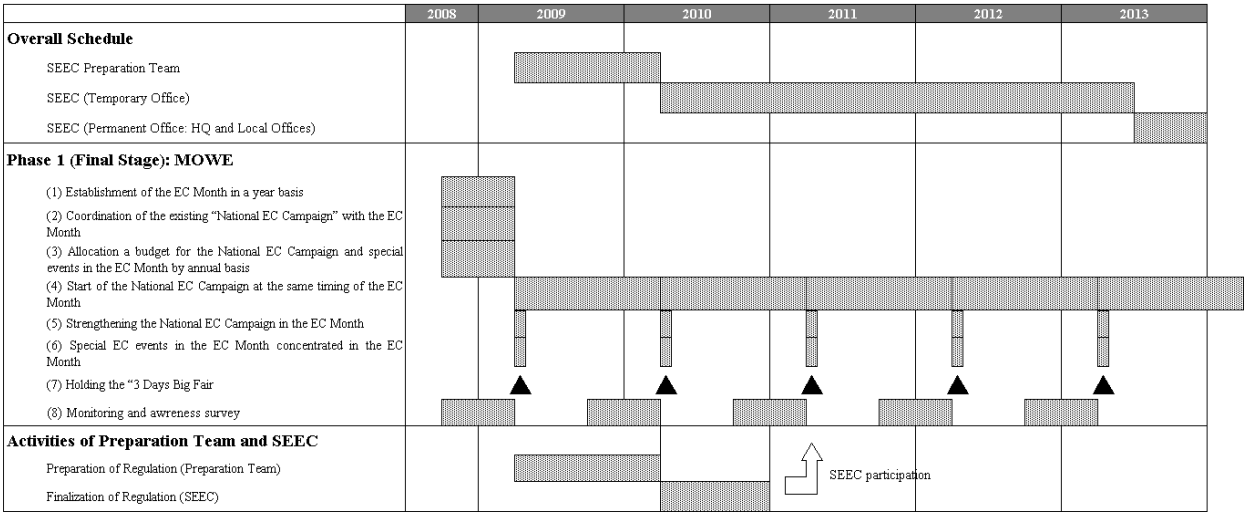
(9) Required Items

	Item	Budget
Phase 1 (Final Stage)	Cost of national campaign, EC month and exhibition is expected to be covered by sponsors (private sector).	0 SR (No special budget is needed because expenditure is covered by sponsor)

(10) Expected Legislation for Enforcement

	Items to be stipulated in Act	Relating Order/Regulation
Phase 2 (Final Stage)	-	-

(11) Expected Action Plan



(12) Attachment

- Implementation plan for the "Mosque Campaign"

Attachment 6. EC Campaign

Implementation plan for the "Mosque Campaign"

1. Objective of EC Campaign in the Mosque Sector

- Enhancing EC awareness of the KSA national
- Disseminating EC activity to the residential sector through Imam and mosque

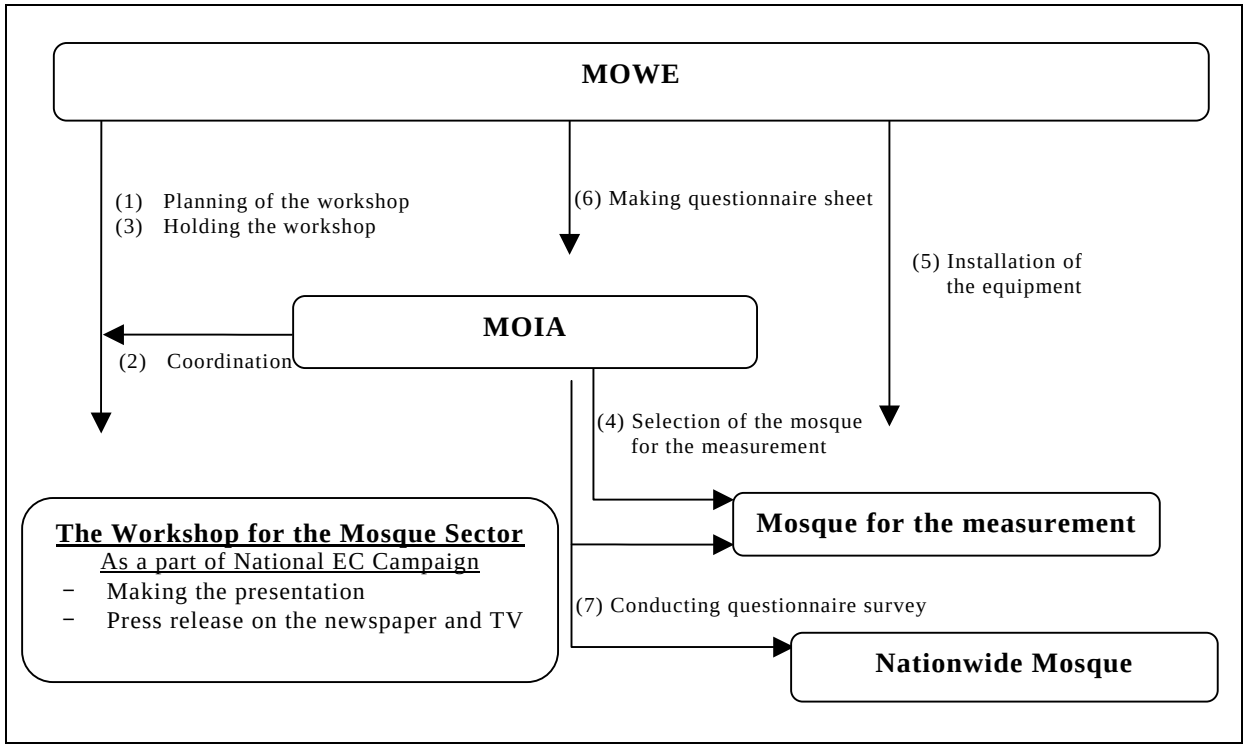
2. Content

- Request Imam to make speech for disseminating EC
- Request mosque to practice EC to initiate EC practice by prayers
- Measurement of electricity consumption of selected 9 mosques
  (Riyadh: 3 Eastern province 3 Western province 3)
- Monitoring and check of speech by Imam and EC activity on a year cycle

3. Outline of the Scheme

Overall Scheme	Task	Responsible Agency
	(First 1 year)	
	(1) Planning of the workshop for the mosque sector during 3 Days Big fair in the EC month • Situation of power supply and demand in the KSA • Necessity of EC activity • Introduction of power load survey at the mosque • Request the Imam to make a speech to disseminate EC • Request the mosque to practice EC • Introduction of Monitoring & check in a year cycle etc.	MOWE
	(2) Coordination of holding the workshop in Riyadh, Jeddah and Dammam in cooperation with MOWE • Inviting the Imam and the mosque staff	MOIA
	(3) Holding the workshop for the mosque sector during 3 Days Big Fair • Introduction of Saudi energy situation and its necessity • Request Imam to make a speech for EC • Request mosque to practice EC activity • Press release on the newspaper and TV to the nationwide	MOWE MOIA
	(4) Selection of the mosque to be installed the measurement equipment (3 mosques should install the equipment in each region, Riyadh, Jeddah and Dammam)	MOWE
	(5) Installation of the measurement equipment at the selected mosque including procurement of the equipment	MOWE
	(6) Making a questionnaire sheet for monitoring the speech by Imam and EC activity by mosque	MOIA
	(7) Conducting the questionnaire survey	MOWE
	(After 1 year)	MOIA
	(8) Same as (1)	MOWE
	(9) Same as (2)	MOIA
	(10) In addition to (3), the following content is introduced at the workshop • Introduction of the result of the questionnaire survey & EC practice at the mosque	MOWE
	(11) Same as (4) (5) (6) & (7)	MOWE/ MOIA

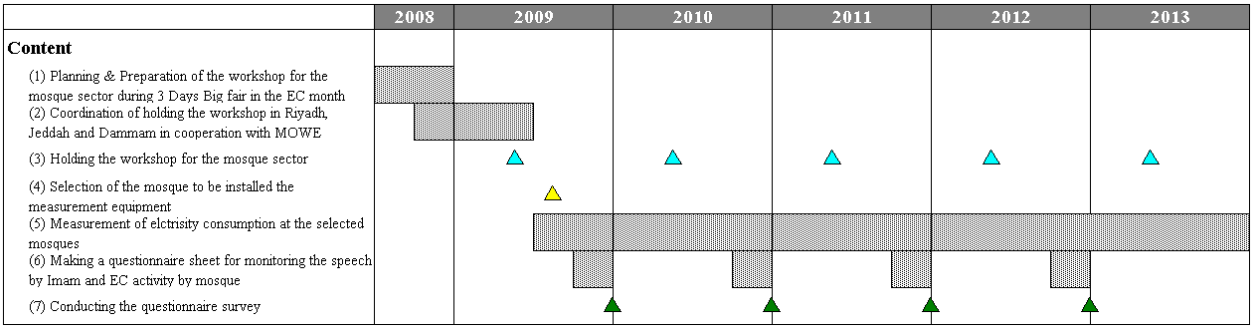
4. Workflow



5. Required Items

Item	Budget
- Procurement of 9 sets of Electricity Measurement Equipment	Approx. 72,000 SR (8,000SAR * 9 sets)

6. Overall Schedule



7. Check System of Customer Records

(1) Program Name

Check System of Customer Records

(2) Objective

- Raising energy conservation awareness of all customers
- Grasping the past electricity consumption easily
- Grasping customers' behavior and needs through internet survey

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	(Existing System) - SEC has already formulated monthly bill access system (past 18 months) by internet. But it is Islamic calendar. **(New System)** - Making check system of customer records by revising the current system - Making a list of customers who access to the SEC's Check System site (for internet survey) - Implementation of internet survey to collect opinions and needs using the customer's list - Feedback of the questionnaire survey results to the cooperative customers	
Phase 1 (Check System)	Task	Responsible Agency
	(1) Making accumulated database in Gregory calendar for all customers records	SEC
	(2) Making website access system by revising the current system	SEC
	(3) Designing website screen for dissemination of energy conservation, CO2 emission reduction, etc.	SEC
	(4) Operation and dissemination of the system to customers	SEC
	(5) Making a list of customers who access to SEC's Check System site (for internet survey)	SEC
Phase 2 (Internet Survey)	Task	Responsible Agency
	(To be added to Phase 1)	
	(1) Designing internet survey	SEC
	(2) Implementation of internet survey to collect opinions and needs using customer's list	SEC SEC
	(3) Feedback of the internet survey results to the cooperative customers	

(4) Executing Agency

Name of Agency	Saudi Electricity Company (SEC)
Expected Role	**(Check System)** - Making accumulated database in Gregory calendar for all customers records - Making website access system by revising the current system - Designing website screen for dissemination of energy conservation, CO2 emission reduction, etc. - Operation and dissemination of the system to customers - Making a list of customers who access to SEC's Check System site (for internet survey) **(Internet Survey)** - Designing internet survey - Implementation of internet survey to collect opinions and needs using customer's list - Feedback of the internet survey results to the cooperative customers

(5) Relating Agency

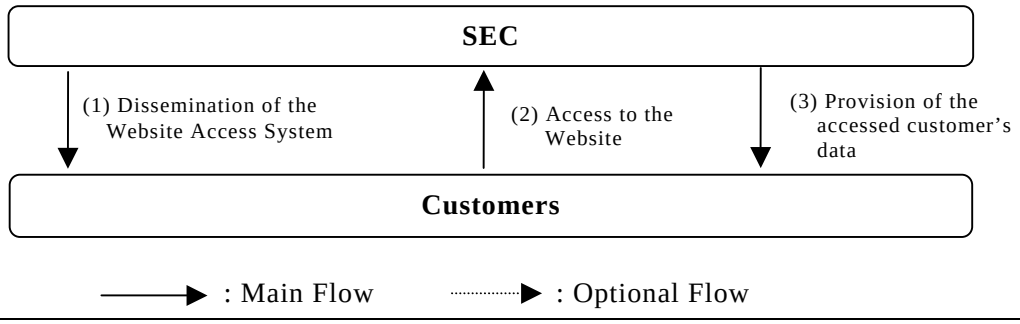
Name of Agency	-
Expected Role	-

(6) Target of the Scheme

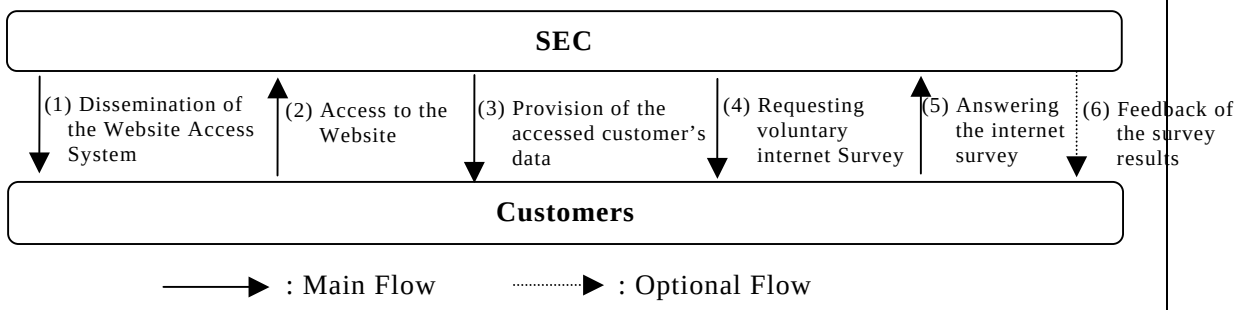
Name of Target	All sectors (especially residential sector)
Expected Action	- Checking their electricity consumption in the past by customer - Participating in internet survey

(7) Workflow

Phase 1 (Check System)



Phase 2 (Internet Survey)



(8) Required Permanent Human Resources

Phase 1 (Check System)	Human Resources	Financial Cost for Human Resources
	SEC (Database) No incremental staff	No incremental cost
	SEC (Campaign) No incremental staff	No incremental cost
Phase 2 (Internet Survey)	Human Resources	Financial Resources
	SEC (Internet Survey) Data collection, making report and publication: 1	Standard Cost: 300,000 SR/year/person 0.3 x 1=0.3 million SR/year

(9) Required Items

Phase 1 (Check System)	Item	Budget
	- Database (outsourcing by SEC) - Internet access system (outsourcing by SEC)	1 million SR/time 0.5 million SR/time
Phase 2 (Internet Survey)	Item	Budget
	-	-

(10) Expected Legislation for Enforcement

Phase 1 (Check System)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Internet Survey)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan

	2008	2009	2010	2011	2012	2013
Overall Schedule						
Phase 1 (Check System)						
Phase 2 (Internet Survey)						
Phase 1 (Check System): SEC						
(1) Making accumulated database in Gregory calendar						
(2) Making website access system						
(3) Designing website screen						
(4) Operation and dissemination of the system to customers						
(5) Making a list of customers who access to the system						
Phase 2 (Internet Survey): SEC						
(1) Designing internet survey						
(2) Implementation of internet survey						
(3) Feedback of the questionnaire survey results						

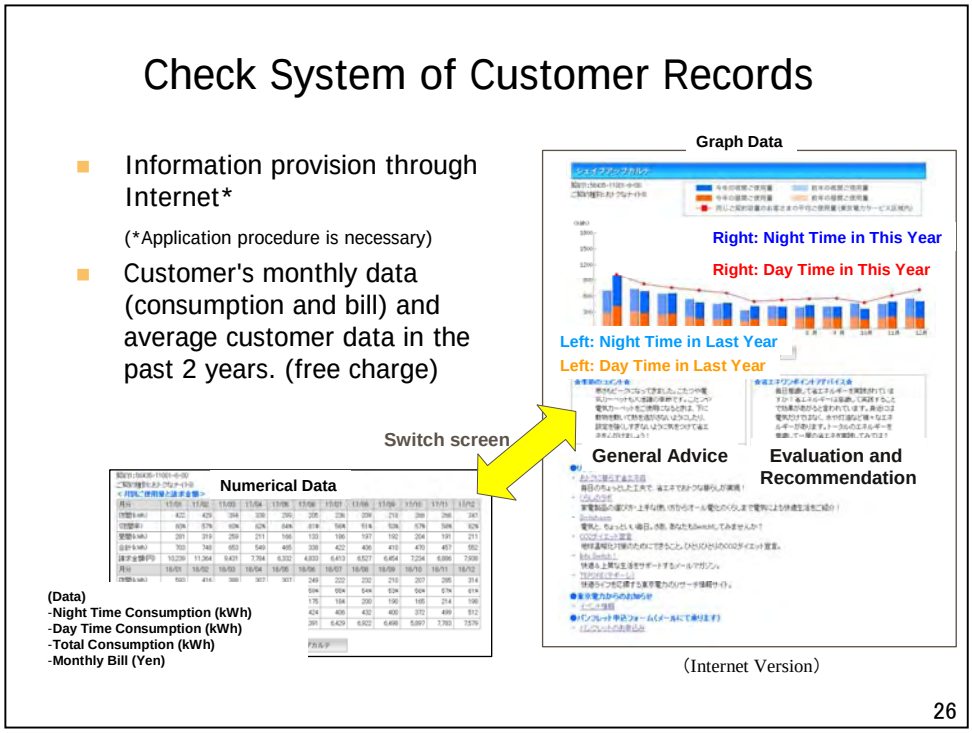
(12) Attachment

- Japan's sample of check system screen in internet
- Japan's sample of questionnaire sheet in internet survey

Attachment 7. Check System

Japan's sample of check system screen in internet

Sample Screen of Check System of Customer Records



Japan's sample of questionnaire sheet in internet survey (Internet Survey for Customer Record Members)

(1) Sample of Questionnaire Design

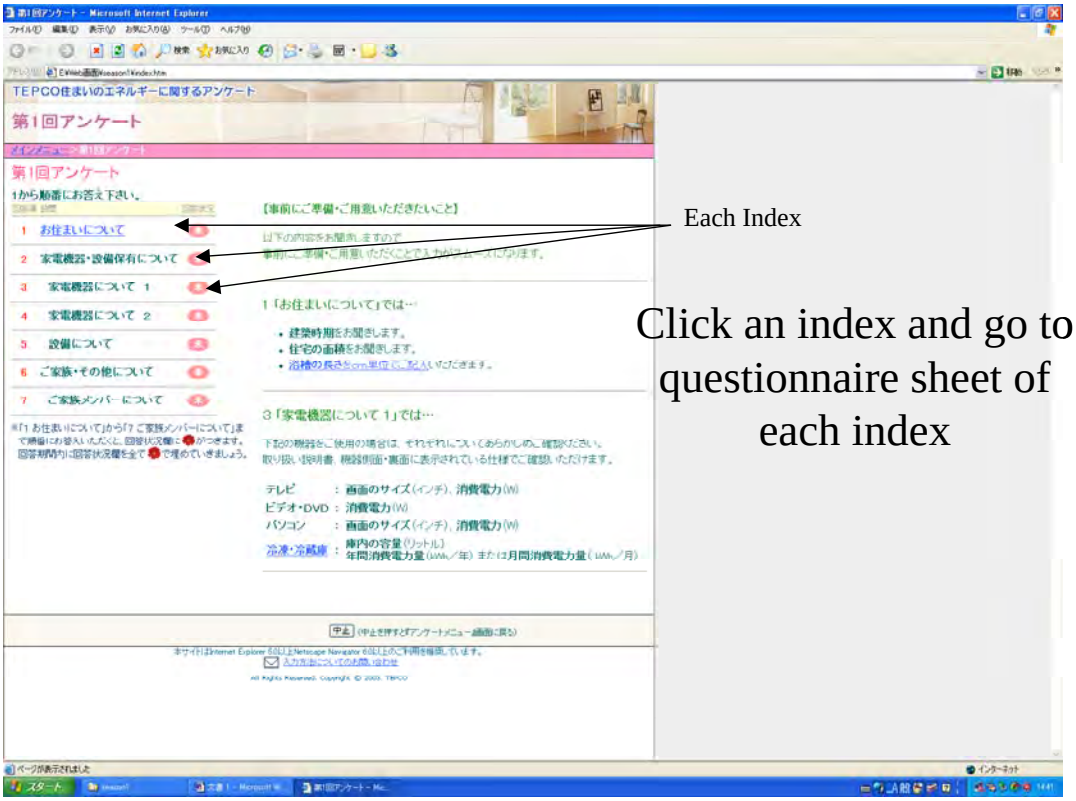
Energy Use Data (15 month) (every time)	Electricity	Consumption, Bill, Reading date
	Other	Utility gas consumption, Bill, Reading date
		LPG consumption, Bill, Purchae date
		Water consumption, Bill, Reading date
		Oil consumption, Bill, Purchase date
		Absent duration (from ## to ##)

Basic Information (1st time)	House data (structure, age, etc.)
	Use of Room (user, purpose, feature)
	Appliances and Equipment
	Family Structure

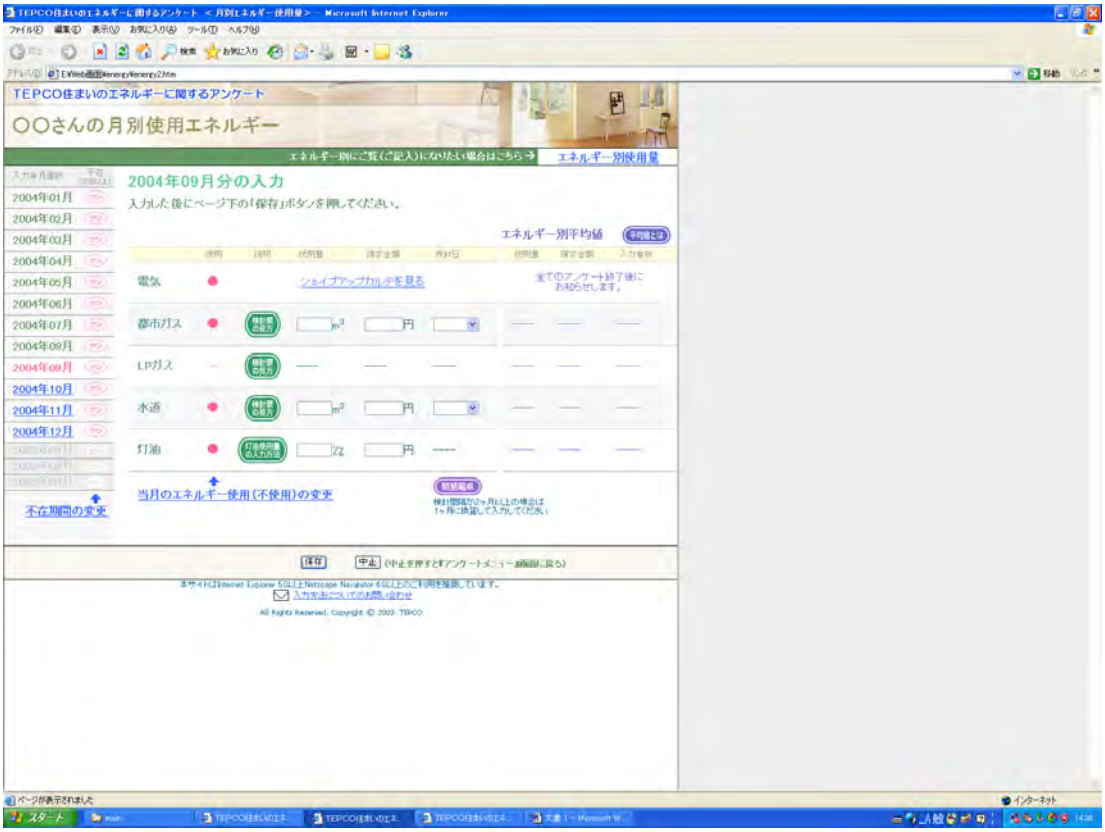
Seasonal Survey (4 times)	Change of Basic Information (every time)	Change of house structure, appliances, equipment (if any)
		Purchased and waste appliances
		Coming and outgoing person
	Lifestyle (1 time)	Room specification (temperature of AC, sunshine, ventilation)
		Lighting
		Custom such as washing dishes, bathing, etc.
		Kitchen equipment and washing equipment
		Bathroom facility, bathing/shower, toilet, etc.
		Meal and house work
	Heating (winter)	Heater and AC equipment and their number
		Use of each heating equipment
		Specification of each heating equipment
		Starting day and end of day of each heating equipment
	Cooling (Summer)	Number of cooling AC
		Use of each cooling equipment
		Starting day and end of day of each cooling equipment
	Awareness (1 time)	Awareness for AC
		Awareness for cooking tools
		Priority points when purchase an equipment
		Interest for environment

(2) Questionnaire Input Screen (Introduction)

(3) Questionnaire Input Screen (Index Sheet)



(4) Questionnaire Input Screen (Energy Data Input)



8. EC Education for Schools

(1) Program Name

EC Education for Schools

(2) Objective

- Raising energy conservation awareness of primary school students

(3) Outline of the Scheme and Each Phase

Overall Scheme	Task	
	(Existing Scheme) - An Education Team (MOWE/SEC/KACST) dispatches lectures and directly makes a seminar for students and teachers at junior high school. **(DT Scheme)** - Making education materials and teaching standard for primary school students by Direct Teaching (DT) scheme by the Education Team - Implementation of an EC education in a classroom/classrooms in a primary school by the Education Team - Arrangement of SEC's P/S visitation for students as a part of education **(TOT Scheme)** - Making education materials by revising DT scheme - Workshop and demonstration to teachers for TOT (Training of Trainers) scheme - Selection of cooperative teachers and giving a special training seminar - Implementation of an EC education in teachers' classroom by cooperative teacher, supported by the Education Team (only first time)	
Phase 1 (DT Scheme)	Task	Responsible Agency
	(1) Making education materials and teaching standard for primary school students by Direct Teaching (DT) scheme by the Education Team	MOWE
	(2) Selection of primary schools	MOWE/MOE
	(3) Implementation of an EC education in a classroom(s) in a primary school by the Education Team	MOWE
	(4) Arrangement of SEC's P/S visitation for students as a part of education	MOWE/SEC
	(5) Review and evaluation of DT scheme	MOWE
Phase 2 (TOT Scheme)	Task	Responsible Agency
	(1) Making education materials by revising DT scheme	MOWE
	(2) Workshop and demonstration to teachers for TOT (Training of Trainers) scheme	MOWE
	(3) Selection of cooperative teachers and giving a special training seminar	MOWE/MOE
	(4) Preparation of small gift (as a part of education) to students	MOWE
	(5) Implementation of an EC education in teachers' classroom by cooperative teacher, supported by the Education Team	MOWE/MOE

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE)
Expected Role	**(DT Scheme)** - Making education materials and teaching standard for primary school students by Direct Teaching (DT) scheme by the Education Team - Selection of primary schools - Implementation of an EC education in classroom(s) in a primary school by the Education Team - Arrangement of SEC's P/S visitation for students as a part of education - Review and evaluation of DT scheme **(TOT Scheme)** - Making education materials by revising DT scheme - Workshop and demonstration to teachers for TOT (Training of Trainers) scheme - Selection of cooperative teachers and giving a training special seminar - Preparation of small gift (as a part of education) to students - Implementation of an EC education in teachers' classroom by cooperative teacher, supported by the Education Team
Name of Agency	Ministry of Education (MOE)
Expected Role	**(DT Scheme)** - Selection of primary schools **(TOT Scheme)** - Selection of cooperative teachers and giving a special training seminar - Implementation of an EC education in teachers' classroom by cooperative teacher, supported by the Education Team

(5) Relating Agency

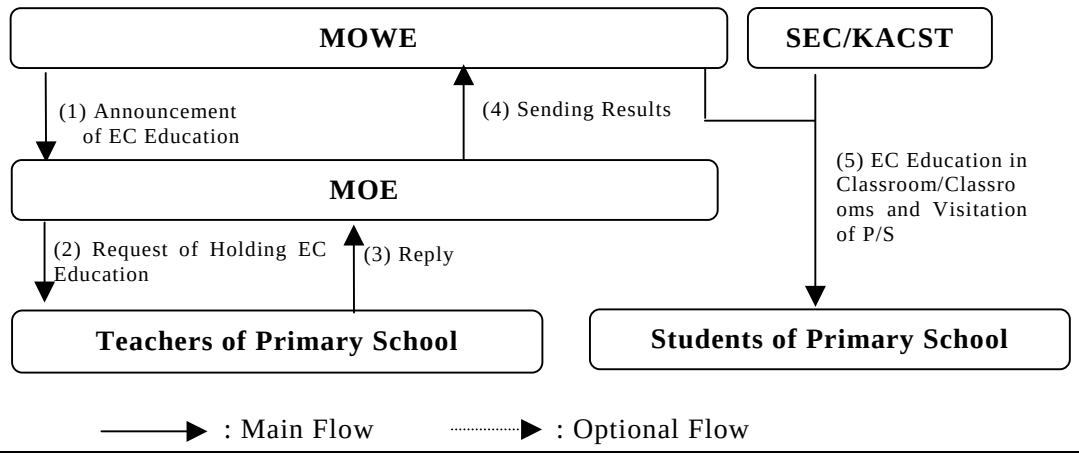
Name of Agency	Saudi Electricity Company (SEC)
Expected Role	- Implementation of an EC education in classroom(s) in a primary school by the Education Team at DT scheme - Arrangement of P/S visitation as a part of education - Support of TOT to cooperative teachers
Name of Agency	King Abdulaziz City for Science and Technology (KACST)
Expected Role	- Implementation of an EC education in classroom(s) in a primary school by the Education Team at DT scheme - Support of TOT to cooperative teachers

(6) Target of the Scheme

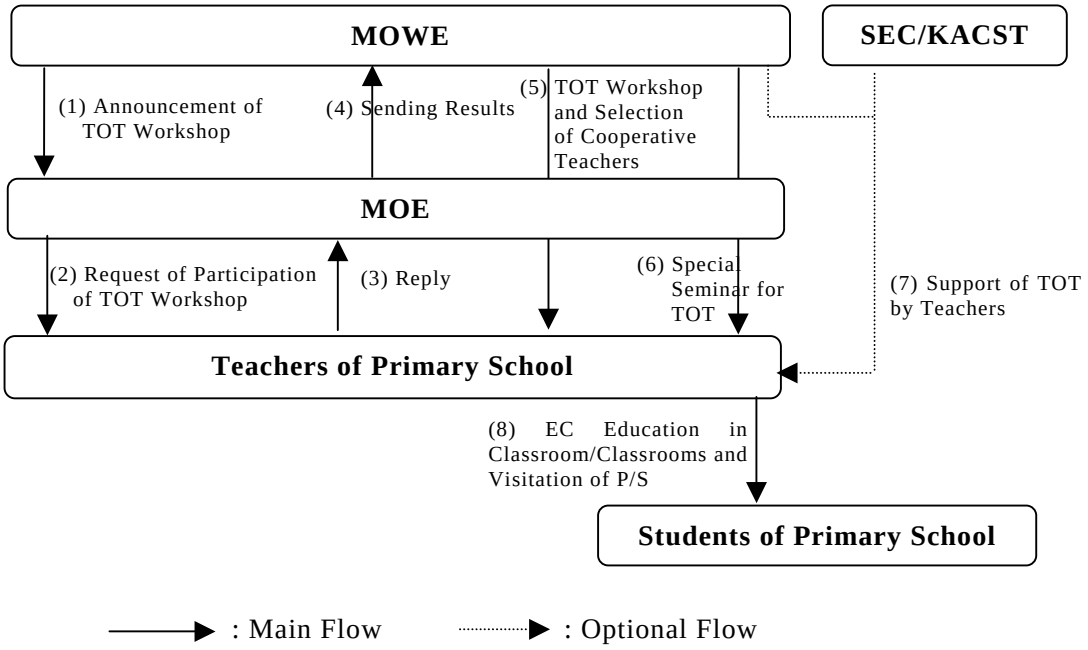
Name of Target	Primary school students (DT Scheme)
Expected Action	- Coordination of contents of DT scheme and P/S visitation between MOWE and teachers
Name of Target	Primary school teachers (TOT Scheme)
Expected Action	- Participation of workshop for TOT scheme - Receiving a special training seminar for cooperative teachers - Implementation of an EC education in classroom and taking students to P/S

(7) Workflow

Phase 1 (DT Scheme)



Phase 2 (TOT Scheme)



(8) Required Permanent Human Resources

Phase 1 (DT Scheme)	Human Resources	Financial Cost for Human Resources
	Education Team (MOWE/SEC/KACST) No incremental staff	No incremental cost
Phase 2 (TOT Scheme)	Human Resources	Financial Resources
	Education Team (MOWE/SEC/KACST) No incremental staff	No incremental cost

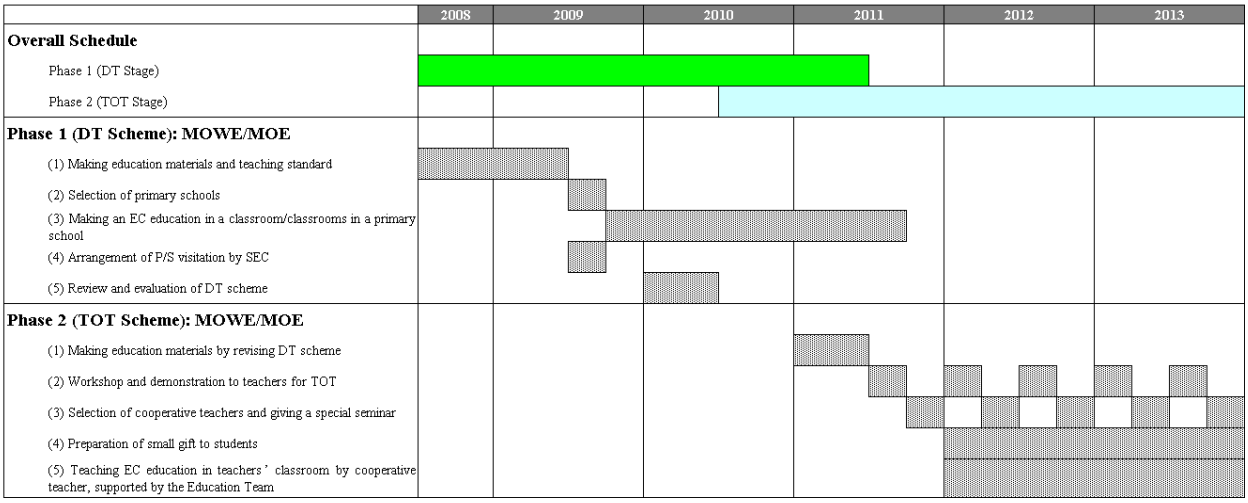
(9) Required Items

Phase 1 (DT Scheme)	Item	Budget
	- Making education materials (MOWE) - Small gifts for students (MOWE) - Transportation costs for visitation of P/S (MOWE)	160,000 SR/year (100,000 SR) (3,000 SR/time x 10 times) (3,000 SR/time x 10 times)
Phase 2 (TOT Scheme)	Item	Budget
	- Workshop and special training seminar (MOWE) - Small gifts for students (MOWE) - Transportation costs for visitation of P/S (MOWE)	126,000 SR/year (3,000 SR/time x 2 times) (3,000 SR/time x 20 times) (3,000 SR/time x 20 times)

(10) Expected Legislation for Enforcement

Phase 1 (DT Scheme)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (TOT Scheme)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan



(12) Attachment

- Japan's sample of education materials
- Japan's sample of EC experiment

Attachment 8. EC education for school

Japan's sample of education materials

Denko's

Eco-friendly Lesson on Energy
〜Let's keep our planet safe through our actions! 〜

(Lesson on electricity and the environment)

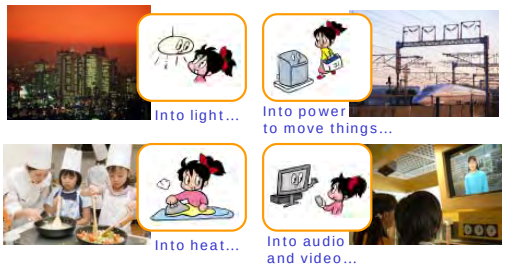
TEPCO (Tokyo Electric Power Co., Inc.)

Today's lesson

(1) How we live and electricity
(2) Where does electricity come from?
(3) Energy and global warming
(4) Ways to stop global warming
(5) What we can start doing today to save the earth from global warming

1. How we live and electricity

Electricity changes its form into a variety of things

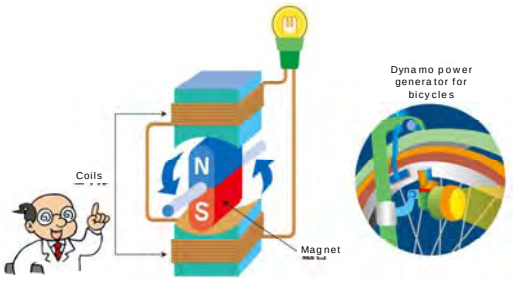


Doc's "This is an important point!" Part 1

- Electricity changes its form into light, power to move things, heat, and others to support our lives
- How much electricity gets used changes significantly depending on the day's weather, temperature, and hour

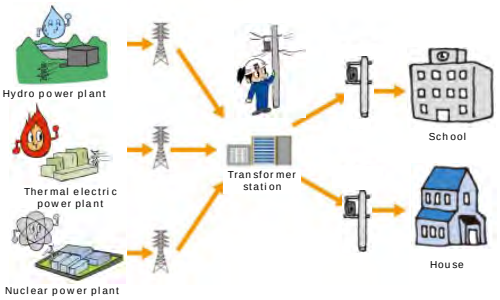
2. Where does electricity come from?

Let's generate electricity!!



7

Where does electricity come from?



8

Who maintains the path of electricity?

Power plant workers

Power line inspectors

Service wire inspectors

Many workers protect electricity to make sure it can travel a long way to reach you.

9

How is electricity generated?

There are a variety of ways to generate power

Hydro power plant

Nuclear power plant

Thermal electric power plant

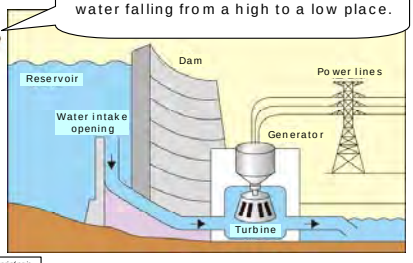
10

How is electricity generated? Hydro power plant

11

How is electricity generated? Hydro power plant

A turbine is turned by the power of water falling from a high to a low place.

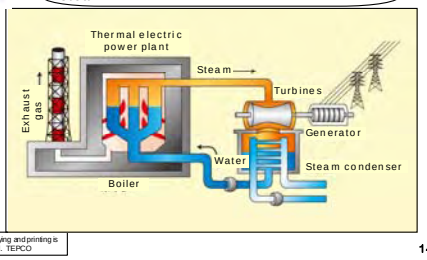


12

How is electricity generated? Thermal electric power plant

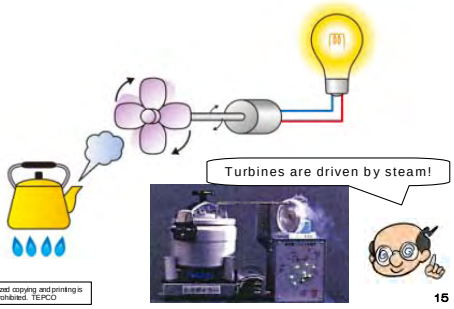
How is electricity generated? Thermal electric power plant

Steam is created by burning fuels, such as coal, oil, and liquefied natural gas (LNG). Then, you drive turbines with the power of steam.



An experiment using a model of a thermal electric power plant

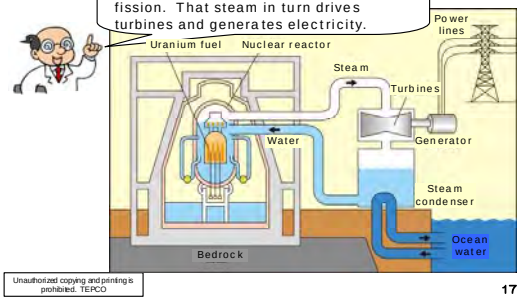
For your information



How is electricity generated? Nuclear power plant

How is electricity generated? Nuclear power plant

Steam is created by heating water with the heat from uranium undergoing fission. That steam in turn drives turbines and generates electricity.



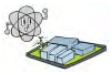
Pros and cons of major power generation methods

Power generation method	Pros	Cons
Hydro (water)	• Because this method uses power available directly from nature, you don't need to consume fuel (natural resource) • No CO2 is produced.	• If too many dams are built, this damages the natural environment. • This method can only generate a small amount of power.
Thermal (coal, oil, natural gas)	• It is easier to adjust the amount of electricity output depending on the demand. • A lot of electricity can be generated.	• Reserves of fossil fuel (resources) are limited. • CO_2 is emitted into the air.
Nuclear (uranium)	• No CO_2 is produced. • A lot of electricity can be generated. • Fuel can be recycled.	• Because the method involves radioactive materials, strict safety management is necessary. • Disposal of radioactive waste is necessary.

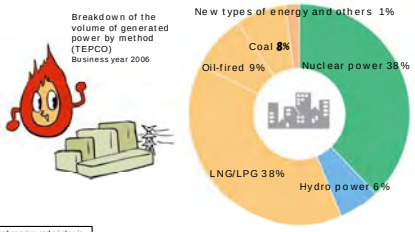
Can you answer this one?

Quiz: Which power generation method produces the largest amount of electricity?

1. Hydro power
2. Thermal power
3. Nuclear power



The answer is: 2. Thermal power



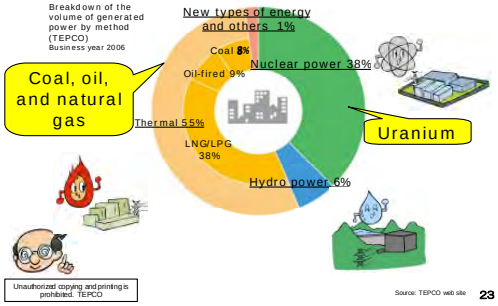
Source: TEPCO web site

Doc's "This is an important point!" Part 2

- Electricity is transmitted from power plants through power lines carried on power poles.
- Electricity is generated by a variety of methods, including hydro power, thermal power, and nuclear power.

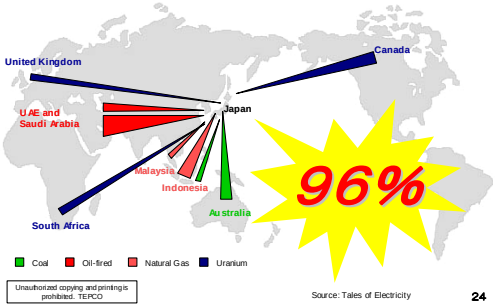
3. Energy and global warming

Which energy sources are necessary to generate power?



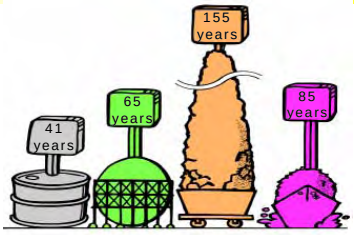
Source: TEPCO web site

Japan imports most of its energy resources from foreign countries



Source: Tales of Electricity

How long will the resources left on the earth last for?



Sources:
(1) BP Statistics 2006
(2) URANIUM 2005

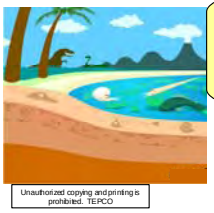
Remember that Japan needs to import most of its energy resources. We need to use them with care.

25

Just what is fossil fuel?

For your information

Coal, oil, and natural gas are products of the remains of animals and plants that lived several hundreds of millions years ago. The dead creatures and plants have accumulated at the bottom of oceans and lakes with soil, and been changed into fossil fuel over a long period of time.



Because it takes several hundreds of millions years to create fossil fuels naturally,

it cannot be made instantly.

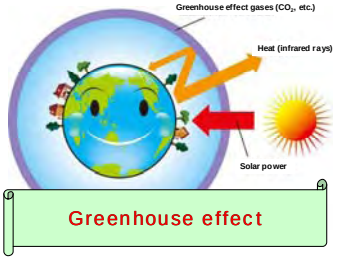
26

What if we keep using fossil fuel?

When fossil fuel – such as coal, oil, and natural gas – is burned, carbon dioxide (CO_2) is emitted.

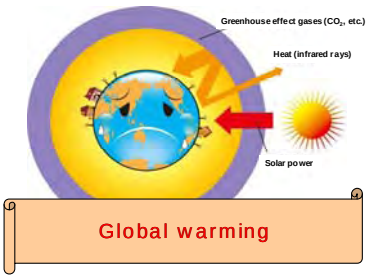
27

Carbon dioxide prevents the heat from the sun escaping back into space



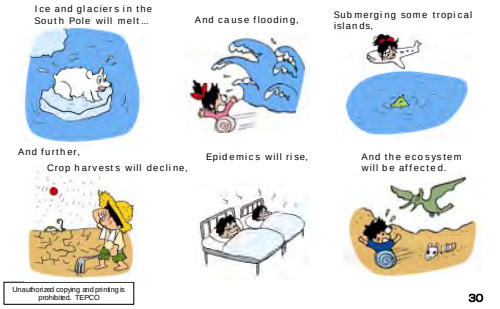
Greenhouse effect

But if there is too much carbon dioxide...



Global warming

What will happen if the temperature of the earth goes up?



30

Doc's "This is an important point!" Part 3

- Japan hardly has any energy resources.
- The reserves of energy resources are limited, and these resources could run out if we keep on using them at the current rate.
- By using the energy resources, we increase the level of carbon dioxide in the atmosphere, which in turn causes the problem of global warming.

4. Ways to stop global warming

Let's consider the following:

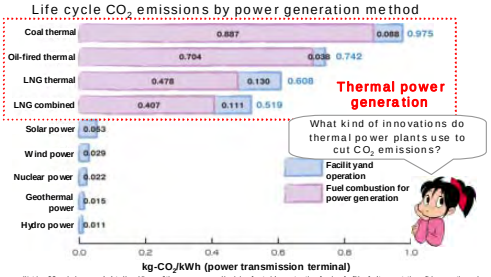
What kinds of actions should we take to maintain our current convenient lifestyle that is supported by electricity while at the same time preserving the earth's environment?

What is TEPCO doing to help protect the earth?

- TEPCO generates electricity by employing methods that cut CO_2 emission as much as possible.
- TEPCO develops technologies that help people use electricity effectively.

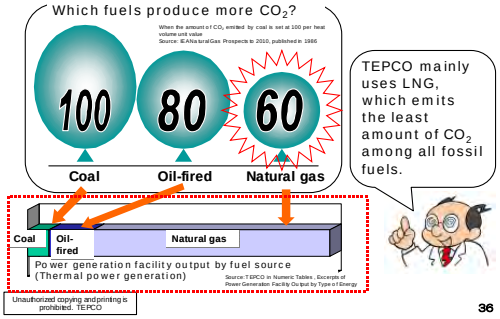
What power generation methods minimize CO_2 emissions?

Life cycle CO_2 emissions by power generation method



(Note) CO_2 emissions are calculated by adding up all the energy consumed in mining of materials, construction of various facilities, fuel transportation, refining, operation, and maintenance, in addition to combustion of fuels for power generation. For nuclear power generation, the planned recycling of nuclear fuel (including domestic reprocessing of used fuel, plutonium for thermal use that assumes single recycling, and disposal of highly radioactive wastes) is included in the calculation.

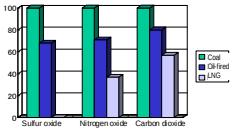
Innovation 1: Choosing fuels that emit lower amounts of CO_2



What is LNG?

For your information

LNG stands for liquefied natural gas. It is a liquid type of fuel which is made by liquefying natural gas at the extremely low temperature of –162℃, and it consists mostly of methane gas.



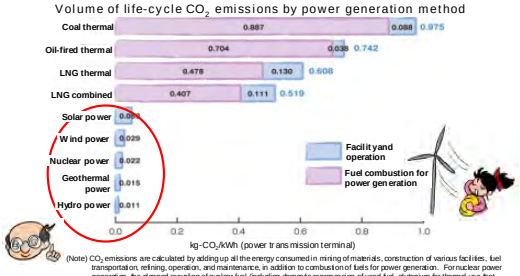
From an eco-friendly point of view for power generation, TEPCO has focused on LNG as an energy source that produces no soot dust and sulfur oxide. We became the world's first company to use LNG as a power generation fuel in 1969 at our Minami Yokohama Thermal Power Plant.

<Major features of LNG>

1. It is a liquid cooled to –162℃. It has no color, is transparent, and has no smell.
2. It is a clean energy source which consists mostly of methane gas, and contains almost no impure substances.
3. CO_2 emissions – a major cause of global warming – from burning LNG are about 60 to 70% of emissions from combusting oil or coal.

Power generation methods that do not produce CO_2 emissions

Volume of life-cycle CO_2 emissions by power generation method



(Note) CO_2 emissions are calculated by adding up all the energy consumed in mining of materials, construction of various facilities, fuel transportation, refining, operation, and maintenance, in addition to combustion of fuels for power generation. For nuclear power generation, the planned recycling of nuclear fuel (including domestic reprocessing of used fuel, plutonium for thermal use that assumes single recycling, and disposal of highly radioactive wastes) is included in the calculation.

Source: Central Research Institute of Electric Power Industry and others

Power generation methods that use the power of nature

○Pros

- The methods are eco-friendly, as they produce little CO_2
- Their energy sources are infinite

×Cons

- To a significant extent, the volume of power that can be generated depends on the weather
- The volume of generated power is small

Heat pump mechanism

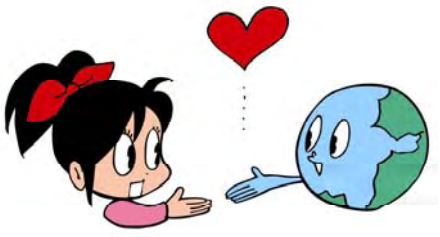
The basics of a heat pump's mechanism, Part I

When gas is compressed, its temperature rises.
When gas expands, its temperature falls.

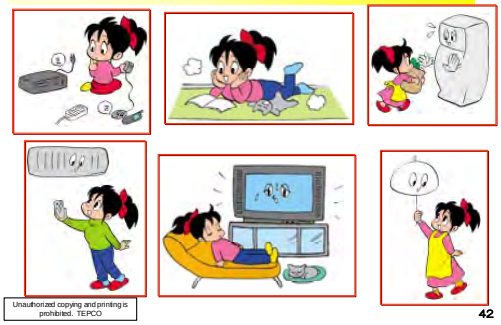
The basics of a heat pump's mechanism, Part II

When two objects having different temperatures come into contact, heat moves.

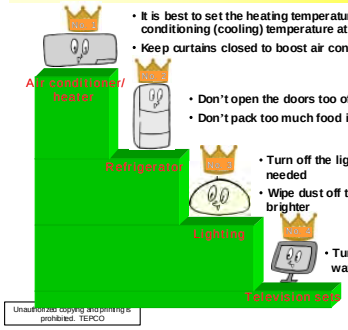
5. What we can start doing today to save the earth from global warming



How can we help to save energy?



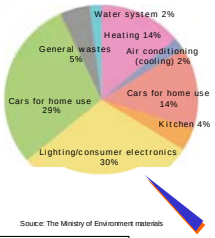
Top four consumer electronics products that consume a lot of electricity in the home



- It is best to set the heating temperature at 20℃ and the air conditioning (cooling) temperature at 28℃
- Keep curtains closed to boost air conditioning/heating efficiency
- Don't open the doors too often
- Don't pack too much food into the fridge
- Turn off the lights when they are not needed
- Wipe dust off the bulbs to make the light brighter
- Turn off the TV when you are not watching programs

How effective are our energy saving actions?

CO_2 emitted from the home



Source: The Ministry of Environment materials

TV

If you turn off the television set when you are not watching any programs (one hour/day)…

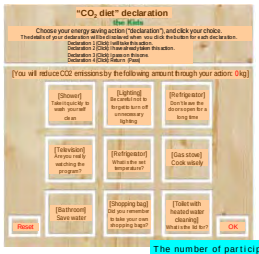
In a year, you save (cathode-ray tube television set, 36 inches):

the equivalent of 24kg in CO_2 emissions and ¥ 1,510 off your electricity bill.

Source: Denko's "I See, That's Energy Saving!" Book

What can we do to protect the earth?

Let's consider together with your family members about what you can do:

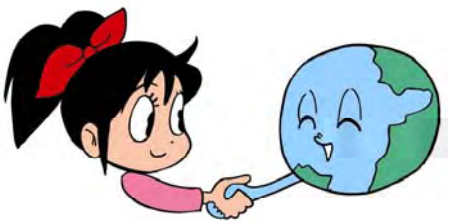


The number of participants that have made a declaration: about 900,000
The amount of CO_2 emission cut by the participants: 33,000 tons

Why does Denko want you to be "friends" with electricity?

Review

- Electricity is an essential part of our life
- Let's use limited energy resources wisely and efficiently
- Start taking actions that you can do today for the sake of the earth!



Let's save our earth by ourselves!

TEPCO
(Tokyo Electric Power Co., Inc.)

The End

Japan' Sample of EC Experiment

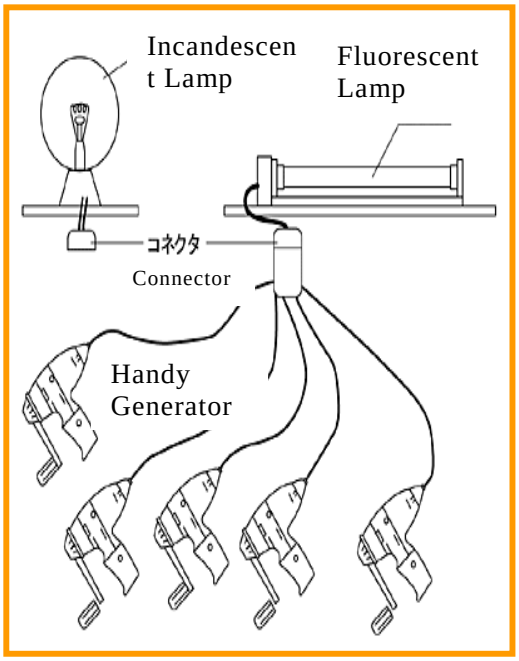
(1) "Feel a Load of Electricity"

(a) Objective

- How to generate
- Feel a load of electricity, by generation of handy generator

(b) Equipment

- Incandescent Lamp: 1
- Florescent Lamp: 1
- Connector: 1
- Handy Generator: 5



(c) Experiment

Step 1: Selection of 2 groups (5 members in 1 group, total 10 member)

Step 2: Group A generates and turns on an incandescent lamp and Group B generates and turns on a fluorescent lamp at the same time.

Step 3: In turn, Group A turns on a fluorescent lamp and Group B turns on an incandescent lamp

Step 4: Hear opinions of each group, "Which is heavier to generate?" (Fluorescent lamp is light for generation).

(2) "Measure Waiting Power"

(a) Objective

1) Feel consumption of waiting power

(b) Equipment

1) Checker of electricity for home appliances

(Function)

Indicate electricity consumption

Indicate electricity bill (estimate)

Indicate CO2 emission (estimate)

Checker of Electricity for Home

(c) Experiment

Step 1: Setting the equipment between outlet and plug of appliances

Step 2: Measure electricity of waiting power of TV

Step 3: Learn pulling off plug can cut its waiting power

9. EC Museum

(1) Program Name

EC Museum

(2) Objective

- Education for electricity and energy conservation
- Dissemination of energy conservation appliances (How to select and use)
- Communication to customers

(3) Outline of the Scheme and Each Phase

<table>
<tr><td>Overall Scheme</td><td colspan="2">Contents</td></tr>
<tr><td></td><td colspan="2">(F/S Stage)
- Making a concept design including objective, target layer, required area, display plan, organization, O&M plan, etc.
- Basic design and feasibility study including site selection
- Preparation of a tender document for detailed design
(D/D and Construction Stage)
- Procurement of a consultant for detailed design
- Detailed design and preparation of tender documents for (i) building construction including interior facilities, (ii) display, (iii) consulting service for construction supervision
- Procurement of contractors and a consultant for construction
- Construction
(Operation Stage)
- Securing human resource and operation budget
- Making an operation manual including responsibility, daily operation and staff allocation, display and seminar planning, training program for guidance staff, etc.
- Training guidance staff in social manner, explanation way, technical knowledge (1 month)
- Opening the Museum</td></tr>
<tr><td>Phase 0
(F/S Stage)</td><td>Task</td><td>Responsible Agency</td></tr>
<tr><td></td><td>(1) Making a concept design including objective, target layer, required area, display plan, organization, O&M plan, etc.
(2) Basic design and feasibility study including site selection
(3) Preparation of a tender document for detailed design</td><td>MOWE
MOWE
MOWE</td></tr>
<tr><td>Phase 1
(D/D and Construction Stage)</td><td>Task</td><td>Responsible Agency</td></tr>
<tr><td></td><td>(1) Procurement of a consultant for detailed design
(2) Detailed design and preparation of tender documents for (i) building construction including interior facilities, (ii) display, (iii) consulting service for construction supervision
(3) Procurement of contractors and a consultant for construction
(4) Construction</td><td>SEEC Consultant
SEEC Contractors and consultant</td></tr>
</table>

Phase 2 (Operation Stage)	Task	Responsible Agency
	(1) Securing human resource and operation budget	SEEC
	(2) Making an operation manual including responsibility, daily operation and staff allocation, display and seminar planning, training program for guidance staff, etc.	SEEC
	(3) Training guidance staff in social manner, explanation way, technical knowledge (1 month)	SEEC
	(4) Opening the Museum and operation	SEEC

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE)
Expected Role	**(F/S Stage)** - Making a concept design including objective, target layer, required area, display plan, organization, O&M plan, etc. - Basic design and feasibility study including site selection - Preparation of a tender document for detailed design
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	**(D/D and Construction Stage)** - Procurement of a consultant for detailed design - Procurement of contractors and a consultant for construction - Securing human resource and operation budget - Making an operation manual including responsibility, daily operation and staff allocation, display and seminar planning, training program for guidance staff, etc. - Training guidance staff in social manner, explanation way, technical knowledge (1 month) - Opening the Museum and operation
Name of Agency	Consultant for Detailed Design
Expected Role	- Detailed design and preparation of tender documents for (i) building construction including interior facilities, (ii) display, (iii) consulting service for construction supervision
Name of Agency	Contractors and Consultant for Construction
Expected Role	- Construction for building with interior facilities - Construction of display - Consulting service for construction supervision

(5) Relating Agency

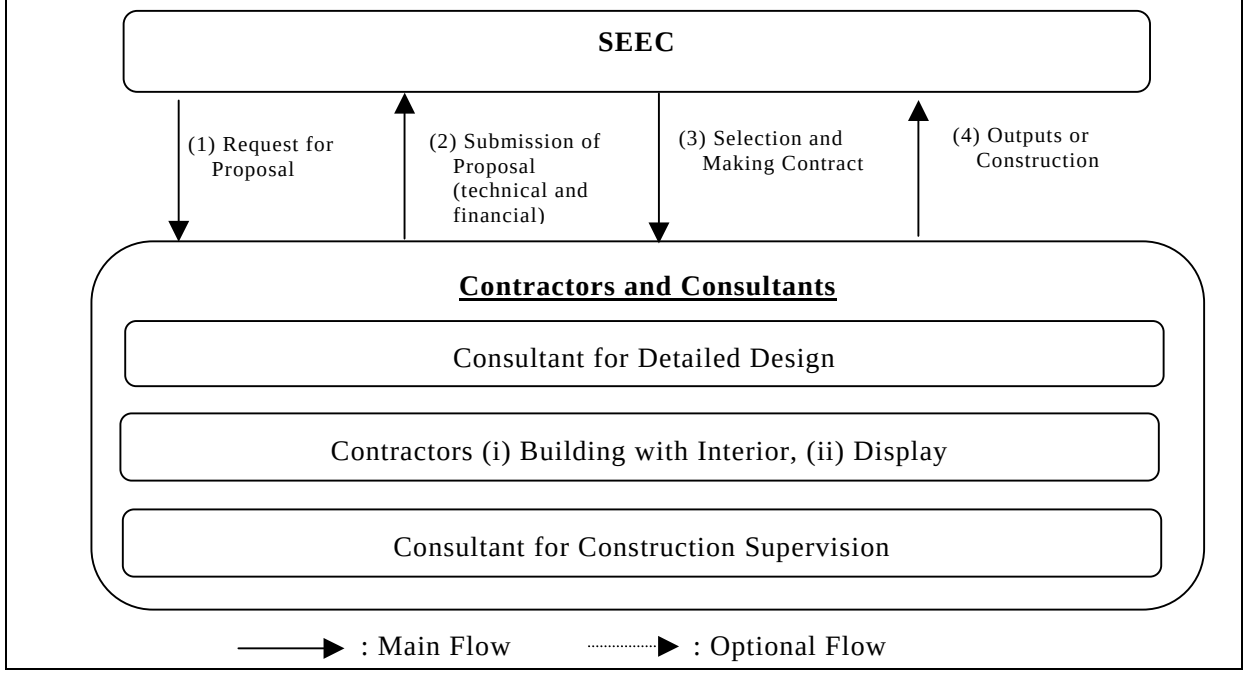
Name of Agency	Saudi Arabian Standards Organization (SASO)
Expected Role	- Dissemination of Energy Labels and Standards System (EELS)
Name of Agency	King Abdulaziz City for Science and Technology (KACST) Saudi Electricity Company (SEC)
Expected Role	- Support of display and event including experiment seminar - Communication with customers for collection of needs
Name of Agency	Manufactures and Importers (M&Is)
Expected Role	- Display of new technology products

(6) Target of the Scheme

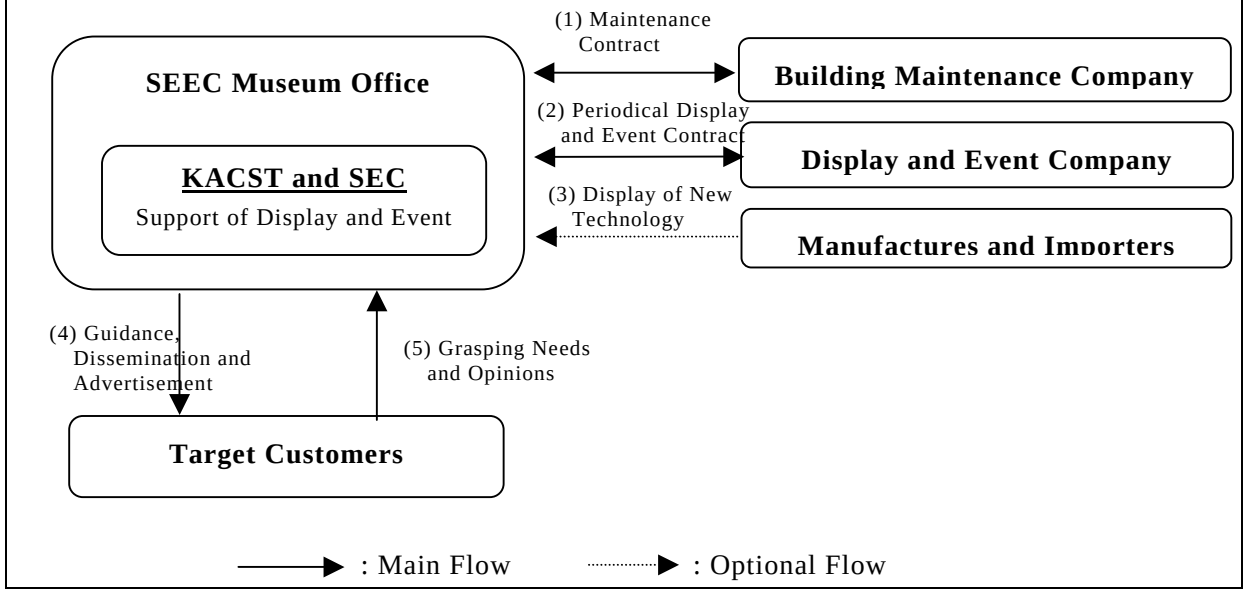
Name of Target	Kids and household wives, and adults
Expected Action	- Look, touch, ask and take action

(7) Workflow

Phase 1 (D/D and Construction Stage)



Phase 2 (Operation Stage)



(8) Required Permanent Human Resources

Phase 0 (F/S Stage)	Human Resources	Financial Cost for Human Resources
	MOWE No incremental staff	No incremental cost
Phase 1 (D/D and Construction Stage)	Human Resources	Financial Resources
	SEEC Planning and supervision: 2	Standard Cost: 300,000 SR/year/person 0.3 x 2 = 0.6 million SR/year
Phase 2 (Operation Stage)	Human Resources	Financial Resources
	SEEC Museum Office General manager: 1 General affairs: 3 Planning: 5 Guidance: 16	Standard Cost: 300,000 SR/year/person 0.3 x 25 = 7.5 million SR/year

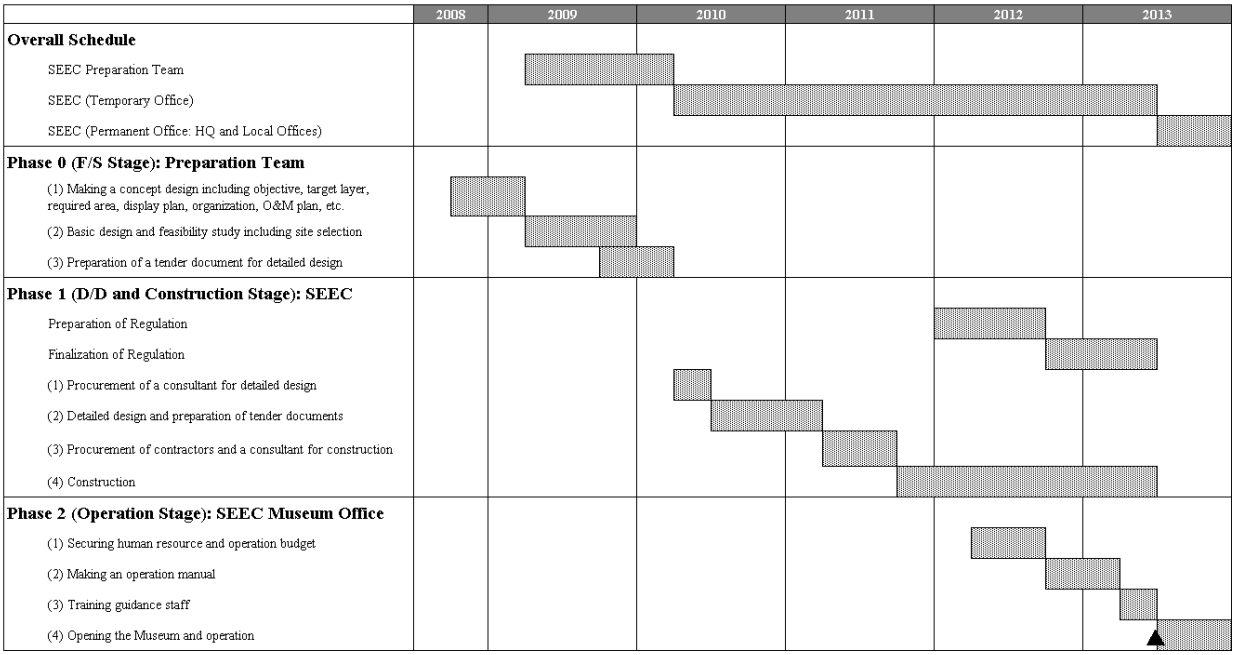
(9) Required Items

Phase 0 (F/S Stage)	Item	Budget
	- Feasibility study	3 million SR
Phase 1 (D/D and Construction Stage)	Item	Budget
	- Consulting service for detailed design	5 million SR
	- SEEC building construction (6F+B1, 2 floors for the museum) * Land cost is excluded.	150 million SR (Budget level)
	- Display construction	20 million SR
	- Consulting service for building and display construction	2 million SR (= (100+20) x 5%))
Phase 2 (Operation Stage)	Item	Budget
	- Building maintenance	3.6 million SR/year (= (100+20) x 3%)
	- Periodical display (every 3 months) * Periodical display is cooperated by manufactures	4 million SR (= 1 million SR/times x 4)
	- Weekly seminar	0.12 million SR (=3,000 SR x 40 times)

(10) Expected Legislation for Enforcement

Phase 0 (F/S Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 1 (D/D and Construction Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Operation Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan

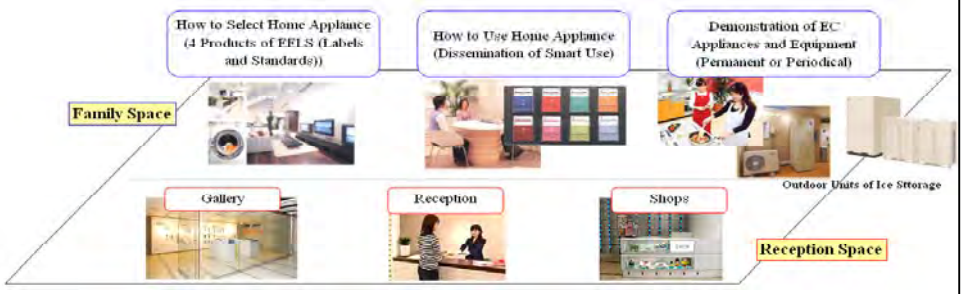


(12) Attachment

- Japan's display sample
- Proposed training program for EC Museum staff

Attachment 9. EC Museum
Japan's display sample

Image of Museum (Ground Floor)



Concept of the Ground Floor

(1) Family Space is considered in the Ground Floor to gather household wives with kids.
(2) For the Family Space, Home Appliances are a main theme, displaying the Labeling Products and other EC appliances.
(3) Dissemination space (booklet, consultation, etc.) is also prepared.
(4) As an option, demonstration for EC and peak shift equipment is considered.

1

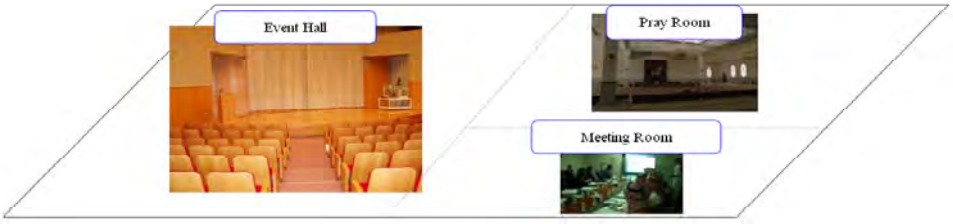
Image of Museum (First Floor)

Concept of the First Floor

(1) General and Kids Space is considered in the First Floor.
(2) For the General Space, visitors can learn how to send electricity to home.
(3) For the Kids Space, education and science experiment space is considered.
(4) For small children, kids park is also prepared.

30

Image of Museum (Second Floor)



Concept of the Second Floor

(1) Second Floor is a space for a large event, pray and meeting.
(2) The space is used for museum event as well as SEEC event.

Proposed Training Program for EC Museum Staff

Program Name	Target Staff	Contents	Hours	Trainer
Social Training	New Employee	1. Social Manner - Speech and action - Guidance skill - Office service regulation	1 hour	Business manner consultant
		2. Basic Knowledge - Tariff and contract - Power facilities (generation, transmission, distribution, renewable energy) - Energy conservation technology and activity	4 hours	SEC
		3. Operation Manuals - Guidance manual of each display - Planning and implementation manual for display and event, etc. - Administration (office maintenance, procurement, disbursement, etc.)	60 days	OJT by senior staff
		4. Follow-up Social Manner - Check of speech. Action and guidance skill of each staff - Discussion of their own issues in their work	3 hours	Business manner consultant
Senior Staff Training	Senior Staff	1. Senior Staff Training - Role of senior staff - How to give OJT to new employee	5 hours	Business manner consultant
Electric Home Appliances Training	All Staff (in turn)	1. Energy Efficiency Labels and Standards (EELS) - What is EELS? - Role of SASO, Manufactures/Importers, Retail shops - How to read labeled data - Site visitation (retail shops)	1 day	SASO/Retail Shop
		2. How to Select and Use Home Appliances (AC, Lamp Washing Machine, TV, Freezer & Refrigerator, IH cooking) - Smart selection - Smart use - Site visitation (retail shops)	2 days	SEC/Retail Shop /Consultant
		3. Factory Visitation - How to produce - Manufacture's appealing points	1 day	Local Manufacture
Power Station Visitation Training	All Staff (in turn)	1. Power Station Visitation - How to generate	1 day	SEC

10. Promotion of Architecture Technology (Building Material Energy Performance Indication System (BEPIS))

(1) Program Name

Promotion of Architecture Technology (Building Material Energy Performance Indication System (BEPIS))

(2) Objective

- Promotion of energy efficient houses/buildings construction
- Standardization and rating of building material energy performance
- Enforcement of certified building material use for construction

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents
	(Existing System) - SASO has already established standards for various products, including building material. - Saudi Building Code (SBC) is now waiting for its approval. It is expected in two years it will become mandatory. **(This Scheme)** - Setting of target building material in accordance with SBC - Setting of performance standards in accordance with existing SASO standards and SBC - Sending material information to SASO - Registration of performance data - Printing BEPIS mark on building material products - Making database - Random inspection - Monitoring and awareness survey

Phase 1 (Pilot Stage)	Task	Responsible Agency
	(1) Setting of target material/performance for standardization in accordance with SBC (building envelope material – wall, insulation, glass, window frame) and existing Saudi construction and building material standards.	SASO
	(2) Collection of existing performance data from domestic and overseas resources	SASO
	(3) Modification of existing criteria into local present/future condition	SASO
	(4) Conducting necessary additional tests at laboratories	SASO
	(5) Publication of BEPIS guideline	SASO
	(6) Authorization of testing requirements for designated products	SASO
	(7) Request of performance data registration to Manufacturers and Importers (M&Is)	SASO
	(8) Making database and publication (booklet and internet)	SASO
	(9) Designing BEPIS format to be indicated on target products	SASO
	(10) Dissemination campaign with workshops	SASO/SEEC
	(11) Establishment of law to enforce on M&Is (registration, inspection, penalty and instruction, etc.)	MOCI
	(12) Establishment of law to enforce on building owner/developers and contractors (use of certified material, inspection, penalty and instruction, etc.)	MOMRA
Phase 2 (Final Stage)	Task	Responsible Agency
	(1) Random inspection of labeled performance data	SEEC/MOCI
	(2) Random inspection at construction sites to confirm compliance	SEEC/MOMRA
	(3) Dissemination campaign with workshops	SASO/SEEC
	(4) Monitoring and awareness survey to be improved	SASO/SEEC
	(5) Integration with other rating of building material performance (strength, fireproof, toxic compound etc.)	SASO
	(6) Updating of BEPIS Database	SASO/SEEC

(4) Executing Agency

Name of Agency	Saudi Arabian Standards Organization (SASO)
Expected Role	- Setting of target material/performance - Collection of existing performance data from domestic and overseas resources - Modification of existing criteria into local present/future condition - Conducting necessary additional tests at laboratories - Publication of BEPIS guideline - Authorization of testing requirements for designated products - Request of performance data registration to Manufacturers and Importers (M&Is) - Making database and publication (booklet and internet) - Designing BEPIS format to be printed on targeted products - Dissemination campaign with workshops - Monitoring and awareness survey - Integration with other rating of building material performance - Updating of BEPIS Database
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	- Dissemination campaign with workshops (transferred from SASO task) - Random inspection of indicated performance data (with MOCI) - Random inspection at construction sites (with MOMRA) - Monitoring and awareness survey (transferred from SASO task) - Updating of BEPIS Database
Name of Agency	Ministry of Commerce and Industry (MOCI)
Expected Role	- Assisting SASO in setting of target material/performance - Establishment of law to enforce on M&Is. - Random inspection of indicated performance data (with SEEC guidance)
Name of Agency	Ministry of Municipality and Rural Affairs (MOMRA)
Expected Role	- Establishment of law to enforce on building owner/developers and contractors - Random inspection at construction sites (with SEEC guidance)

(5) Relating Agency

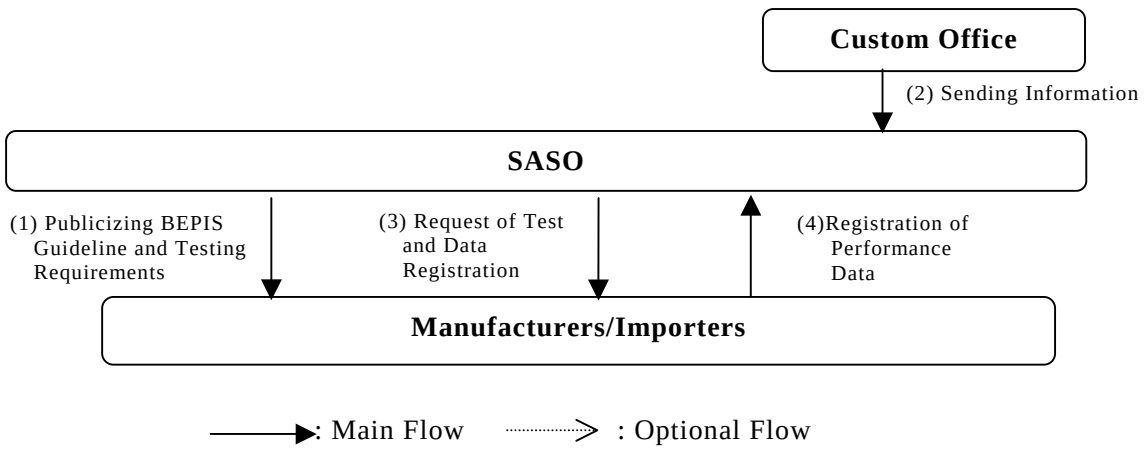
Name of Agency	Saudi Building Code Committee (SBCC)
Expected Role	- Assisting SASO in setting of target material/performance
Name of Agency	King Abdulaziz City for Science & Technology (KACST)
Expected Role	- Assisting SASO in conducting necessary additional tests
Name of Agency	Custom Office
Expected Role	- Sending information of import products to SASO

(6) Target of the Scheme

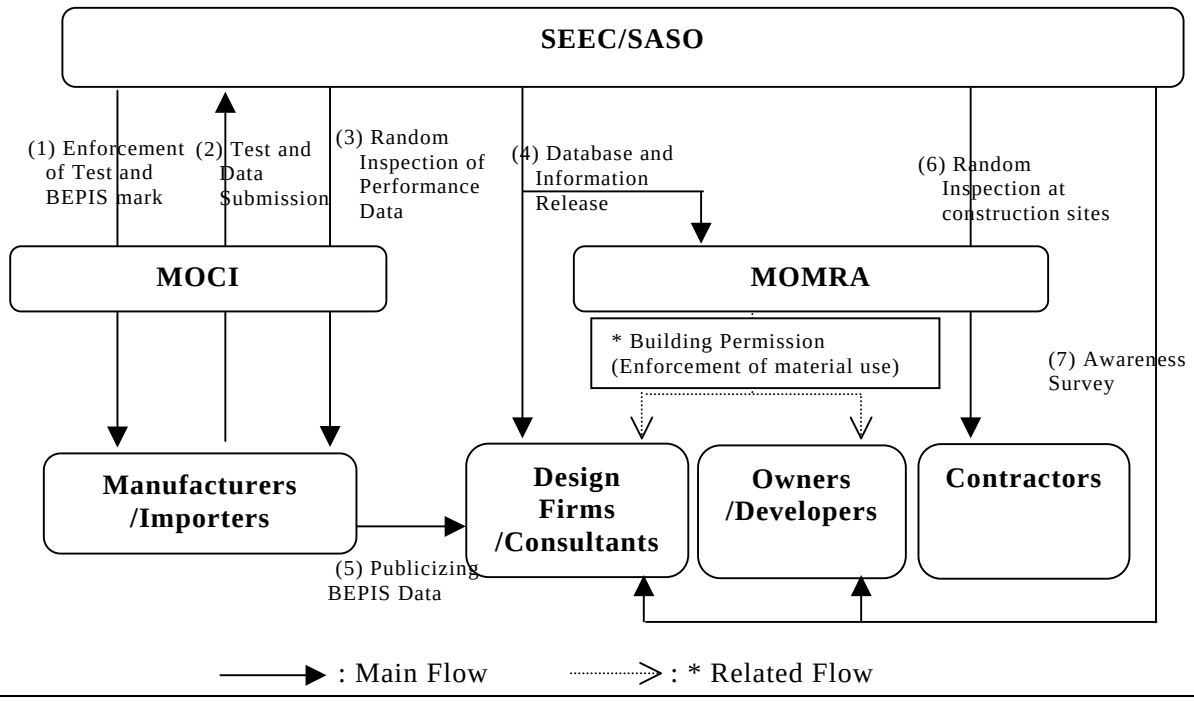
Name of Target	Manufacturers and Importers (M&Is)
Expected Action	- Testing performance of designated products in accordance with SASO standard in authorized laboratories - Publicizing BEPIS data of products - Printing BEPIS mark on designated products
Name of Target	Housing/Building design firms and consultants
Expected Action	- Use of authorized building material for design - House/Building design with reliable insulation performance
Name of Target	Housing/Building contractors
Expected Action	- Use of authorized building material for construction
Name of Target	Housing/Building owners/developers
Expected Action	- Use of authorized building material for houses/buildings

(7) Workflow

Phase 1 (Pilot Stage)



Phase 2 (Final Stage)



(8) Required Permanent Human Resources

Phase 1 (Pilot Stage)	Human Resources	Financial Resources
	SASO New Department Registration: 2 Dissemination and publication: 1 Database engineer: 1	Standard Cost: 300,000 SR/year/person 0.3 x 4 = 1.2 million SR/year
	SASO Existing Department No incremental staff	No incremental cost
Phase 2 (Final Stage)	**Human Resources**	**Financial Resources**
	SEEC Inspection: 1 Dissemination and publication: 1	Standard Cost: 300,000 SR/year/person 0.3 x 2 =0.6 million SR/year
	SASO New Department Registration: 1 Database engineer: 1 Some of SASO tasks might be transferred to SEEC.	Standard Cost: 300,000 SR/year/person 0.3 x 2 =0.6 million SR/year

(9) Required Items

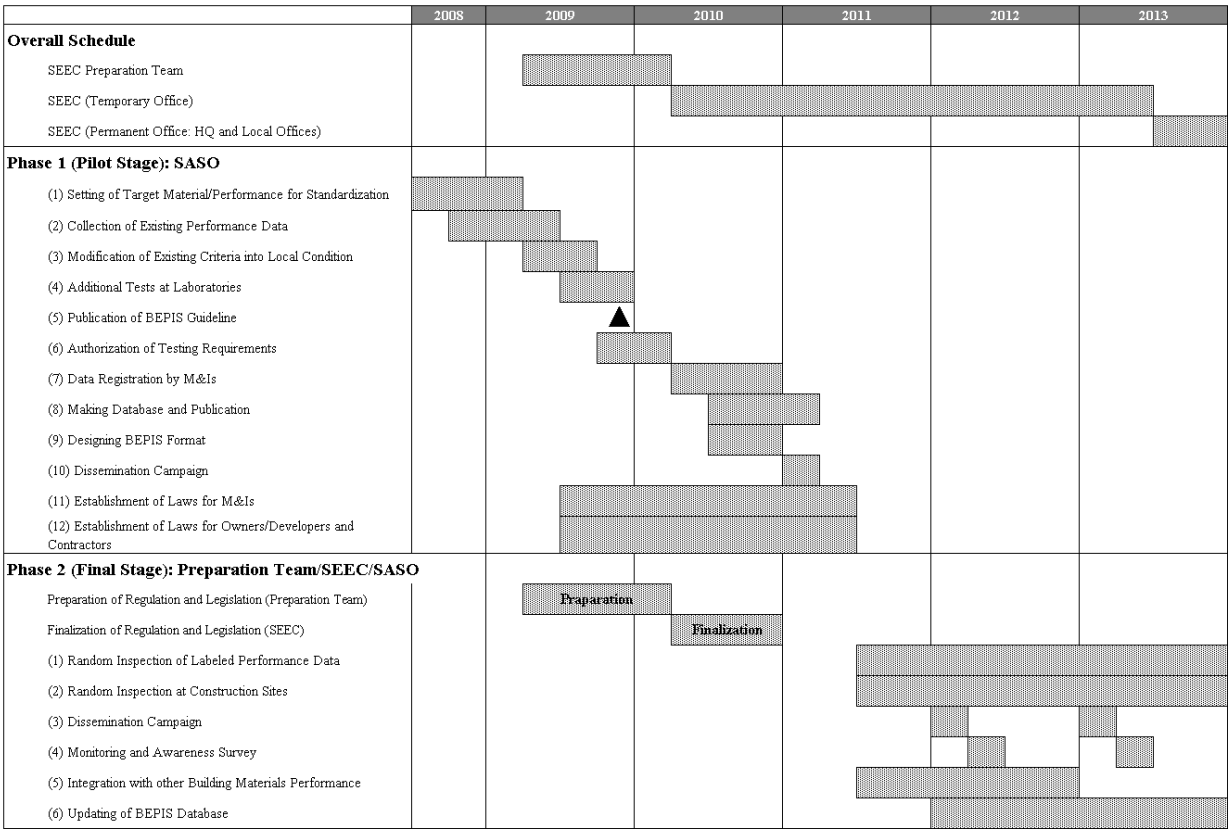
Phase 1 (Pilot Stage)	Item	Budget
	- Database software (SASO) - Internet access system to the database (SASO) - Format of BMEP mark (SASO)	1 million SR/time 0.5 million SR/time -
Phase 2 (Final Stage)	Item	Budget
	- Testing cost for random inspection of performance data (SEEC) - Inspection cost at construction site (SEEC)	300,000 SR/year (=30,000 SR x 10 times) 150,000 SR/year (=3,000 SR x 50 times)

(10) Expected Legislation for Enforcement

Phase 1 (Pilot Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	Role of Manufactures and Importers	-
	Standards of Judgment for Manufacturers /Importers and Registration of the Performance	(1) Designated building material is specified by a Cabinet Order. (to be prepared by SASO, MOCI and SBCC) (2) Standards of judgment for each building material are specified by a Cabinet Order. (to be prepared by SASO, MOCI and SBCC) (3) Designated agency to register the performance is appointed by an Announcement from the Minister. (to be prepared by MOCI)
	Recommendation and Orders concerning Improvement of Performance	Manufacturer/Importer to be recommended is specified by a Cabinet Order. (to be prepared by SASO or MOCI)
	Indication marking and obligation to Manufacturers /Importers	The marking method to be taken by Manufacturers /Importers is specified by an Announcement from the Ministry. (to be prepared by SASO or MOCI)
	Recommendation and Orders concerning Printing BEPIS Mark	-
	Provision of Information	-
	Penalty	-

Cabinet Order: In case that decision making can be made among more than 2 ministries.
Ordinance of the Ministry: In case that decision making can be made by 1 ministry.
Announcement from the Ministry: Guideline or notification

(11) Expected Action Plan



(12) Attachment

(Act and Relating Documents to Act to be established)

- Sample of Act

(Others)

- Sample form of BEPIS database

(13) Items to be Further Studied

- Legislation of Saudi Building Code Enforcement Orders/Ordinance
  - Enforcement of the use of certified (BEPIS-marked) material will be exercised through implementation of Saudi Building Code, which also covers whole building issues as structure, safety, sanitary etc.
  - BEPIS implementation needs to develop in close contact with SBC implementation roadmap.
- Roll of House/Building Owners/Developers, Designers/Consultants and Contractors
  - Use of building material is conducted; by House/Building Owners/Developers' decision, with Designers/Consultants' design, and at Contractors' practice.
  - Therefore all their responsibility in using certified material should be clearly stated in SBC enforcement orders/ordinance, through necessary license, building permission, inspection procedure and penalties in case of violations.

Attachment 10-1. Promotion of Architecture Technology (Building Material Energy Performance Indication System (BEPIS))

Item	Contents	Remark
Article 1 Role of Manufacturers and Importers	Business operators engaged in manufacturing or importing energy-consumption related building materials hereinafter referred to as "Manufacturers/Importers" shall endeavor to contribute to the rational use of energy in houses and buildings in which their manufactured or imported material are used, by improving the performance of materials in light of energy consumption.	This item stipulates that all business operators engaged in manufacturing or importing building materials related to energy consumption shall endeavor to improve the performance of their materials.
Article 2 Standards of Judgment for Manufacturers /Importers and Registration of the Performance	(1) With respect to energy-related building materials heavily used in Saudi Arabia which are specified by a Cabinet Order*1 in the respect that it is particularly necessary to improve the performance thereof hereinafter referred to as "Specified Building Material", the competent Minister shall establish and publicize standards of judgment, specified by a Cabinet Order*2, for Manufacturers /Importers, with regard to the improvement of the performance for the respective Specified Building Materials.	This item stipulates that designated building materials are specified by a Cabinet Order. The standards of judgment is specified by the competent Ministry. The standards of judgment stipulates the performance data to be indicated, the test methods, and the lowest level of the performance (minimum standard level).
	(2) The standards of judgment prescribed in the preceding paragraph shall be established by taking into consideration the lowest level of the performance as prescribed in the preceding Article for the respective Specific Materials.	This item stipulates the minimum standard level of the Specific Materials.
	(3) The Manufacturers/Importers shall send the performance of Specific Materials to a designated agency appointed by the competent Minister*3.	This item stipulates an obligation of sending the performance data to a designated agency.

Item	Contents	Remark
Article 3 Recommendation and Orders concerning Improvement of Performance	(1) The competent Minister may, when he finds it necessary for a Manufacturer/Importer whose production or import volume of Specified Material satisfies the requirements specified by a Cabinet Order*4 to improve the performance prescribed in Article 1, with respect to the Specified Materials that the Manufacturer/Importer manufactures or imports, to a considerable extent in light of the standards of judgment prescribed in paragraph (1) of the preceding Article, recommend the Manufacturer/Importer to improve the performance of the manufactured or imported Specified Materials, setting targets for improvement.	This item specifies manufacturers and importers who shall comply with this Act, by a Cabinet Order. Besides the competent Minister can recommend to improve the performance when necessary.
	(2) Where a Manufacturer/Importer that has received recommendations made under the preceding paragraph has failed to follow the recommendations, the competent Minister may publicize this.	This item is a kind of penalty.
	(3) Where a Manufacturer/Importer that has received recommendations prescribed in paragraph (1) has failed to take the measures recommended without justifiable grounds, the competent Minister may, when he finds that such failure significantly affects the rational use of energy in buildings which use Specified Material, order the Manufacturer/Importer to take the measures recommended.	This item is stronger treatment for Manufacture /Importers who has failed to take the measures recommended without justifiable grounds even after the above recommendation.

Item	Contents	Remark
Article 4 Indication Marking and Obligation to Manufacturers /Importer	The competent Minister shall specify the following matters for the respective Specified Materials*5, and make public notice of them. ・ Matters to be indicated in indication marking by Manufacturers/Importers with regard to energy efficiency of Specified Material the value calculated pursuant to the provision of an Ordinance of the Ministry. ・ The marking method and other matters to be observed by Manufacturers/Importers when indicating energy efficiency.	This item stipulates the indicating method for Specific Material, specified by an Announcement from the Ministry. Besides, it stipulates the indication marking obligation to the Manufacturers/Importers.
Article 5 Recommendation and Orders concerning Printing BEPIS Mark	(1) The competent Minister, when he finds that a Manufacturer/Importer does not print indication marks of energy efficiency in accordance with the public notice made under the preceding Article with respect to Specified Material, recommend the Manufacturer /Importer to print indication marks of energy efficiency, in accordance with the public notice, to the manufactured or imported Specified Material.	The competent Minister can recommend a Manufacturer/ Importer to print indication marks of energy efficiency when necessary.
	(2) Where a Manufacturer/Importer that has received recommendations made under the preceding paragraph has failed to follow the recommendations, the competent Minister may publicize this.	This item is a kind of penalty.
	(3) Where a Manufacturer/Importer that has received recommendations prescribed in paragraph (1) has failed to take the measures recommended without justifiable grounds, the competent Minister may, when he finds that such failure significantly affects the rational use of energy in buildings which use Specified Material, order the Manufacturer/Importer to take the measures recommended.	This item is stronger treatment for Manufacturers /Importers who has failed to take the measures recommended without justifiable grounds even after the above recommendation.

Item	Contents	Remark
Article 6 Provision of Information	Business operators engaged in distributing energy-consumption related building materials, and other business operators capable of cooperating, through their business activities, in owners, developers, designers, consultants and building contractors' efforts towards the rational use of energy shall endeavor to provide information that contributes to owners, developers, designers, consultants and building contractors' efforts towards the rational use of energy, by making notifications on the status of energy use of buildings and indicating the performance of materials in light of building energy efficiency.	This item stipulates that building material distributors shall endeavor to provide information.
Article 7 Penalty	A person who falls under any of the following items shall be punished by a fine of not more than ## Saudi Riyal. • A person who has violated an order issued under Article 3 (3) and Article 5 (3).	This is penalty clause when a Manufacturer/Importer does not improve even after recommendation and order of the Minister.

*1 Energy-related building material (Cabinet Order)
To be prepared by SASO, SBCC and MOCI

*2 Standards of judgment (Ordinance of the Ministry)
To be prepared by SASO, SBCC and MOCI

*3 A designated agency appointed by the competent Minister (Announcement from the Ministry)
To be announced by a competent Ministry

*4 Production or import volume of Specified Material satisfies the requirements (Cabinet Order)
To be prepared by SASO or MOCI

*5 Matters for the respective Specified Material (Announcement from the Ministry)
To be formulated by SASO or MOCI

Attachment 10-2. Others

Sample Form of BEPIS Database

Material Category					Registration		Product Information		Required Information						Energy Performance Rating (5-1) *1
					Number	Date	Name	Manufacturer	U-Value (W/m2K)	Thermal Conductivity λ (W/mK)	Volumetric Specific Heat (kJ/m3K)	Shading Coefficient SC	Tested Laboratory	Certified Date	
A Wall / Roof Material	1 Structural Material	1 Cast Concrete	a Ordinary Concrete		A-0101-a-##				-	○	○	-			
			b Cinder Concrete		A-0101-b-##				-	○	○	-			
		2 Concrete Block	a Concrete Block		A-0102-a-##				○	-	○	-			
			b Hollow Concrete Block		A-0102-b-##				○	-	○	-			
			c Concrete Block with Polystyren		A-0102-c-##				○	-	○	-			
		3 Brick	a Brick		A-0103-a-##				○	-	○	-			
			b Hollow Brick		A-0103-b-##				○	-	○	-			
	2 Heavyweight Panel	1 Concrete Panel	a Precast Concrete Panel		A-0201-a-##				○	○	○	-			
			b Autoclaved Concrete Panel		A-0201-b-##				○	○	○	-			
		2 Curtain Wall Unit	a Metal Curtain Wall		A-0202-a-##				○	-	-	-			
			b Glass Curtain Wall		A-0202-b-##				○	-	-	-			
	3 Lightweight Panel	1	a Wooden Sheathing Board		A-0301-a-##				○	○	-	-			
			b Cellulose Panel		A-0301-b-##				○	○	-	-			
			c Extruded Cement Panel		A-0301-c-##				○	○	-	-			
	4 Wall / Roof Covering Material	1	a Stone		A-0401-a-##				○	○	-	-			
			b Ceramic Tile		A-0401-b-##				○	-	-	-			
	5 Plastering Material and Paint	1 Plastering Material	a Mortar		A-0501-a-##				-	○	-	-			
			b Plaster		A-0501-b-##				-	○	-	-			
		2 Paint	a Waterproof Membrane		A-0502-a-##				○	○	-	○			
			b Paint		A-0502-b-##				○	-	-	○			
B Insulation	1 Insulation	1 Foam Board	a Expanded Polystyrene Foam		B-0101-a-##				○	○	-	-			
			b Extruded Polystyrene Foam		B-0101-b-##				○	○	-	-			
		2 Rigid Panel	a Fiberglass Panel		B-0102-a-##				○	-	-	-			
			b Polyurethane Panel		B-0102-b-##				○	-	-	-			
		3 Loose Fill / Batt	a Rock and Slag Wool Loose Fill		B-0103-a-##				○	○	-	-			
			b Fiberglass Loose Fill		B-0103-b-##				○	○	-	-			
		4 Spray	a Rock and Slag Wool Spray		B-0104-a-##				○	○	-	-			
			b Cellulose Spray		B-0104-b-##				○	○	-	-			
			c Polyurethane Spray Foam		B-0104-c-##				○	○	-	-			
C Opening	1 Sash *2	1	a Aluminum Sash		C-0101-a-##				○	-	-	-			
			b Steel Sash		C-0101-b-##				○	-	-	-			
	2 Glass	1 Single Pane Glass	a Transparent Glass		C-0201-a-##				○	○	-	○			
			b Heat Absorbing/Reflective Glas		C-0201-b-##				○	○	-	○			
			c Low-Emittance Glass		C-0201-c-##				○	○	-	○			
		2 Double Pane Glas	a Transparent Glass		C-0101-a-##				○	○	-	○			
			b Heat Absorbing/Reflective Glas		C-0202-b-##				○	○	-	○			
			c Low-Emittance Glass		C-0202-c-##				○	○	-	○			

?: Required Value for Registration

*1: 5 - Best Performance 1- Minimal Required Performance

*2: To be Tested with Unit Area of Single Glass

11. Monitoring and Awareness Survey (MAS)

(1) Program Name

Monitoring and Awareness Survey (MAS)

(2) Objective

- Monitoring and evaluation of energy conservation progress in nation wide
- Grasping energy conservation consciousness of KSA people

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	- Identification of necessary survey - Development of questionnaire sheet for each survey - Implementation of questionnaire survey by interview and/or internet - Presentation of the surveyed result at a workshop in EC month and via internet (workshop / MOWE / KACST / SASO web sites) - Making database for the surveyed results - Analyzing the surveyed results and making recommendation for the future steps - Continuously implementation of the surveys annually	
Phase 1 (Pilot Stage)	Task	Responsible Agency
	(1) Identification of necessary survey: · Electricity consumption of governmental, industry, commercial and residential sector by utilizing SEC meter (100 each) · EC practice and used EC technology in industry (100) · EC awareness and practice level of governmental, industry, commercial and residential sector (100 each) · Study for effective dissemination on labeling (100) (2) Development of questionnaire sheet for each survey (3) Implementation of questionnaire survey by interview and/or internet (4) Presentation of the surveyed result at a workshop in EC month and via internet (workshop / MOWE / KACST / SASO web sites) (5) Making database for the surveyed results (6) Analyzing the surveyed results and making recommendation for the future steps	SEC MOWE MOWE SASO Each Agency Each Agency MOWE and Each Agency MOWE Each Agency MOWE

Phase 2 (Final Stage)	Task	Responsible Agency
	Same as the task of "Phase 1 (Pilot Stage)" (1) Continuous implementation of the surveys annually (MOWE tasks will be transferred to SEEC)	SEEC

(4) Executing Agency

Name of Agency	Ministry of Water and Electricity (MOWE)
Expected Role	**(Pilot Stage)** - Identification of necessary survey - Development of questionnaire sheet for each survey - Implementation of questionnaire survey by interview and/or internet - Presentation of the surveyed result at a workshop in EC month and via internet (workshop / MOWE / KACST / SASO web sites) - Making database for the surveyed results - Analyzing the surveyed results and making recommendation for the future steps
Name of Agency	Saudi Energy Efficiency Center (SEEC)
Expected Role	**(Final Stage)** - Continuously implementation of the surveys annually

(5) Relating Agency

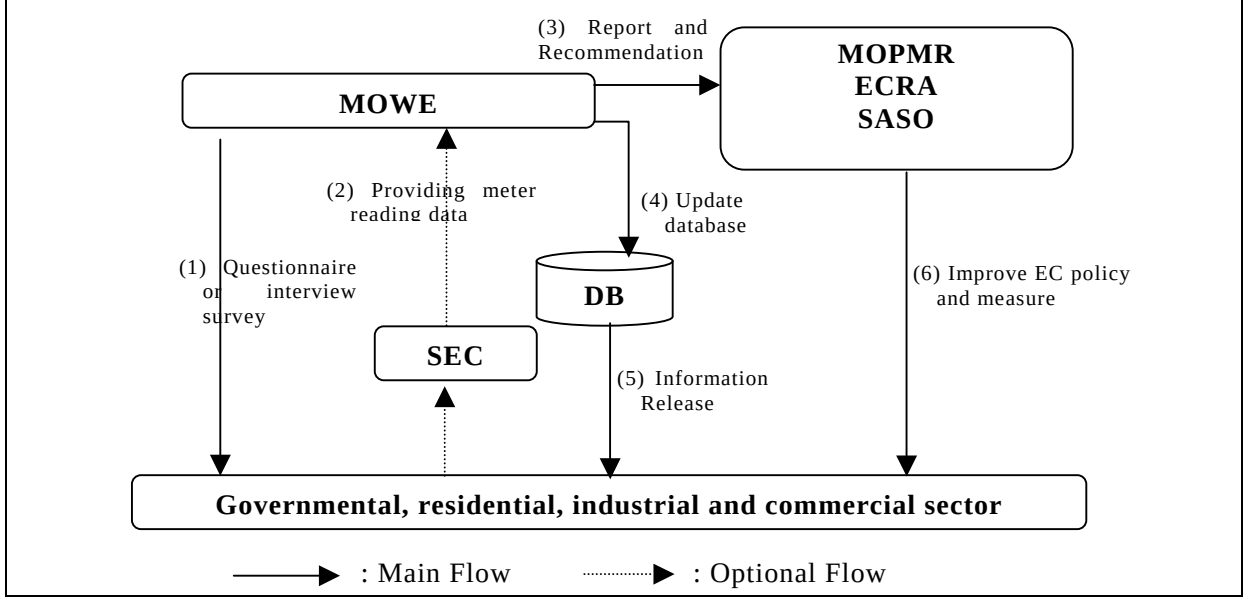
Name of Agency	Ministry of Petroleum and Mineral Resources (MOPMR)
Expected Role	- Data/Info collection - EC Policy planning based on surveyed result
Name of Agency	ECRA
Expected Role	- EC Policy planning based on surveyed result
Name of Agency	SEC
Expected Role	- Data/Info collection - Provision of meter reading with daily load curve
Name of Agency	SASO
Expected Role	- Data/Info collection - Policy planning of labeling based on surveyed result

(6) Target of the Scheme

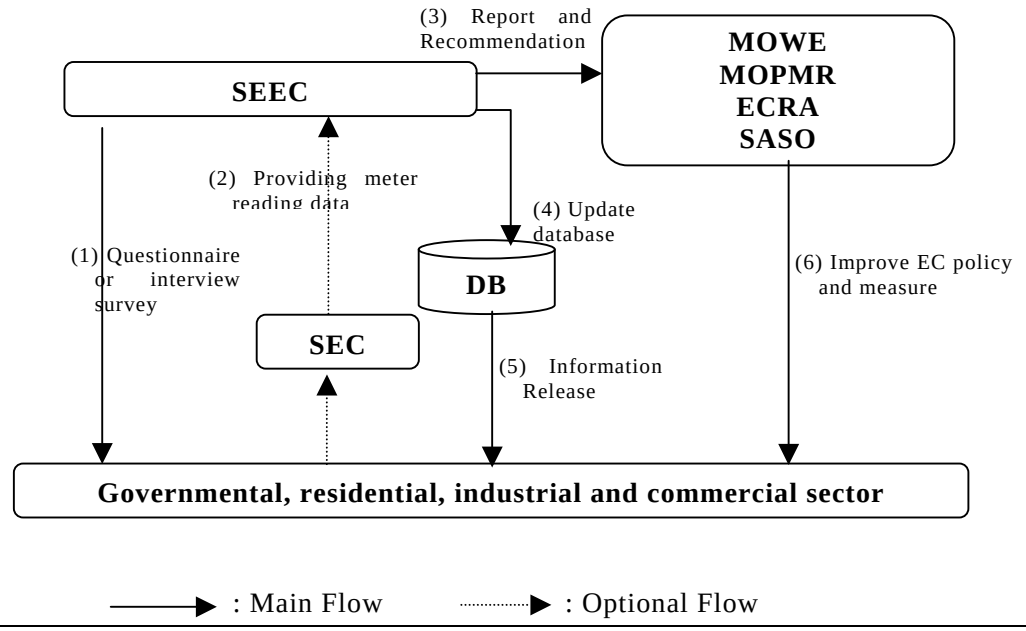
Name of Target	Industrial sector
Expected Action	- Answering questionnaire or interview (Situation of energy consumption, EC progress in energy intensity, EC practice level, Penetration of EC technology, EC consciousness, Future plan, etc.)
Name of Target	Government and Commercial sector
Expected Action	- Answering questionnaire or interview (Situation of energy consumption, EC progress in energy intensity, EC practice level, Penetration of high efficient equipment/appliances, EC consciousness, Future plan, etc.)
Name of Target	Residential sector
Expected Action	- Answering questionnaire or interview (Situation of energy consumption, EC practice level, Penetration of high efficient appliances, EC consciousness, etc.)
Name of Target	Customers for home appliances
Expected Action	- Answering questionnaire or interview (Recognizing level of the labeling and standard system, effective dissemination method, compliance level in retail shops, etc.)

(7) Workflow

Phase 1 (Pilot Stage)



Phase 2 (Final Stage)



(8) Required Permanent Human Resources

Phase 1 (Pilot Stage)	Human Resources	Financial Cost for Human Resources
	MOWE No incremental staff	No incremental cost
Phase 2 (Final Stage)	Human Resources	Financial Resources
	SEEC Questionnaire designer and analyst: 2 Database engineer: 1	Standard Cost: 300,000 SR/year/person 0.3 x 3 = 0.9 million SR/year

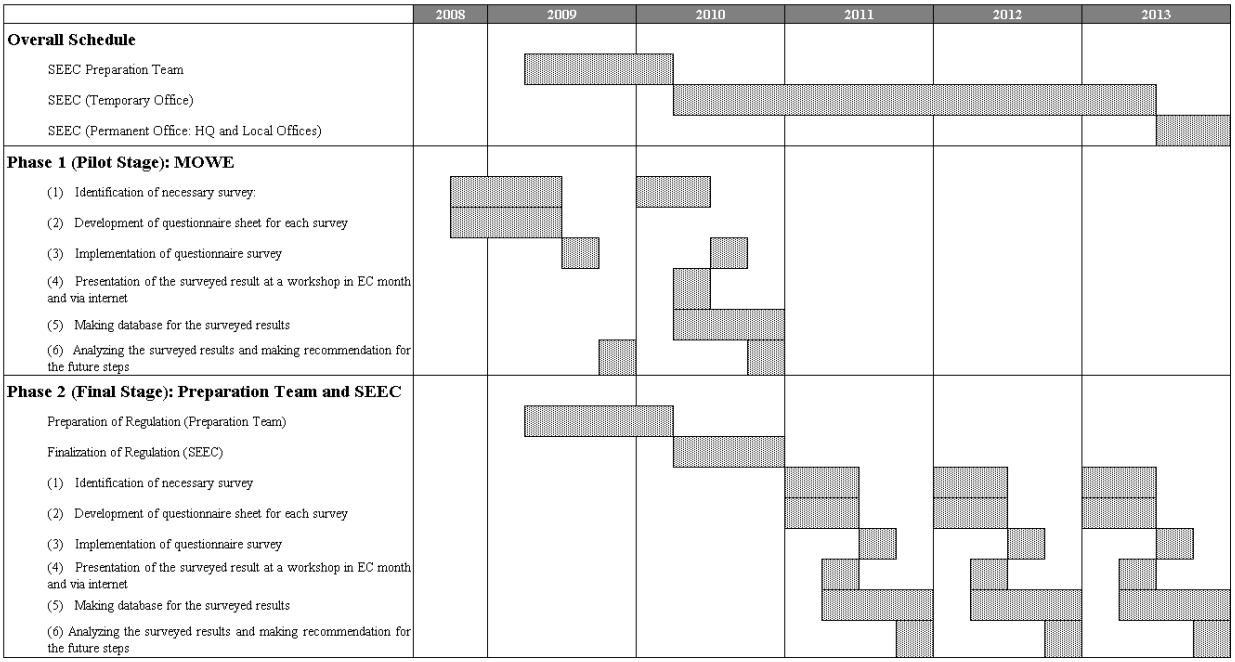
(9) Required Items

Phase 1 (Pilot Stage)	Item	Budget
	- Database software (MOWE) - Internet access system to the database (MOWE) - Survey cost (MOWE): · Electricity consumption of governmental, industry, commercial and residential sector by utilizing SEC meter (100 each) · EC practice and used EC technology in industry (100) · EC awareness and practice level of governmental, industry, commercial and residential sector (100 each) · Study for effective dissemination on the labeling and standard system (100)	1 million SR/time 0.5 million SR/time - 0 SR/year 0.5 million SR/time 0.5 million SR/time 0.1 million SR/time
Phase 2 (Final Stage)	Item	Budget
	- Survey cost (SEEC): · Electricity consumption of governmental, industry, commercial and residential sector by utilizing SEC meter (100 each) · EC practice and used EC technology in industry (100) · EC awareness and practice level of governmental, industry, commercial and residential sector (100 each) · Study for effective dissemination on the labeling and standard system (100)	- 0 SR/year 0.5 million SR/time 0.5 million SR/time 0.1 million SR/time

(10) Expected Legislation for Enforcement

Phase 1 (Pilot Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan



(12) Attachment

- Sample questionnaire sheet for “EC practice and used EC technology in industry”
- Sample questionnaire sheet for “EC awareness and practice level of industry, commercial and residential sector”
- Sample questionnaire sheet for “Study for effective dissemination on labeling”
- Evaluation plan for “EC Exhibition”

Attachment 11. Monitoring and Awareness Survey (MAS)

Sample questionnaire sheet for "EC practice and used EC technology in industry"

1. EC practice in industry

Minor Category		Realistic Energy Conservation Measures		Evaluation			
				Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
1.1.	Transformer	1.1.1.	Shut down of Transformer when not necessary				
		1.1.2.	Tap Change of Transformer using higher tap of primary side				
		1.1.3.	Shut down of Tight Transformer when relevant equipment is off				
		1.1.4.	Use of Proper Capacity of Transformer (Too large transformer→Low Phase factor)				
		1.1.5.	Temp. Control around Transformers by Ventilation (Less than 30℃ is recommended)				
		1.1.6.	Adoption of High Efficiency Transformer				
		1.1.7.	Prevention of Excess Load (Reduction of load loss)				
		1.1.8.	Equipartition of Load for quantity control				
		1.1.9.	Proper multi Transformer use by Seasonal Change (Use of Load Curve for analysis is recommended.)				
1.2.	Demand Control	1.2.1.	Introduction of Demand Control Circuit to reduce Peak Load				
1.3.	Wiring	1.3.1.	Utilization of Single Phase Three Line (Use of neutral line reduces copper				
		1.3.2.	Shortening and/or Thickening of Wire (Reduction of wire loss)				
2.1.	Temperature Setting	2.1.1.	Change of Room Temperature Setting				
		2.1.2.	Change of Chilled Water Temperature Setting				
		2.1.3.	Proper Humidity Control in Summer				
2.2.	Operation	2.2.1.	Reduction of Outside Air Intake				
		2.2.2.	Intermittent Operation (No use is the best Energy Saving measure.)				
		2.2.3.	Reduction of Blown Air Volume				
		2.2.4.	Best mixed Operation of Air Conditioner and Natural Ventilation				
2.3.	Ancillary Equipment	2.3.1.	Equalization of Room Temp. by Ancillary Equipment (Circulator, Fan, etc.)				
		2.3.2.	Use of Sunblind for interrupting Sunshine				
		2.3.3.	Blocking of Outside Air Intrusion by Air Curtain				
3.1.	Cleaning	3.1.1.	Cleaning of Lighting Apparatuses				
		3.1.2.	Introduce of Dust Resistant lighting Apparatuses				
3.2.	ON/OFF	3.2.1.	Switch Color Coding for easy Identification for finding right switch				
		3.2.2.	Good grouping of lamps for switching off when unnecessary				
		3.2.3.	Installation of Pull Switch for each Apparatus				
		3.2.4.	Installation of automatic On/Off switch				
3.3.	Efficient Utilization	3.3.1.	Reflection Rate Improvement of Wall				
		3.3.2.	Local Lighting				
		3.3.3.	Utilization of Natural Light				
		3.3.4.	Location Change of Lighting Apparatus for lighting just point				
3.4.	Energy Efficient Equipment	3.4.1.	Adoption of High Efficiency Equipment				
		3.4.2.	Introduction of Hf Type Apparatus				
		3.4.3.	Change to Fluorescent Bulb from White Lamp				

Minor Category		Realistic Energy Conservation Measures		Evaluation			
				Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
4.1.	Operation	4.1.1.	Idling Prevention				
		4.1.2.	Operation by Proper Voltage (5% of Voltage shift→10% of property down)				
		4.1.3.	Operation at Proper Load (60-100% of full load is preferable.)				
4.2.	Maintenance	4.2.1.	Quality Management of Brushes in Direct Current Power Generator				
		4.2.2.	Efficiency Improvement by Inspection and Maintenance				
4.3.	Efficiency Improvement	4.3.1.	Improvement of Power Factor (More than 85%)				
		4.3.2.	Improvement of Energy Transfer Efficiency				
4.4.	Selection of Equipment	4.4.1.	Proper Model Selection according to Load				
		4.4.2.	Selection of High Efficiency Equipment				
5.1.	Proper Specification	5.1.1.	Selection of Equipment of Proper Specification				
		5.1.2.	Impeller Change (Reduction of Contraction Loss)				
5.2.	Operation	5.2.1.	Review of Parallel and Series Operation (Recalculation of Piping and Duct				
		5.2.2.	Avoidance of Light Load Operation of Blower				
		5.2.3.	Adoption of Pump Revolution Speed Control instead of Bulb Contraction				
		5.2.4.	Inverter Control of Air Conditioner				
		5.2.5.	On/Off Control of Ventilation Fan Operation by using a temperature sensor				
		5.2.6.	On/Off of chiller pump and cooling tower fan with compressor operation				
6.1.	Cooling Tower	6.1.1.	Quantity control of Cooling Towers				
		6.1.2.	Utilization of cooling towers in winter (Shut down of air conditioner)				
6.2.	Refrigerator	6.2.1.	Change of Refrigerator control procedure (From chilled water input Temp. control to output Temp. control)				
7.1	Total Measures	7.1.1.	Shut down of compressor with timer by production analysis				
		7.1.2.	Air Pressure Reduction				
		7.1.3.	Prevention of Air Leakage				
		7.1.4.	Use of Supply Pipe of Large Size and of Loop Form				
7.2.	Individual Measures	7.2.1.	Reduction of Air Nozzle Diameter				
		7.2.2.	Air Blow from short distance (Long distance → Low pressure)				
		7.2.3.	Using small air nozzles with high pressure				
		7.2.4.	Recommended tool installation before air nozzle (Stop valve, Reducing valve, Two port valve, and Large scale piping)				
		7.2.5.	Installation of an air saver in air micrometer				
		7.2.6.	Just fit Cylinder System is the best selection for air actuators				
		7.2.7.	Usage of Energy Conservation Valve				
		7.2.8.	Adoption of double power differential cylinder				

Minor Category		Realistic Energy Conservation Measures		Evaluation			
				Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
8.1.	Furnace Body	8.1.1.	Reinforcement of Insulation				
		8.1.2.	Curtain Installation at entrance				
		8.1.3.	Separation of Heat Source for Melting and Keeping temperature				
		8.1.4.	Treating time reduction by increasing heat power and reinforcing insulation				
		8.1.5.	Time Reduction by Air Circulation in Melting Furnace				
8.2.	Treating Materials	8.2.1.	Use of Lighter Treating Materials				
		8.2.2.	Increase of Treating Material Volume Ratio in Furnace				
8.3.	Heat Recovery	8.3.1.	Recovery of Product Heat in Baking Furnace				
9.1.	Rational Utilization of Dryer	9.1.1.	Time Reduction by Proper Temperature of Drying				
		9.1.2.	Alignment Improvement of Treating Material in Dryer				
		9.1.3.	Improvement of Drying Vessel				
9.2.	Utilization of Excess and Waste Heat	9.2.1.	Utilization of Excess Heat in Infrared Dryer				
		9.2.2.	Hot Water Supply from Waste Heat in Odor Removing Furnace				
		10.1.1.	Shortening the Length of Secondary conduction Wire of Welding Machine				
		10.1.2.	Reduction of Un-utilized Loss Current of Resistant Welder				
		10.1.3.	Installation of Integrated Capacitor in Alternate Current Welder for Power Factor Improvement				
		10.1.4.	Unit Consumption Improvement by Semi-Automatic Welding Work				

2. Used EC technology in industry

List of Energy Conservation Technologies of Japan 1 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Iron & Steel (14)	Power generation by blast furnace top pressure				
	Direct current type arc furnace with water-cooling wall				
	High frequency melting furnace				
	Channel type induction furnace for cast iron fusion				
	Alloy iron furnace of high energy efficiency				
	Feedstock pre-heating system for electric furnace				
	Adoption of plunger type pump for de-scaling				
	High efficiency gas separation system				
	Energy conservation operation of arc furnace				
	Belt conveyer of sand transportation				
	Compressor operating number management				
	Electricity reduction of industrial water pump				
	DC twin electric furnace				
	Lazar cutting machine				
Metal (2)	Lighting energy reduction				
	Closed recycle system for high pressure water				
Aluminum (5)	Variable pump installation for maintaining oil pressure				
	VVVF control of pump and fume blower				
	Low rotating speed operation of circulating fan				
	Heat loss reduction of energy efficient electric furnace				
	Operation improvement of hot air circulating fan installed in aluminum annealing furnace				

List of Energy Conservation Technologies of Japan 2 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Cupper (2)	Efficiency improvement of flash furnace in cupper refinery process				
	Energy conservation in cupper electrolysis process				
Ammonia (1)	Isothermal CO shift reactor in ammonia process				
Caustic Soda (5)	Electrolysis vessel of ion exchange method for energy conservation				
	Sodium chloride electrolysis vessel of ion exchange method				
	Negative electrode improvement in electrolysis vessel of ion exchange method				
	Conversion from membrane method to ion exchange method				
	Electricity reduction of sodium chloride electrolysis vessel				
Ethylene (2)	Turbo expander installation in the gas line of de-methanizer top				
	Cold heat recovery from the bottom stream in de-methanizer				
BTX (2)	Heat recovery from top vapor of ortho xylene separation column				
	Steam turbine power generation by the waste heat of column top vapor				
Medicals (2)	Gelatin drying system by heat pump				
	Process improvement of oxygen concentration by ultra filtration				

List of Energy Conservation Technologies of Japan 3 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Chemicals (11)	Powder detergent drying system by gas turbine waste gas				
	Ethanol recovery system by heat pump of vapor re-compression				
	Power recovery of waste gas by gas expander				
	Compressor energy Conservation				
	Blower renewal for energy conservation				
	Electricity and steam reduction				
	Chiller motor stoppage during winter				
	Reduction of start loss in foaming process				
	Motor change in agitation				
	Chiller operation method				
	Waste gas recycle and energy efficient equipment				
Rubber (2)	Load reduction of compressors for production				
	Level control of lifting pump				
Plastics (1)	Energy conservation activity				
Refinery (3)	Power recovery by condensing turbine in catalytic cracking				
	Energy conservation of recycling gas reduction in reformer				
	Reboiler steam reduction of amine regeneration in desulphurization system of diesel oil				

List of Energy Conservation Technologies of Japan 4 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Cement (9)	Vertical roller mill in feed crashing process				
	Vertical roller mill in coal crashing process				
	Pre-crasher (Roller press) in finishing process				
	Pre-crasher for clinker (Pre-grinder) in finishing process				
	High efficiency separator in finishing process				
	Waste stone circulating system in vertical roller mill process				
	Waste tire combustion as alternative fuel in calcinations furnace				
	Power generation by waste heat in cement manufacturing				
	Sludge treatment				
Glass (2)	Electric melting furnace in crucible furnace process				
	High efficiency melting furnace and molding system				
Ceramic (1)	New alloy metal (TZ)				

List of Energy Conservation Technologies of Japan 5 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Paper and Pulp (18)	Pulp washing system of medium concentration substitution type				
	Secondary separation pulper system in decollement process for treatment of waste paper				
	Oxygen de-lignin system				
	High temperature and odorless recovery boiler				
	Heat recovery of thermo mechanical pulp in pulp manufacturing process				
	High efficiency surface pressure dryer				
	Heat recovery by sludge combustion furnace				
	Re-powering system and gas turbine waste heat boiler				
	Chemical mixer of medium concentration in oxygen de-lignin and bleaching process				
	Combined system of round hole slit screen and decollement				
	Combined screen of multi function				
	Crown control roll of energy conservation type				
	High temperature soft calendar for paper manufacturing				
	AC driving of paper processing and winder system				
	Rotating speed control in paper processing equipments				
	Electricity conservation of vacuum pump in paper manufacturing				
	Energy conservation manufacturing process of thermo mechanical pulp				
	Rotating speed control				

List of Energy Conservation Technologies of Japan 6 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Sugar (3)	Drum type beet slicer				
	Molasses cleaning method by magnesia				
	Fan type cleaning system				
Food (7)	Fluidized spray dryer for granulation				
	Salt manufacturing by new ion exchange membrane				
	Anaerobiotic waste water treatment				
	Gas turbine and cogeneration				
	Utilization of pulp mold				
	Sludge reduction of waste water treatment				
	Fuel cell using methane gas from anaerobiotic wastewater treatment				
Spinning (8)	High efficiency weaving loom of rapier arm type				
	Water jet loom				
	High speed combing machine				
	High speed fine spinning machine				
	High speed spinning machine of bathing type				
	High speed spinning machine of bathing type and multi yarn				
	High speed card machine for spinning				
	High efficiency motor for stretching and twisting				

List of Energy Conservation Technologies of Japan 7 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Dyeing (4)	Dyeing system of micro wave type				
	Jet flow dyeing system				
	Counter flow cleaning system for dyeing				
	High frequency dryer for twisted yarn dyeing				
Gas / Electricity (7)	Cooling system of gas turbine combustion air				
	Soot blower for large scale boiler				
	Combined cycle re-powering system of waste gas re-combustion				
	Industry re-powering system				
	Rotating speed control by wet type transmission for blowers in large scale boiler				
	High back pressure ejector for LPG supply				
	Field gas work by non cut and cover construction				
Construction (1)	Air bubble method of soil remediation				

List of Energy Conservation Technologies of Japan 8 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Electric appliance (21)	Lighting improvement by natural lighting system				
	Solar photovoltaic power generation in private power station				
	Utilization of furnace air to heating source in winter				
	Cogeneration system1				
	Cogeneration system2				
	Management organization				
	Independent blower for bubbling in metal finishing process				
	Air conditioner and lighting in office				
	Amorphous transformer in supermarket				
	Dyeing process stop by PCM frame system introduction				
	Energy conservation of turbo refrigerator during long term stoppage				
	Timer control of air dryer				
	Low pressurization of reverse osmosis membrane in pure water process				
	High pressure sodium lamp of ceiling light				
	Energy efficiency of air conditioner outside apparatus				
	Optimization of heat exchanger cleaning interval of air conditioner				
	Demand control system				
	Integration of air conditioner piping				
	Pump inverter				
	Inverter of R/O pump in water purification				
	Water reutilization in laundry factory				

List of Energy Conservation Technologies of Japan 9 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Machine (3)	Dry cutting of CNC lathe				
	Thermal cracking gasification and melting technology by kiln method				
	Air heating				
Others (3)	Die-cast recycling				
	Fuel oil change				
	Automatic start and stop of compressor				

List of Energy Conservation Technologies of Japan 10 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Common (27)	Energy conservative combustion system of small and medium size boiler				
	Oxygen rich combustion system				
	Heat pump using cooling water from air compressor as heat source				
	Low temperature vacuum concentrating system of heat pump type				
	Waste heat recovery system of refrigerator				
	Cogeneration system of waste heat boiler with additional heating				
	Gas turbine cogeneration system of variable ratio of heat and electricity				
	Power recovery by steam turbine in vacuum steam line				
	Expansion turbine for low pressure steam				
	Condensing turbine for low pressure steam				
	Extracting turbine of steam with vapor				
	Fluid joint in high pressure pump for water jet				
	Energy conservation of blower and pump				
	Energy conservation by increasing efficiency of sludge dryer				
	Reverse osmosis membrane for water purification				
	Motor for plastics extruder				
	Screw air compressor with high efficiency inverter				
	Forced fan controlled by microcomputer				
	Pole variable motor by PAM (Pole amplitude modulation) method				
	High efficiency lighting system by constant current				
	Dehumidifier system by refrigeration				

List of Energy Conservation Technologies of Japan 11 (Electricity)

Industry	Contents				
	Name of Technologies	Not Useful / Not Attractive	Implemented	Useful	Attractive to be Studied
Common	Cogeneration system by direct utilization of waste gas for dryer				
	Multi-stage recovery of flash steam				
	Heat efficiency of refractory dryer				
	Pressure control method of private power station				
	Efficiency of turbo air compressor				
	Melting efficiency in continuous desulphurization				

Sample questionnaire sheet for "EC awareness and practice level of industry, commercial and residential sector"

1. EC awareness and practice level of industry sector

8.1 Existence of responsible group for energy management in your firm.

a. yes	b. no

(1) If yes, number of the group member in charge of energy conservation

persons

(2) If yes, what is the group managers responsibility

(3) If any public titles and/or license is required for leader of energy manager in enterprise, please specify it.

(4) Do you have any internal committee for rational energy use?

(5) If you have the internal committee for rational energy use, how oftern is it held annually

times/year

8.2 Existence of energy conservation action plan and/or practice

a. yes	b. no

(1) If yes, pls attach a copy of the plan

8.3 Existence of any target of energy usage

a. yes	b. no

(1) If yes, pls provide all the targets

(2) Pls provide your record against the targets

8.4 Experience of energy audit

a. yes	b. no

(1) If yes, by whom

Internal: pls specify name of person in charge

external: pls specify name of audit firm

(2) If yes, any modification to improve energy efficiency

a. yes	b. no

pls specify

(3) If yes, how frequent is it?

Times/year

8.5 Use of energy efficient equipment

(1) Total enthalpy heat exchanger	a. yes	b. no
(2) Outdoor air cooling	a. yes	b. no
(3) Waste heat recovery	a. yes	b. no
(4) Use of CFL	a. yes	b. no
(5) Inverter drive for pump and fan	a. yes	b. no
(6) Others	Please specify	

8.6 Current activity for rational energy use

(1) Temperature setting of air conditioner		
On cooling	deg C	
On heating	deg C	
(2) Tweaky on/off control of air conditioner	a. yes	b. no
(3) Stop of unnecessary air conditioner	a. yes	b. no
(4) Open/close of drapes/blind	a. yes	b. no
(5) Lights out on break time	a. yes	b. no
(6) Unnecessary lights out	a. yes	b. no
(7) Cut/shift of peak demand of electricity	a. yes	b. no
(8) Others	Please specify	

8.7 In which group does your company belong to on energy saving?

a.	b.	c.	d.	e.
Very conscious about energy saving	Conscious about energy saving	Moderately conscious about energy saving	Unconscious about energy saving	Opposed to energy saving
f. Other : Please specify				

8.8 In which group does your company belong to on air-conditioning?

a.	b.	c.	d.
Always conscious about energy (money) saving	Conscious about cooling energy saving	Unconscious about energy saving	Conscious about importance of cooling, rather than energy
e. Other : Please specify			

8.9 Please mark your approval (personal opinion) for the following idea;

	<-- Be opposed		Neutral		Agree -->
(1) Cooling is expensive and lavish.	1	2	3	4	5
(2) Cooling is energy wasting.	1	2	3	4	5
(3) Cooling is not good for health.	1	2	3	4	5
(4) Cooling makes progress in work or study.	1	2	3	4	5
(5) Cooling is comfortable in sleeping.	1	2	3	4	5
(6) Cooling is necessary tool in Saudi Arabia.	1	2	3	4	5

8.10 Who sets the temperature setting of air conditioner?

a. Facility manager	b. Foreman	c. Sensitive person to heat	d. Sensitive person to Cold
e. Other : Please specify			

8.11 Please mark your approval (personal opinion) for the following idea;

	<-- Be opposed		Neutral		Agree -->
(1) Minimum use of cooling	1	2	3	4	5
(2) Unplug appliance in not used	1	2	3	4	5
(3) Refrigerate after cooling down at outside	1	2	3	4	5
(4) Turn on TV set only when I want to watch	1	2	3	4	5
(5) Everyone puts in at the same room	1	2	3	4	5
(6) Turn off unnecessary light	1	2	3	4	5
(7) Minimum use of automobile	1	2	3	4	5
(8) Have dinner with all family member	1	2	3	4	5
(9) Family member takes a bath one after ano	1	2	3	4	5
(10) EC of home is decrease of utility charge	1	2	3	4	5
(11) EC of home is environment protection	1	2	3	4	5

8.12 If you want to adopt any EC measures and/or install any EC equipment, pls specify.

8.13 If you know, please provide any information on energy conservation dissemination organization

8.14 If you know, please provide any information on published materials / magazines for energy conservation

8.15 If you know, please provide any information on published materials / magazines for energy conservation

8.16 If you know, please provide any information about published energy conservation case study

8.17 Please mark [yes], if you want to have the following service.

(1) Advise on energy management	a. yes	b. no
(2) Advise on upgrading equipment for rational energy use	a. yes	b. no
(3) Provide helpful information to have energy conservation	a. yes	b. no
(4) Energy audit	a. yes	b. no
(5) Introduce ESCO (Energy Service Company)	a. yes	b. no
(6) Others	Please specify	

8.18 Please provide your idea on energy conservation margin and/or potential of your facility

2. EC awareness and practice level of commercial sector

8.1 Existence of responsible group for energy management in your building

a. yes	b. no

(1) If yes, number of the group member in charge of energy conservation

persons

(2) If yes, what is the group managers responsibility

(3) If any public titles and/or license is required for leader of energy manager in enterprise, please specify it.

(4) Do you have any internal committee for rational energy use?

(5) If you have the internal committee for rational energy use, how oftern is it held annually

times/year

8.2 Existence of energy conservation action plan and/or practice

a. yes	b. no

(1) If yes, pls attach a copy of the plan

8.3 Existence of any target of energy usage

a. yes	b. no

(1) If yes, pls provide all the targets

(2) Pls provide your record against the targets

8.4 Experience of energy audit

a. yes	b. no

(1) If yes, by whom

Internal: pls specify name of person in charge

external: pls specify name of audit firm

(2) If yes, any modification to improve energy efficiency

a. yes	b. no

pls specify

(3) If yes, how frequent is it?

Times/year

8.5 Use of energy efficient equipment

	a. yes	b. no
(1) Total enthalpy heat exchanger	a. yes	b. no
(2) Outdoor air cooling	a. yes	b. no
(3) Waste heat recovery	a. yes	b. no
(4) Use of CFL	a. yes	b. no
(5) Inverter drive for pump and fan	a. yes	b. no

(6) Others

Please specify

8.6 Current activity for rational energy use

(1) Temperature setting of air conditioner			
On cooling	deg C		
On heating	deg C		
(2) Tweaky on/off control of air conditioner	a. yes	b. no	
(3) Stop of unnecessary air conditioner	a. yes	b. no	
(4) Open/close of drapes/blind	a. yes	b. no	
(5) Lights out on break time	a. yes	b. no	
(6) Unnecessary lights out	a. yes	b. no	
(7) Cut/shift of peak demand of electricity	a. yes	b. no	
(8) Others	Please specify		

8.7 In which group does your company belong to on energy saving?

a.	b.	c.	d.	e.
Very conscious about energy saving	Conscious about energy saving	Moderately conscious about energy saving	Unconscious about energy saving	Opposed to energy saving
f. Other : Please specify				

8.8 In which group does your company belong to on air-conditioning?

a.	b.	c.	d.
Always conscious about energy (money) saving	Conscious about cooling energy saving	Unconscious about energy saving	Conscious about importance of cooling, rather than energy
e. Other : Please specify			

8.9 Please mark your approval (personal opinion) for the following idea;

	<-- Be opposed		Neutral		Agree -->
(1) Cooling is expensive and lavish.	1	2	3	4	5
(2) Cooling is energy wasting.	1	2	3	4	5
(3) Cooling is not good for health.	1	2	3	4	5
(4) Cooling makes progress in work or study.	1	2	3	4	5
(5) Cooling is comfortable in sleeping.	1	2	3	4	5
(6) Cooling is necessary tool in Saudi Arabia.	1	2	3	4	5

8.10 Who sets the temperature setting of air conditioner?

a. Facility manager	b. Foreman	c. Sensitive person to heat	d. Sensitive person to Cold
e. Other : Please specify			

EC awareness and practice level of residential sector

7. Awareness on energy conservation

7.1 Current activity for rational energy use

(1) Temperature setting of air conditioner		
On cooling	deg C	
On heating	deg C	
(2) Unnecessary lights out	a. yes	b. no
(3) Use of CFL	a. yes	b. no
(4) Others	Please specify	

7.2 In which group do you belong to on energy saving?

1	2	3	4	5
Opposed to energy saving	Unconscious about energy saving	Moderately conscious about energy saving	Conscious about energy saving	Very conscious about energy saving

7.3 Please mark your practice level as follows;

	Practice level			Other Answer
(1) Setting temperature of air conditioner (Air conditioner)	Less than 21	22-24	More than 25	
	1	2	3	
(2) Stop of air conditioner when nobody uses (Air conditioner)	Never stop	Sometimes stop	Frequent stop in a day	
	1	2	3	
(3) Frequency of filter cleaning (Air conditioner)	Never or more than 1 year	Every 3 Month	Within 1 Month	
	1	2	3	
(4) Food in refrigerator (Refrigerator)	Everytime store too much	Sometimes store too much	Not to store too much	
	1	2	3	
(5) Refrigerate after cooling down at outside (Refrigerator)	Unconscious	Sometimes conscious	Practice everytime	
	1	2	3	
(6) Turn off room lights when nobody exists (Light)	Unconscious	Sometimes conscious	Keen conscious	
	1	2	3	
(7) Use of CFL (high efficient lamp)	Never or unknown	Adopted in some lamps	Adopted in all lamps	
	1	2	3	
(8) Turn off when you do not watch (TV)	Unconscious	Sometimes conscious	Practice everytime	
	1	2	3	
(9) Unplug appliance in not used (Household appliance)	Unconscious	Sometimes conscious	Practice everytime	
	1	2	3	
(10) Have dinner with all family member (Dinner)	Individually	Sometimes together	Everytime together	
	1	2	3	

7.4 Please mark your approval for the following idea;

	<-- Be opposed		Neutral		Agree -->
(1) Cooling is expensive and lavish.	1	2	3	4	5
(2) Cooling is energy wasting.	1	2	3	4	5
(3) Cooling is not good for health.	1	2	3	4	5
(4) Cooling makes progress in work or study.	1	2	3	4	5
(5) Cooling is comfortable in sleeping.	1	2	3	4	5
(6) Cooling is necessary tool in Saudi Arabia.	1	2	3	4	5

7.5 Please provide your idea on energy conservation margin and/or potential of your house

8.11 Please mark your approval (personal opinion) for the following idea;

	<-- Be opposed		Neutral		Agree -->
(1) Minimum use of cooling	1	2	3	4	5
(2) Unplug appliance in not used	1	2	3	4	5
(3) Refrigerate after cooling down at outside	1	2	3	4	5
(4) Turn on TV set only when I want to watch	1	2	3	4	5
(5) Everyone puts in at the same room	1	2	3	4	5
(6) Turn off unnecessary light	1	2	3	4	5
(7) Minimum use of automobile	1	2	3	4	5
(8) Have dinner with all family member	1	2	3	4	5
(9) Family member takes a bath one after ano	1	2	3	4	5
(10) EC of home is decrease of utility charge	1	2	3	4	5
(11) EC of home is environment protection	1	2	3	4	5

8.12 If you want to adopt any EC measures and/or install any EC equipment, pls specify.

8.13 If you know, please provide any information on energy conservation dissemination organization

8.14 If you know, please provide any information on published materials / magazines for energy conservation

8.15 If you know, please provide any information on published materials / magazines for energy conservation

8.16 If you know, please provide any information about published energy conservation case study

8.17 Please mark [yes], if you want to have the following service.

(1) Advise on energy management	a. yes	b. no
(2) Advise on upgrading equipment for rational energy use	a. yes	b. no
(3) Provide helpful information to have energy conservation	a. yes	b. no
(4) Energy audit	a. yes	b. no
(5) Introduce ESCO (Energy Service Company)	a. yes	b. no
(6) Others	Please specify	

8.18 Please provide your idea on energy conservation margin and/or potential of your facility

Sample questionnaire sheet for "Study for effective dissemination on labeling"

0. Target

   Purchaser of AC, refrigerator, TV set and lighting appliances in last one year

1. Gender
   a. Male
   b. Female
2. Age
   a. Under 20
   b. 20 – 29
   c. 30 – 39
   d. 40 – 49
   e. 50 – 59
   f. Over 60
3. Awareness

   "Do you know the energy efficiency labeling?"
   a. Yes
   b. I have come across
   c. No → Go to 10.
4. From which media

   "How have you known/seen the labeling?"
   a. Article/Advertising on newspaper
   b. Article/Advertising on magazine
   c. Program/CM of TV
   d. EC labeling brochure
   e. Homepage of SEEC
   f. Manufacturer's Catalogue of appliances
   g. In the retailer shop
   h. Others (Please specify)

5. How used on purchasing

   "Did you consult the labeling n purchasing?"
   a. Yes
   b. No → Go to 9.
6. What did you refer?

   "Which of labeling did you refer?"
   a. Labeling on manufacturer's catalogue
   b. Labeling shown on appliance
   c. Both a. and b.

7. Evaluation of effectiveness

   “Was the labeling useful?”

   a. Very useful
   b. Useful to a certain degree
   c. Not too useful
   d. Completely useless/No care

8. Useful information of labeling

   “Which information on the labeling was most useful?”

   a. Number of stars
   b. Ranking
   c. Both of a. and b.
   d. Energy/Electricity consumption
   e. Energy efficiency (Achievement)

9. Reason of not used

   “Why didn’t you consult the labeling?”

   a. Because I couldn’t understand the labeling.
   b. Because I couldn’t find the labeling.
   c. Because I put priority on price or function rather than labeling.
   d. Other (Please specify)

10. Impression of the labeling system

    “How do you feel about the labeling system?”

    a. Very useful
    b. I will check the labeling from now on.
    c. I will study the labeling from now on.
    d. I am not interested in the labeling.
    e. Other (Please specify)

11. Purchase shop

    “Where did you purchased?”

    a. Large home appliance center
    b. Local home appliance shop
    c. Hypermarket
    d. Supermarket
    e. Department store
    f. DIY shop
    g. Mail order
    h. Other (Please specify)

(b) Evaluation plan for “National EC Campaign”

0. Target

   At School, shopping mall, mosque and Internet

1. Gender
   a. Male
   b. Female
2. Age
   a. Under 20
   b. 20 – 29
   c. 30 – 39
   d. 40 – 49
   e. 50 – 59
   f. Over 60
3. Awareness

   “Do you know the “National EC Campaign”?”
   a. Yes
   b. I have come across
   c. No → Go to 9.
4. From which media

   “How have you known/seen the EC Campaign?”
   a. Article/Advertising on newspaper
   b. Article/Advertising on magazine
   c. Program/CM of TV
   d. EC campaign brochure
   e. Homepage of SEEC
   f. Manufacturer’s Catalogue
   g. In the retailer shop
   h. Other (Please specify)

5. How used on EC activity

   “Did you do something by the “National EC Campaign”?”
   a. Purchase/replace to more efficient appliance
   b. Turn off not used appliance
   c. Raise AC temperature setting
   d. Other (Please specify)

   e. No → Go to 8.

6. Evaluation of effectiveness

   “Was the “National EC Campaign” useful?”

   a. Very useful
   b. Useful to a certain degree
   c. Not too useful
   d. Completely useless/Nonsense

7. Useful information of the “National EC Campaign”

   “Which information on the “National EC Campaign” was most useful?”

   a. EC Labeling
   b. EC operation of appliances
   c. Energy management
   d. Cost for energy
   e. Other (Please specify)

8. Reason of no action

   “Why didn’t you do anything?”

   a. Because I couldn’t understand the “National EC Campaign”.
   b. Because I put priority on comfort rather than energy conservation.
   c. Because it’s messy.
   d. Other (Please specify)

9. Impression of the “National EC Campaign”

   “How do you feel about the “National EC Campaign”?”

   a. Very good
   b. Good
   c. Better than none
   d. Bad
   e. Other (Please specify)

Evaluation Plan for "EC-Exhibition"

(1) Method

Evaluation is made based on questionnaire survey to citizens or event guests (visitors of WE-Power Exhibition)

(2) Sample of Questionnaire in case of Exhibition

Q1. How to know WE-Exhibition?

a. Newspaper b. Magazine c. TV d. Internet e. Manufactures
f. From friend/family g. Others (_____)

Q2. Purpose of Your Visit

a. Information collection of new products b. Participation of events
c. Making network to manufactures d. No specific purpose
e. Others (_____)

Q3. What display is the most impressive for you?

a. ##### b. ##### c. ##### d. ##### e.##### f. #####

Q4. How do you feel display and explanation?

Display contents

a. Very good b. Good c. Fair d. Insufficient e. No good
Comments (_____)

Explanation by Guide

a. Very good b. Good c. Fair d. Insufficient e. No good
Comments (_____)

Q5. What event is the most impressive for you?

a. Workshop b. Award ceremony c. Demonstration d. Others (_____)

Q6. What technology is your interesting? (multi-answer possible)

a. Air conditioner b. Lamp c. TV d. Washing Machine
e. Refrigerator and Freezer f. Transformer g. Motor h. Solar i. Battery
j. Others (_____)

Q7. (In case that you select a, b, c, d, e of Q6) How to select electricity home appliances?
(multi-answer possible)

Air conditioner

a. Initial price b. Initial price and operation cost c. Brand d. Product life
e. Design g. Others (_____)

Lamp

a. Initial price b. Initial price and operation cost c. Brand d. Product life
e. Design g. Others (_____)

TV

a. Initial price b. Initial price and operation cost c. Brand d. Product life
e. Design g. Others (_____)

Washing Machine

a. Initial price b. Initial price and operation cost c. Brand d. Product life
e. Design g. Others (_____)

Refrigerator and Freezer

a. Initial price b. Initial price and operation cost c. Brand d. Product life
e. Design g. Others (_____)

Q8. Do you have any requests in next exhibition?

(_____)

Q9. Do you have any opinions for the exhibition?

(_____)

Answerer's Property

Sex	a. Male b. Female
Age	a. 10-19 b. 20-29 c. 30-39 d. 40-49 e. 50-59 f. above 60
Job	a. Company staff b. Government c. Student d. Household wife e. Private business f. Others (_____)
Residence	a. Northern area b. Central area c. Southern area d Western area e. Foreign county

12. Load Management

(1) Program Name

Load Management (Emergency Load Adjustment Contract)

(2) Objective

- Load adjustment in case supply shortage is expected in peak hours
- Avoiding supply shortage and maintaining supply reliability

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	- In order to mitigate the current situation of supply shortage in peak hours, a new optional contract called "Emergency Load Adjustment Contract", in which SEC offers tariff discount for customers who are ready to reduce peak demand upon SEC's request, is expected. - Full-scaled implementation of this scheme starts following the approval by ECRA, which is also responsible for monitoring the scheme's performance after implementation and for arbitration when a dispute between SEC and customers takes place.	
Phase 1 (Pilot Stage)	Task	Responsible Agency
	(1) Designing specifications of the contract ➢ Identification of eligible customers (demand size, sector) ➢ Minimum requirement of adjustment [xxx kW, or xxx % of the contract capacity] ➢ Identification of peak hours when the scheme is applied ➢ Maximum number of request per year ➢ Lead time of notifying the adjustment [xx hours prior to the start of load adjustment] ➢ Estimation of "avoidable cost" with peak shift, which leads to the unit price of tariff discount [incentives for actual adjustment and for stand-by] ➢ Penalties on customers who didn't accept the request	SEC
	(2) Drafting contract document	SEC
	(3) Implementation of pilot project [site selection, application, implementation, and review]	SEC
	(4) Workshops for estimating potential volume of peak shift	SEC
	(5) Approval by ECRA	ECRA
Phase 2 (Final Stage)	Task	Responsible Agency
	(6) Procurement of kilowatt-hour meters fit for the contract	SEC
	(7) Publicity to customers for dissemination	SEC
	(8) Start of the full-scaled implementation of the scheme	SEC

(4) Executing Agency

Name of Agency	Saudi Electricity Company (SEC)
Expected Role	**(Pilot Stage)** - Designing specifications of the contract - Drafting contract document - Implementation of pilot project - Workshops for estimating potential volume of peak shift **(Final Stage)** - Procurement of meters fit for the scheme - Publicity of the scheme to large customers for dissemination - Management and review of the scheme after implementation

(5) Related Agencies

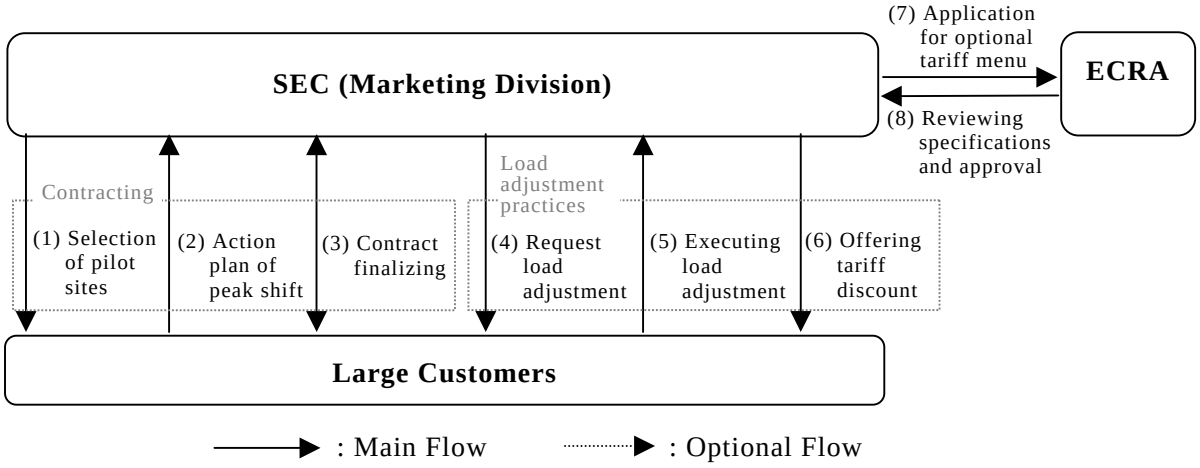
Name of Agency	Electricity and Cogeneration Regulatory Authority (ECRA)
Expected Role	**(Pilot Stage)** - Authorization of the scheme after reviewing specifications of this scheme submitted by SEC. **(Final Stage)** - Monitoring the scheme's effectiveness and providing suggestions for improvement when needed - Arbitrating dispute between SEC and customers
Name of Agency	Chamber of Commerce (COC)
Expected Role	- Cooperation with SEC for disseminating this scheme among large customers

(6) Target of the Scheme

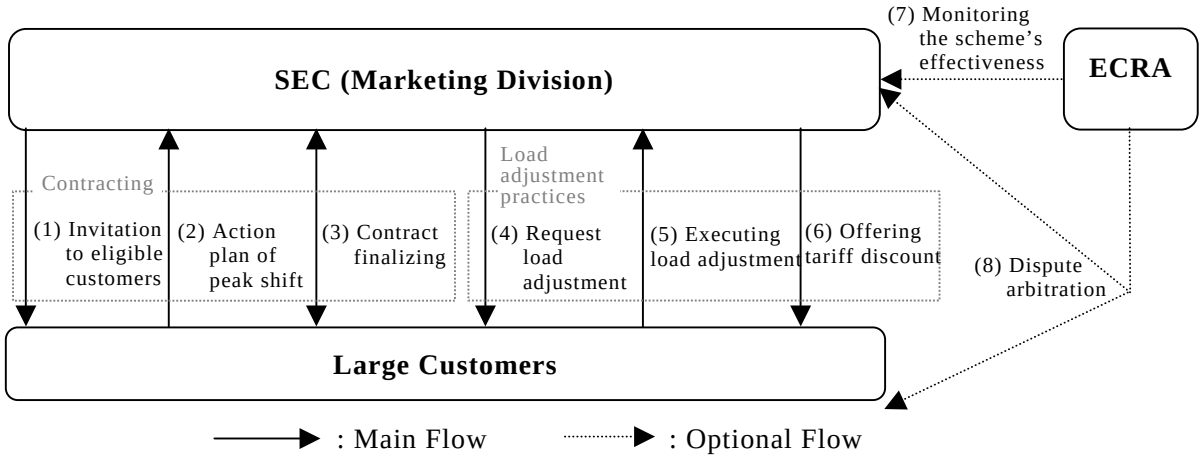
Name of Target	**(Pilot Stage)** Selected large customers (industrial & commercial) * SEC considers selecting three (3) large customers from Central Region as the first step of this pilot project.
Expected Action	- Reviewing their own load pattern - Estimation of economic value of power demand in peak hours to determine economically optimized volume of demand adjustment - Making action plan of peak shift in emergency - Contracting with SEC - Taking expected actions of load adjustment upon SEC's request - Giving comments for improving the scheme (if any)
Name of Target	**(Final Stage)** Large customers (industrial & commercial, specifications of eligibility to be confirmed)
Expected Action	- Reviewing their own load pattern - Estimation of economic value of power demand in peak hours to determine economically optimized volume of demand adjustment - Making action plan of peak shift in emergency - Contracting with SEC - Taking expected actions of load adjustment upon SEC's request

(7) Workflow

Phase 1 (Pilot Stage)



Phase 2 (Final Stage)



(8) Required Permanent Human Resources

Phase 1 (Pilot Stage)	Human Resources	Financial Cost for Human Resources
	SEC No particular additional staff needed	No particular additional cost needed
Phase 2 (Final Stage)	Human Resources	Financial Cost for Human Resources
	SEC No particular additional staff needed	No particular additional cost needed

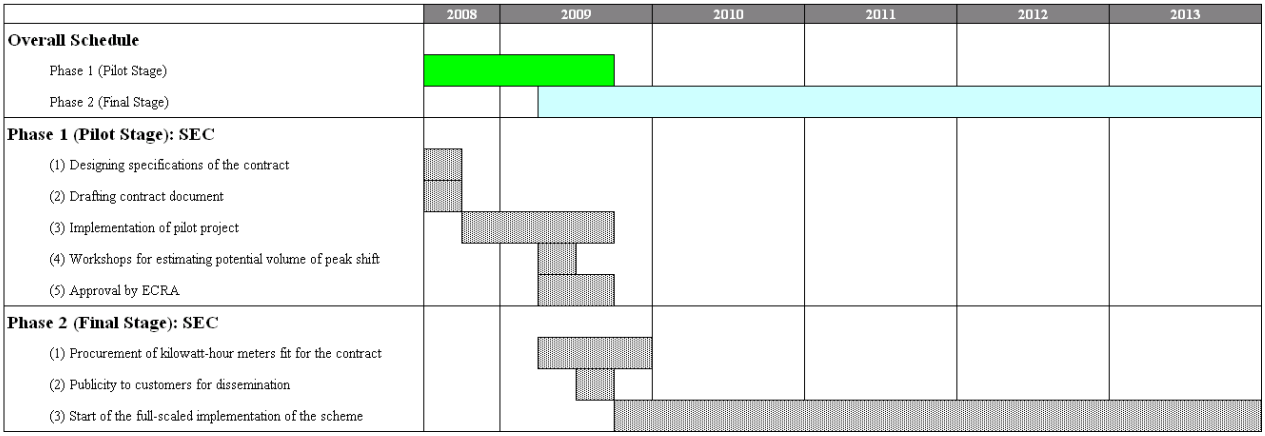
(9) Required Items

Phase 1 (Pilot Stage)	Item	Budget
	- Tariff discount for adjustment in pilot project (SEC)	Estimate: 60,000SR (5 SR/kW/hour x 3 hours x 200kW x 5 times + 5,000SR/meter) x 3 sites
Phase 2 (Final Stage)	Item	Budget
	- Tariff discount for adjustment in full-scaled implementation (SEC)	Estimate: 20million SR/year (Assuming that 1,000 customers join this scheme)

(10) Expected Legislation for Enforcement

Phase 1 (Pilot Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	- To be incorporated into the mid-term electricity tariff policy (2009-11) by ECRA
Phase 2 (Final Stage)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan



(12) Attachment

- Sample of action plan of peak adjustment for industrial customers
- Sample of action plan of peak adjustment for commercial customers
- Contract form customized for KSA case

(13) Items to be Further Studied

- Designing specifications of the contract, such as:
  - Identification of eligible customers (demand size, sector)
  - Minimum requirement of adjustment [xxx kW, or xxx % of the contract capacity]
  - Identification of peak hours when the scheme is applied
  - Maximum number of requests per year
  - Lead time of notifying the adjustment [xx hours prior to the start of load adjustment]
  - Estimation of "avoidable cost" with peak shift, which leads to the unit price of tariff discount [incentives for actual adjustment and for stand-by]
  - Penalties for customers who didn't accept the request
- Drafting contract document

→ At the moment, SEC is still in the process of discussing the general specification of the scheme. The consultants' support is needed up to the completion of scheme designing.

Attachment 12. Load management
Sample of action plan of peak adjustment for industrial customers

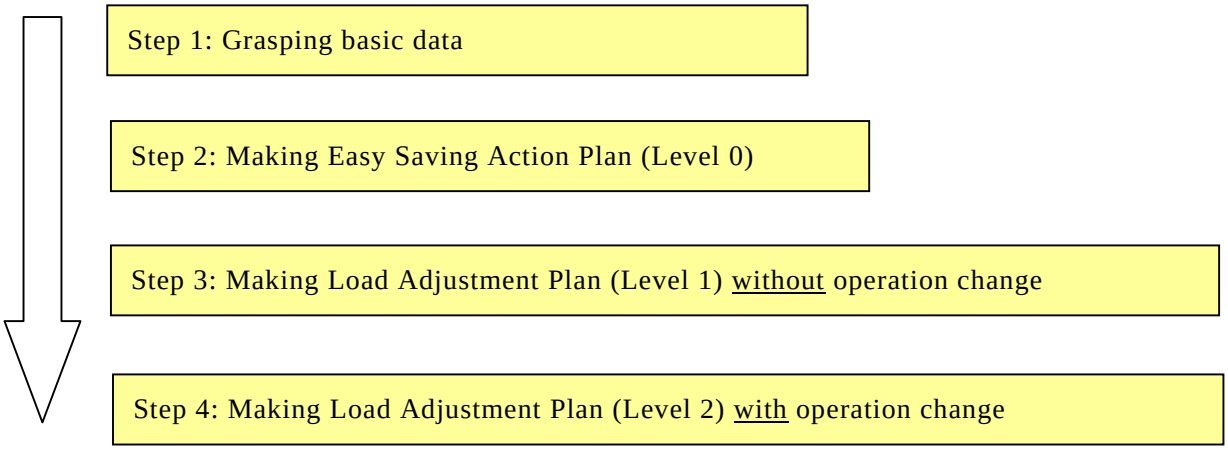
1. Background

Sometimes a power utility requests load shedding to secure power system reliability in emergent situation in Japan. To request industries, a power utility prepares "Load Adjustment Contract" to give incentive to industries.

On the other hand, factories that agree load shedding request from a power utility, prepare their own load adjustment action plan to smoothly take actions without production loss.

It is important that an action plan is prepared beforehand to quickly meet saving request.

2. Methodology to Make an Action Plan



3. Stepwise Action

(1) Grasping basic data

In order to effectively develop a load adjustment action plan, basic data of electric power consumption should be prepared as the following category.

Data collection of electricity required equipment or equipment group

(Common facilities)

- ✧ Type of equipment
- ✧ Manufacture
- ✧ Product year
- ✧ Required power

(Production Line)

- ✧ Type of equipment
- ✧ Manufacture
- ✧ Product year
- ✧ Required power

Operation pattern of each equipment or equipment group

- ✧ Operation hours (start and stop time)
- ✧ How to start and stop (automatically or manual)

Possibility Check of Power Saving without Production Loss

- ✧ Identification of easy saving action (turn off floor light, turn off unnecessary AC, turn off computer (switching to battery), etc.)
- ✧ Identification of load adjustment action without operation change (**Common Facilities: stop AC, turn off all floor lights, etc.)**
- ✧ Identification of load adjustment action with operation change (**Production Line**: **stop production line that can shift to off peak period, stop equipment that has no serious impact, etc.)**

(2) Making Easy Saving Action Plan (Level 0)

It is a usual action plan to do in all summer days. The following actions are possible.

- Turn off floor light (or turn off every one light)
- Turn off light and AC that nobody uses
- Turn off unnecessary AC
- Setting AC temperature at 1 degree higher or more, etc.

(3) Making Load Adjustment Plan (Level 1) without Operation Change

It is an action plan when a power utility requests power saving due to emergency situation. As a first step, an action plan without operation change of production line is considered. For example, common facilities equipment is the first target such as:

- Stop AC in common facilities (lobby, office,
- Turn off all floor light including toilet (using outside natural light)
- Stop all equipment that do not affect on production line

(4) Making Load Adjustment Plan (Level 2) with Operation Change

It is also an action plan when a power utility requests power saving due to emergency situation. But it is a plan for more critical situation.

As a final step, an action plan with operation change of production line is considered. However, this action plan consider, even if operation changes, production loss is not produced. For example,

- Stop lines that can shift operation to off-peak period
- Stop equipment that has no serious impact
- If possible, maintenance is done instead of operation (to reduce load), etc.

4. Conclusion

It is important to grasp basic data of all electricity used equipment and potential of energy saving in advance. These actions and potential energy saving should be estimated by a calculation sheet.

Name of Unit	No. of Unit	Operation Time	Power Demand (kW)	Possible Reduction (kW)	Requirements for Load Shedding
Total					

Sample of action plan of peak adjustment for commercial customers

According to emergent level defined beforehand, the following step-wise action plan in building is prepared and taken action.

Name		Saving Time	Thorough Saving Time	Emergency
Level		Level 1	Level 2	Level 3
Parameter to Direct		Period of saving electricity when supply-demand is under pressure ex. June-Sep, Dec-Feb	ex. Reserve Margin : about 3%	ex. Reserve Margin: about 1%
Concept		Save the usage of electricity	Restrict the usage of electricity as much as possible	Stop the usage of electricity as long as no hindrances for customers and emergencies
Time for Execution		13:00～16:00	13:00～16:00 or Time directed by in-house Committee	Time directed by in-house Committee
Power system	Air conditioning	Room temperature: **not below 28℃**	Room temperature: **not below 30℃**	Air-conditioniner: **turned off**
		【Exception】 **Important** rooms as necessary	same as level 1	【Exception】 **Very Important** rooms, ex. medical facilities etc.
	Elevators	Operate about **1/2 as much as usual**	Further restrictions on operation and strengthened **restriction of employees' usage**	In principle, **halt operation** as long as no hindrances for customers and emergencies
Lighting System	Lighting	Turn off **about 3/4** of lighting in corridors and halls.	same as level 1	**Prohibit the usage of electricity,** as long as no hindrances for customers and emergencies.
	OA	**Turn off or completely pull the plug off** the unused OA equipment and business terminals.	same as level 1	
	Charging equipment	**Prohibit charging** ex. PHS, notebook computers, etc.	same as level 1	
	Hot water supply	**Restrict the usage** of equipment for hot water supply (pots, tea servers, coffee makers)	**Prohibit the usage** of equipment for hot water supply (pots, tea servers, coffee makers)	
	Other	In rest rooms, completely turn off electrical hot water supply and warm seat toilet.	same as level 1	–
Welfare Facilities	Café	–	Close company café **after 13:00.**	**Close** company café
	Cafeteria	–	–	Prohibit evening hours of company cafeteria .

Contract form customized for KSA case

Contract Application Form

Name of Customer
Address
Telephone

1. Location:

2. Beginning Day of the Contract: / /

3. Contract Adjustment Capacity (kW), Contract Request Time, Hours before Request

Contract Adjustment Capacity	Contract Request Time	Hours before Request
(kW)	(times)	3 1 (hours before)

4. Adjustment Capacity: Attachment 1 (Calculation Sheet)

5. Original Contract:

Type of Contract:
Contract Capacity: kW
Supply Voltage: V

Customer's ID Number : _____ – _____ – _____ – _____

Attachment 1 (Calculation Sheet)

No.	Name of Equipment	Purpose of Use	Target of Adjustment (yes/no)	Voltage (v)	Capacity (kW)	No. of Units	Total Capacity (kW) a	Load Rate (%) b	Possible Adjustment Rate (%) c	Adjustment Capacity (kW) =axbxc	Operation Way during Adjustment	Possible Adjustment Time from Request (min.)	Load which is affected by quick load shedding	Necessary Work from Request to Adjustment	Recovery Time from Adjustment (min.)
											Manual or Remote Control	(1) Soon (2) 10 Minutes (3) 30 Minutes (4) 1 hour (5) 3 hours			(1) Soon (2) 10 Minutes (3) 30 Minutes (4) 1 hour (5) 3 hours
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
	Others														
						Total			Total		Maximum			Maximum	

13. Promotion of R&D Scheme

(1) Program Name

Promotion of R&D Scheme

(2) Objective

- Building energy efficient house/building
- Development of high efficiency equipment in industrial and commercial sector

(3) Outline of the Scheme and Each Phase

Overall Scheme	Contents	
	- Request for proposal to academy and industry, etc. - Submission of proposal (application) - Selection of applicants by R&D Committee to be established - Making contract - Implementation and submission of completion report - Evaluation and review - Follow-up survey (2 years after completion)	
Phase 0 (Making Strategy)	Task	Responsible Agency
	(Establishment of Strategy and Scheme)	
	(1) Establishment of R&D Committee	KACST
	(2) Needs survey on EC research targeting at academic, government and industry	KACST
	(3) Seeds survey targeting at academy and domestic/foreign manufacturers	KACST
	(4) Establishment of R&D policy by identifying how R&D can contribute for national EC target	R&D C
	(5) Development of research strategy such as: • Basic research (Pioneering research) • Product development (Practical application) • Experimental demonstration project (Verification)	KACST
	(6) Identification of R&D themes from needs and seed survey: • Insulation material for building and house • Building and house design • Air conditioning system suitable for KSA • High efficiency equipment for building and factories	R&D C
	(7) Design of scheme to meet research strategy (budget for one project, number of project, duration, selection of applicants, expected output, evaluation method, etc.)	KACST

Phase 1 (Demonstration Project)	Task	Responsible Agency
	(Experimental Demonstration Project) At first, experimental demonstration project will start. (1) Request for proposal to academy and industry, etc. (2) Submission of proposal (application) (3) Selection of applicants by R&D committee to be established (4) Making contract (5) Implementation and submission of completion report (6) Evaluation and review (7) Follow-up survey (2 years after completion)	 KACST Applicants R&D Committee KACST Applicants R&D C KACST
Phase 2 (Basic Research)	Task	Responsible Agency
	(Basic Research and Product Development) These fields will also start after reviewing the initial stage. Same as the task of Phase 1.	

(4) Executing Agency

Name of Agency	King Abdulaziz City for Science and Technology (KACST)
Expected Role	**(Making Strategy)** - Establishment of R&D Committee - Needs survey on EC research targeting at academic, government and industry - Seeds survey targeting at academy and domestic/foreign manufacturers - Establishment of R&D policy by identifying how R&D can contribute for national EC target - Development of research strategy - Design of scheme to meet research strategy **(Demonstration and Basic Research)** - Request for proposal to academy and industry, etc. - Follow-up survey (2 years after completion)
Name of Agency	R&D Committee (MOPMA, MOHedu, ECRA, SEC, MOWE, MOMRA, MOCI, COC, SEEC (in the future))
Expected Role	**(Making Strategy)** - Establishment of R&D policy - Identification of R&D themes from needs and seed survey - Making contract - Follow-up survey (2 years after completion) **(Demonstration and Basic Research)** - Selection of applicants - Evaluation and review

(5) Relating Agency

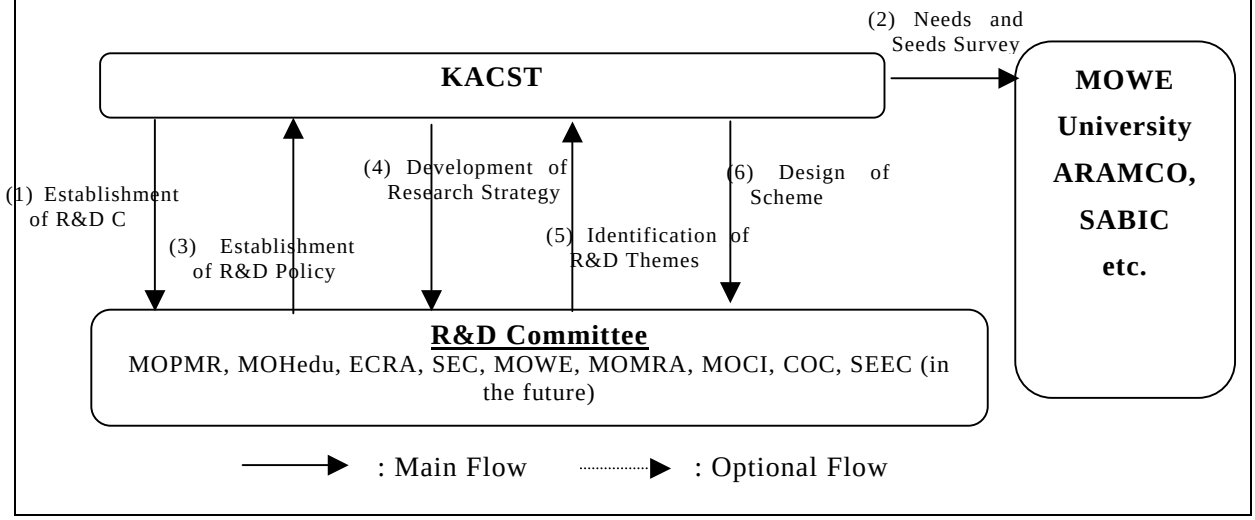
Name of Agency	MOWE, University, ARAMCO, SABIC, etc.
Expected Role	- Providing R&D needs and seeds
Name of Agency	MOF
Expected Role	- Allocation of budget for a research fund

(6) Target of the Scheme

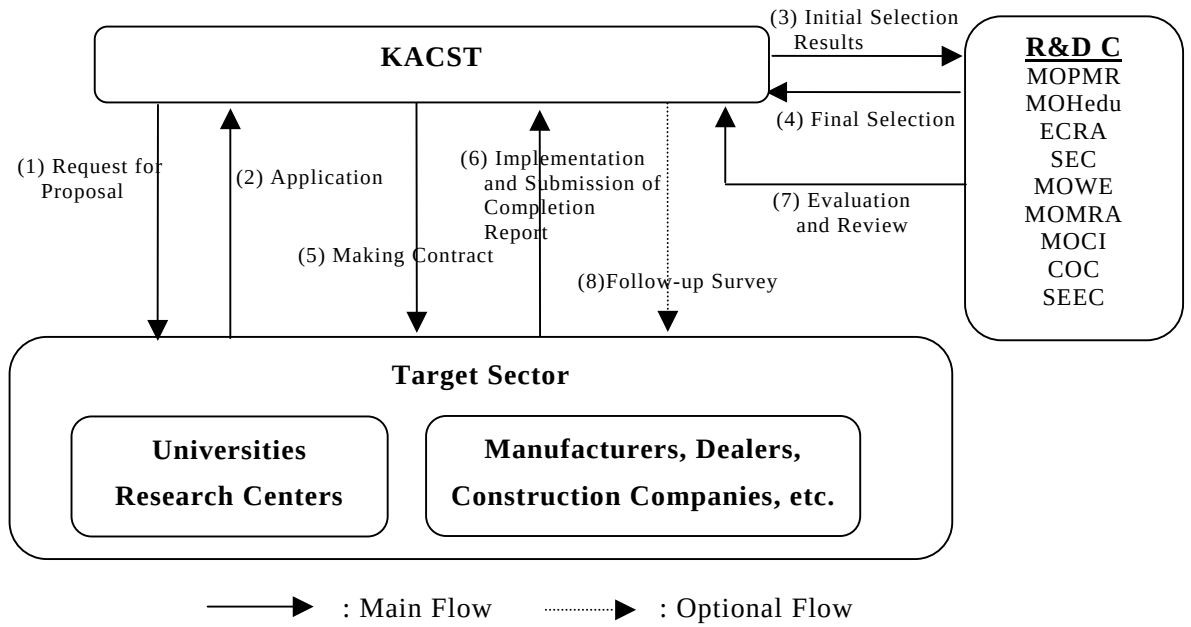
Name of Target	Universities, Research Centers, Manufacturers, Dealers, Construction Companies, etc.
Target Fields of R&D	✧ Building Envelop ● Architectural design of Passive Cooling ● Thermal Insulation ✧ Efficient Electrical and mechanical system ● High Efficiency AC System suitable for Saudi climate ● High Efficiency Lighting System suitable for Saudi climate ✧ Efficient building management ● Facility Management System ✧ Promotion of high efficiency equipment in residential, commercial and industrial sector ● Efficient Boilers (Solar/Gas) ● Efficient Solar system (Hot water) ● Efficient HVAC system (DC) ● Efficient Lighting system (LED/CFC) ● Efficient Washing machines (Water/Electricity) ● Electrical oven
Expected Action	**(Demonstration and Basic Research)** - Application of proposal - Implementation and submission of completion report

(7) Workflow

Phase 0 (Making Strategy)



Phase 1&2 (Demonstration and Basic Research)



(8) Required Permanent Human Resources

Phase 0 (Making Strategy)	Human Resources	Financial Cost for Human Resources
	KACST No additional researcher	No incremental cost
Phase 1 (Demonstration Project)	Human Resources	Financial Resources
	KACST No additional researcher	No incremental cost
Phase 2 (Basic Research)	Human Resources	Financial Resources
	KACST No additional researcher	No incremental cost

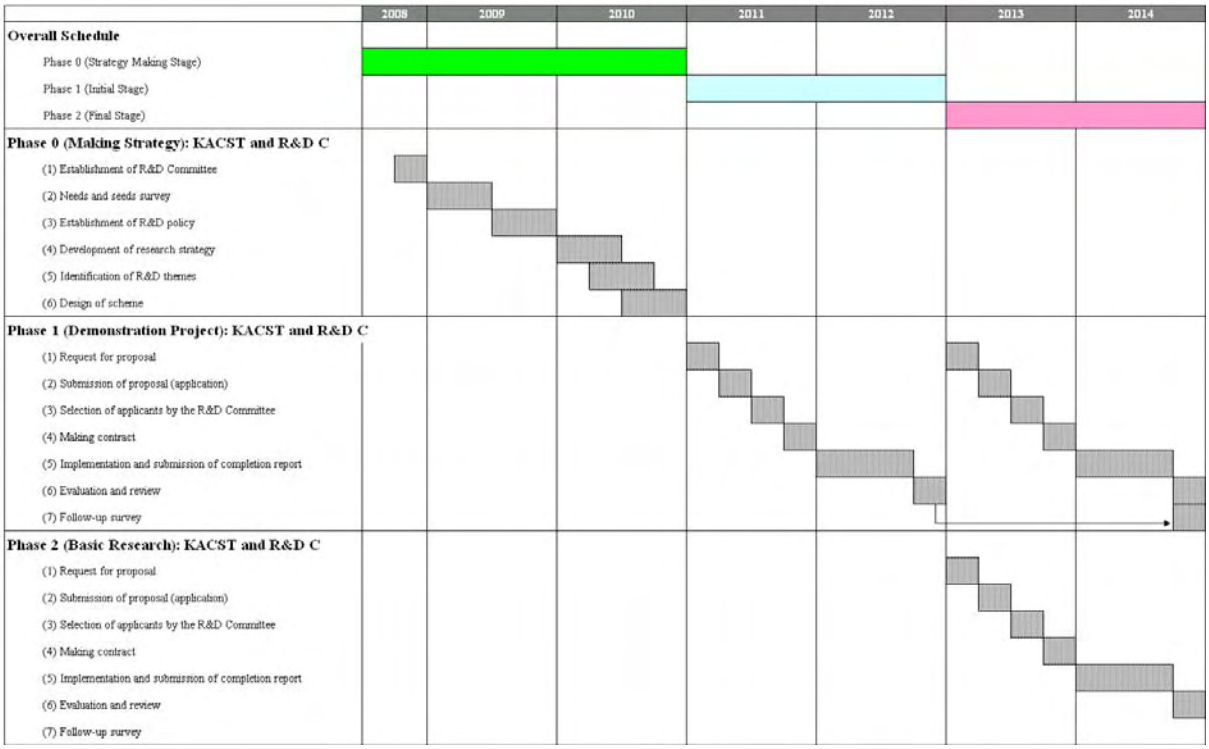
(9) Required Items

Phase 0 (Making Strategy)	Item	Budget
	- Needs and Seeds Survey	1 million SR
Phase 1 (Demonstration Project)	Item	Budget
	- Budget for experimental demonstrative project	9 million SR/2years (=Maximum 3 million SR/project) x 3 projects)
Phase 2 (Basic Research)	Item	Budget
	- Budget for all projects ・ B: Basic research (Pioneering research) P: Product development (Practical application) E: Experimental demonstration project	B: 5 million SR/2years (=Maximum 0.5 million SR/project x 10 projects)
		P: 10 million SR/2years (=Maximum 1 million SR/project x 10 projects)
		E: 9 million SR/2years (=Maximum 3 million SR/project) x 3 projects)

(10) Expected Legislation for Enforcement

Phase 0 (Making Strategy)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 1 (Demonstration Project)	Items to be stipulated in Act	Relating Order/Regulation
	-	-
Phase 2 (Basic Research)	Items to be stipulated in Act	Relating Order/Regulation
	-	-

(11) Expected Action Plan



(12) Attachment

- List of priority area in energy conservation in KSA

Attachment 13. Promotion of R&D Scheme

List of priority area in energy conservation in KSA

Priority areas in energy conservation in Kingdom of Saudi Arabia

A) Design of rational Building and housing for KSA

1) Building envelop
   - ✧ Architectural design of Passive Cooling
     - Model house at major cities
     - Use of PV system
     - Solar Protection / Control
   - ✧ Thermal Insulation
     - Material type (hollow Red Blocks / Cavity Walls/Polystyrenes)
     - Insulation location (external/internal Insulation)
     - Noise Insulation
     - Cost down
     - Window Shading With Minimum Glazing areas

2) Efficient Electrical and mechanical system
   - ✧ High efficiency AC System suitable for Saudi climate
     - District cooling (Chilled-Water/Absorption) System
     - Improvement of desert cooler
     - Energy source (electricity or gas)
     - Easy installation/Maintenance work
   - ✧ High efficiency Lighting System suitable for Saudi climate
     - Indirect Lighting (Skylights/Louvers)
     - CFC / Dimmers
     - LED lighting
     - Use of sunlight via optical fiber
     - Easy installation/replacement work

3) Efficient building management
   - ✧ Facility Management System
     - Building energy management system (BEMS)
     - Intelligent Building Design and Operation
   - ✧ Load Management System
     - Development of peak shift equipments
     - Time of use / variable tariff
     - Thermal storage

B) Promotion of high efficiency equipment in residential, commercial and industrial sector

1) Efficient Boilers (Solar/Gas)
2) Efficient Solar system (Hot water)
3) Efficient HVAC system (DC)
4) Efficient Lighting system (LED/CFC)
5) Efficient Washing machines (Water/Electricity)
6) Electrical oven