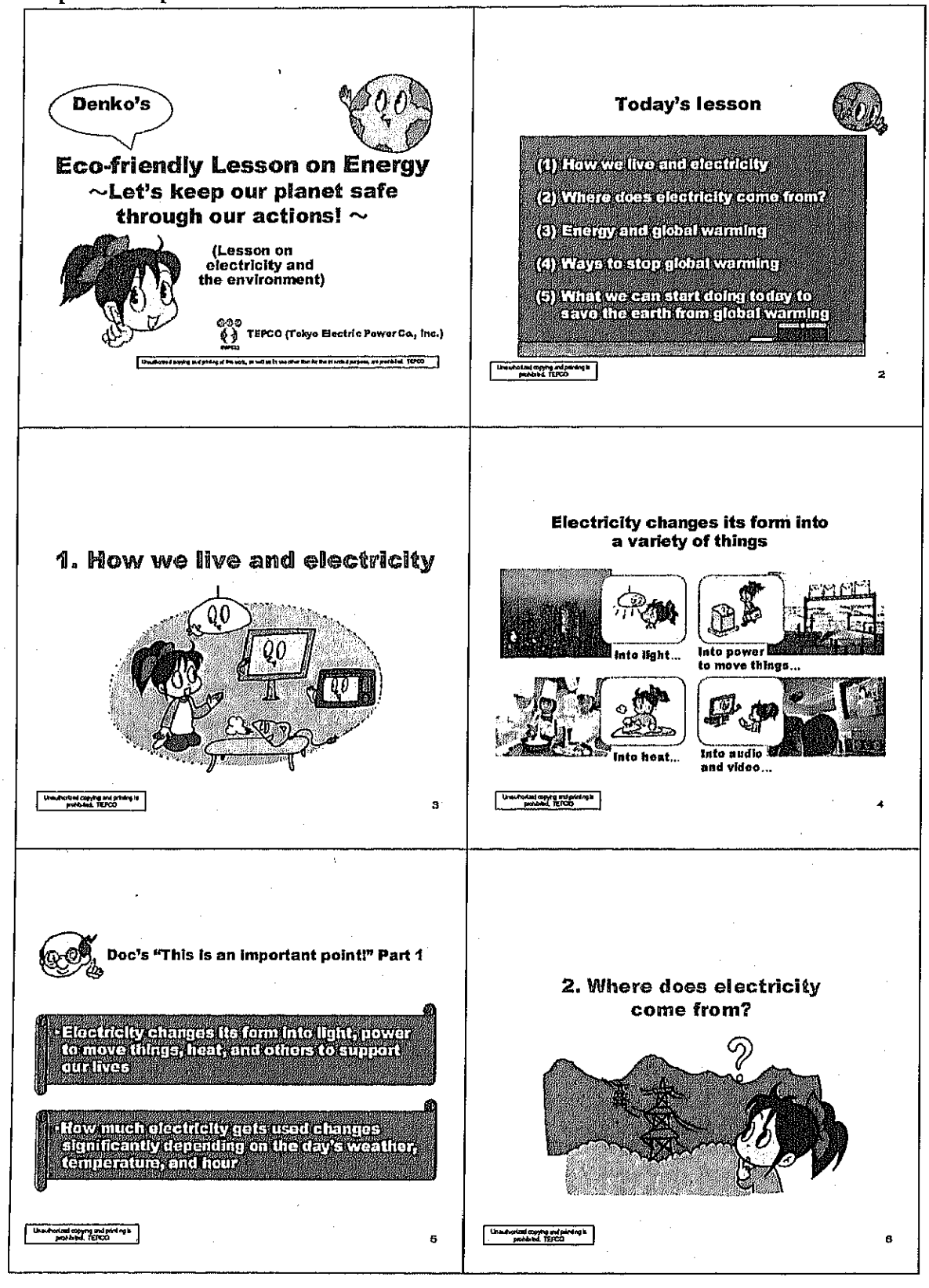
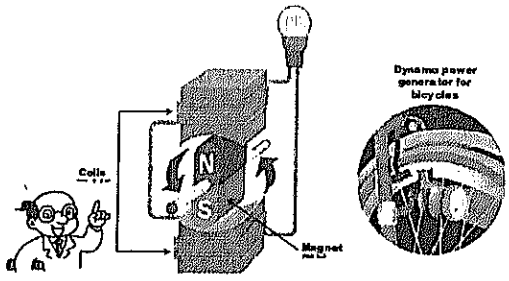
## Attachment 8. EC education for school

### Japan's sample of education materials



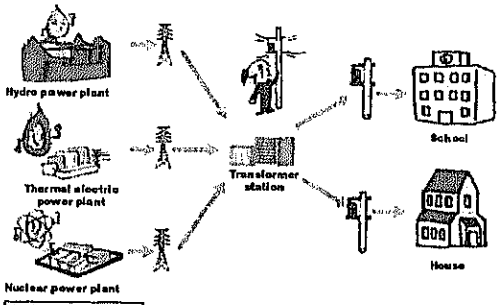
## Let's generate electricity!!






7

## Where does electricity come from?

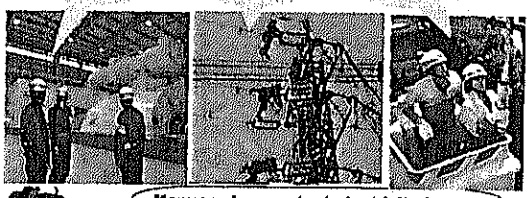





8

## 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.



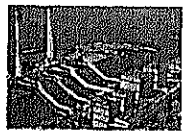
9

## How is electricity generated?

There are a variety of ways to generate power

Hydro power plant

Nuclear power plant

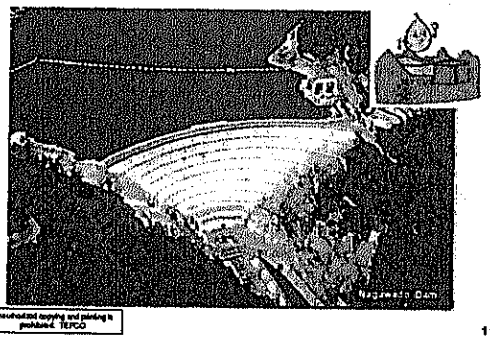


Thermal electric power plant



10

## How is electricity generated? Hydro power plant

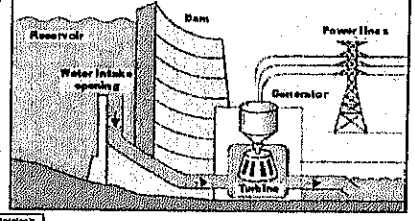




11

## How is electricity generated? Hydro power plant

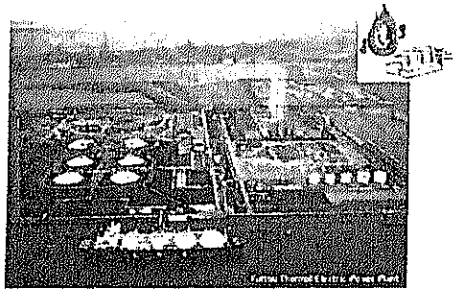
A turbine is turned by the power of water falling from a high to a low place.






12

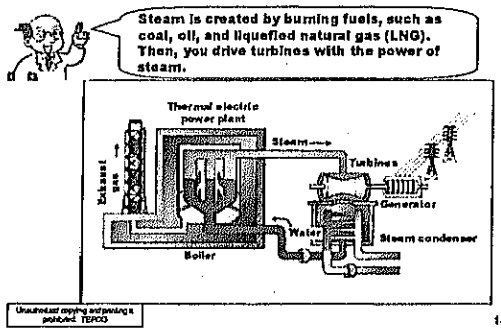
## How is electricity generated? Thermal electric power plant





13

## How is electricity generated? Thermal electric power plant



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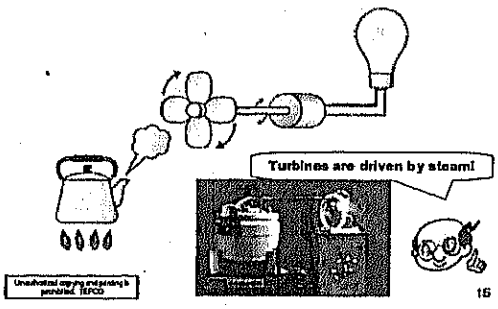
## An experiment using a model of a thermal electric power plant

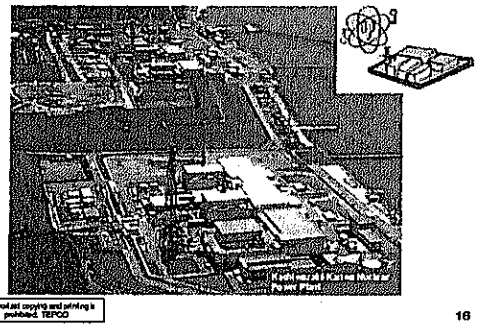
For your information






15

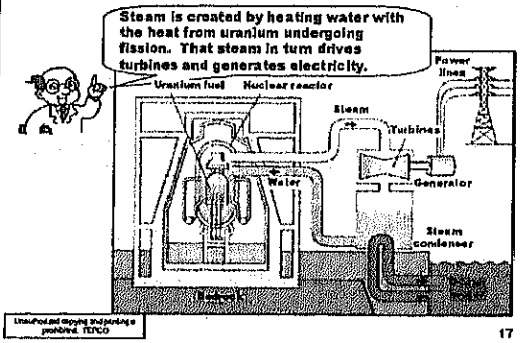
## How is electricity generated? Nuclear power plant





16

## How is electricity generated? Nuclear power plant



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## 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)<br>• No $CO_2$ is produced. | • If too many dams are built, this damages the natural environment.<br>• 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.<br>• A lot of electricity can be generated. | • Reserves of fossil fuel (resources) are limited.<br>• $CO_2$ is emitted into the air. |
| Nuclear (uranium) | • No $CO_2$ is produced.<br>• A lot of electricity can be generated.<br>• Fuel can be recycled. | • Because this method involves radioactive materials, strict safety management is necessary.<br>• Disposal of radioactive waste is necessary. |



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## Can you answer this one?

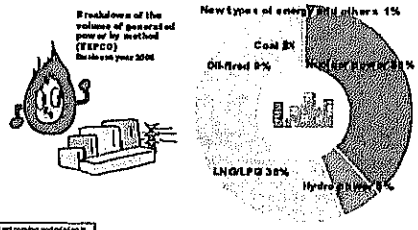
**Quiz:** Which power generation method produces the largest amount of electricity?

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





## The answer is: 2. Thermal power







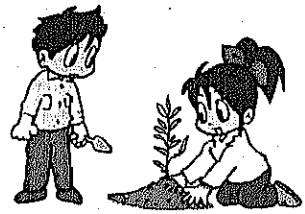

## Doc's "This is an important point!" Part 2

- 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.





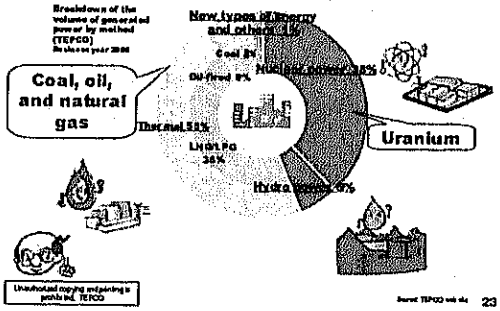
## 3. Energy and global warming







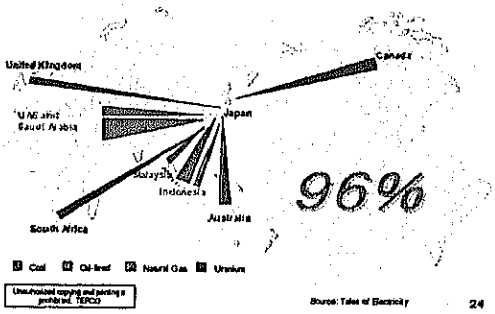
## Which energy sources are necessary to generate power?







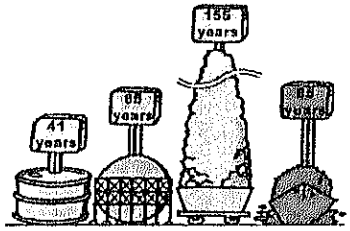

## Japan imports most of its energy resources from foreign countries






Source: Tales of Electricity

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




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



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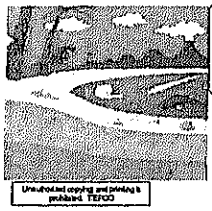
## Just what is fossil fuel?

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.



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## 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.



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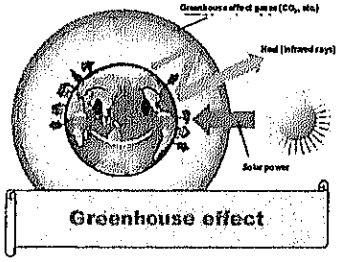
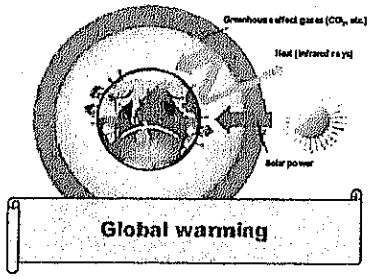
## Carbon dioxide prevents the heat from the sun escaping back into space



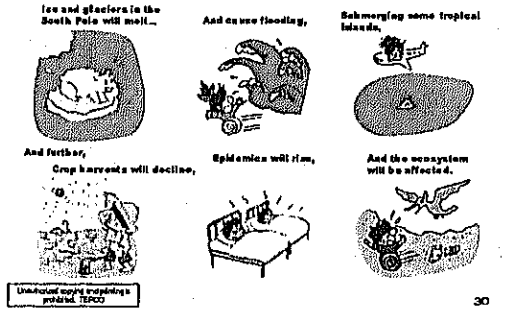

Greenhouse effect

## But if there is too much carbon dioxide...




Global warming

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






30

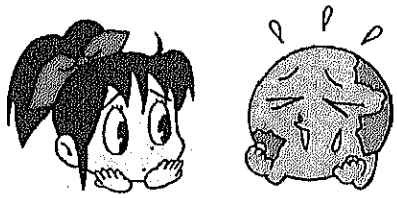
## Doc's "This is an important point!" Part 3

- 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

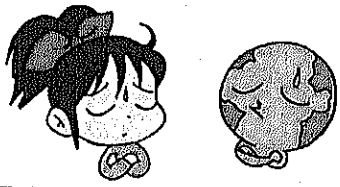






## Let's consider the following:

**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?**

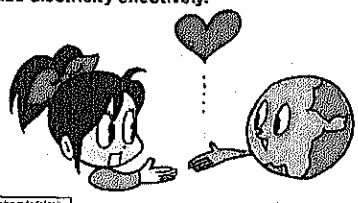






## What is TEPCO doing to help protect the earth?

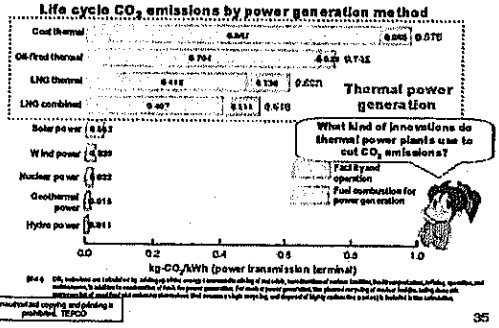
- TEPCO generates electricity by employing methods that cut $CO_2$ emission as much as possible.
- TEPCO develops technologies that help people use electricity effectively.







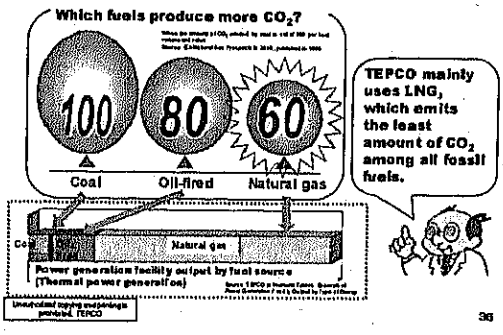
## What power generation methods minimize $CO_2$ emissions?







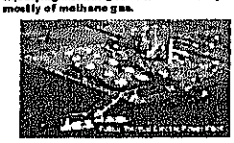

## Innovation 1: Choosing fuels that emit lower amounts of $CO_2$

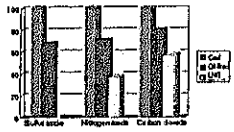


## What is LNG?

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°C, 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>

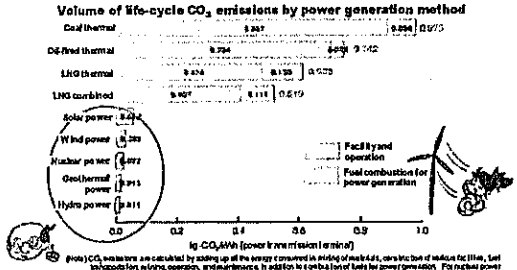
1. It is a liquid cooled to -162°C. It has no color, is transparent, and has no smell.
2. It is a clean energy source which consists mostly of methane gas, and contains almost no impure substances.
3. $CO_2$ emissions - a major cause of global warming - from burning LNG are about 60 to 70% of emissions 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 facilities, fuel transportation, mining, 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



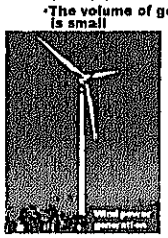
## Power generation methods that use the power of nature

**OPros**

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

**XCons**

- 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.

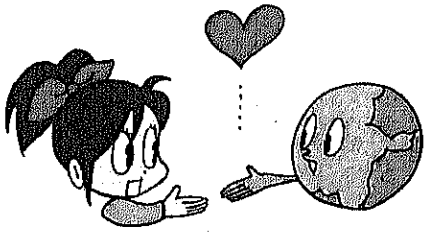
**The basics of a heat pump's mechanism, Part II**

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





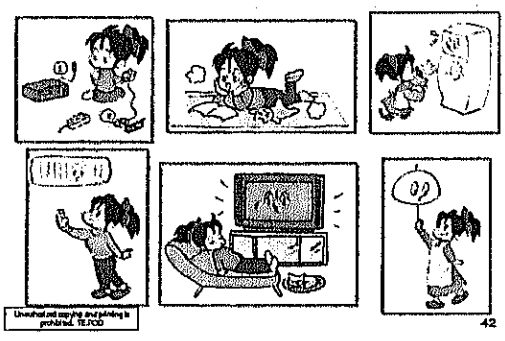
## 5. What we can start doing today to save the earth from global warming



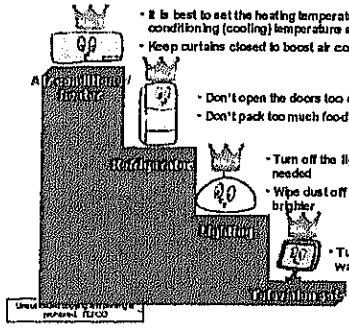




## How can we help to save energy?



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




- It is best to set the heating temperature at 20°C and the air conditioning (cooling) temperature at 28°C
- 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



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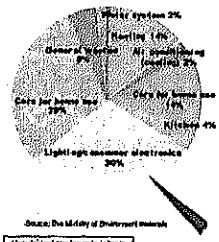
## How effective are our energy saving actions?

$CO_2$ emitted from the home



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: Denki's Tidbit, That's Energy Saving! Book



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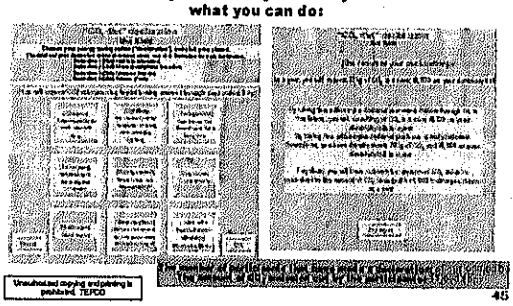
## What can we do to protect the earth?

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





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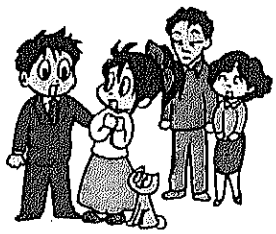
## Why does Denko want you to be "friends" with electricity?





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## 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!



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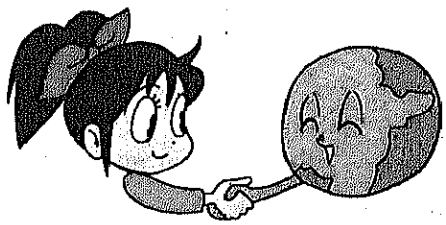

## Let's save our earth by ourselves!

TEPCO
(Tokyo Electric Power Co., Inc.)

**The End**



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**Japan' Sample of EC Experiment**

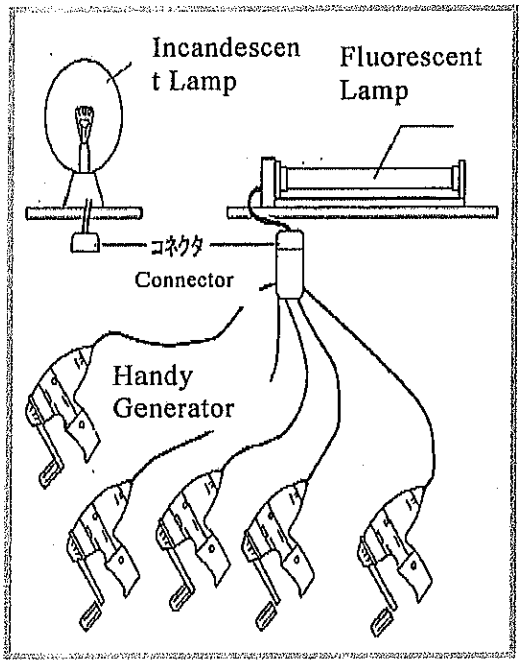
**(1) "Feel a Load of Electricity"**

(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

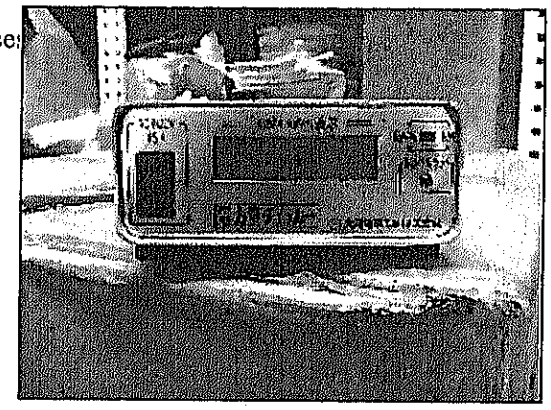
1) Checker of electricity for home appliance

(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

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

| 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)**<br>- Making a concept design including objective, target layer, required area, display plan, organization, O&M plan, etc.<br>- Basic design and feasibility study including site selection<br>- Preparation of a tender document for detailed design |
| Name of Agency | Saudi Energy Efficiency Center (SEEC) |
| Expected Role | **(D/D and Construction Stage)**<br>- Procurement of a consultant for detailed design<br>- Procurement of contractors and a consultant for construction<br>- Securing human resource and operation budget<br>- Making an operation manual including responsibility, daily operation and staff allocation, display and seminar planning, training program for guidance staff, etc.<br>- Training guidance staff in social manner, explanation way, technical knowledge (1 month)<br>- 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<br>- Construction of display<br>- Consulting service for construction supervision |

**(5) Relating Agency**

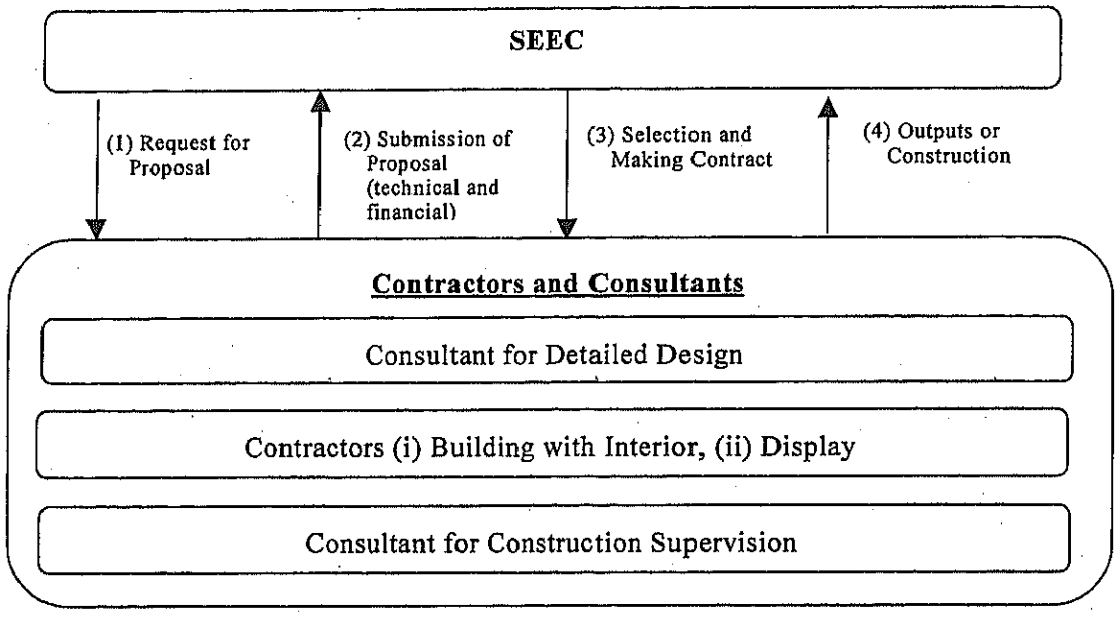
| | |
|---|---|
| Name of Agency | Saudi Arabian Standards Organization (SASO) |
| Expected Role | - Dissemination of Energy Labels and Standards System (EELS) |
| Name of Agency | King Abdulaziz City for Science and Technology (KACST)<br>Saudi Electricity Company (SEC) |
| Expected Role | - Support of display and event including experiment seminar<br>- 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**

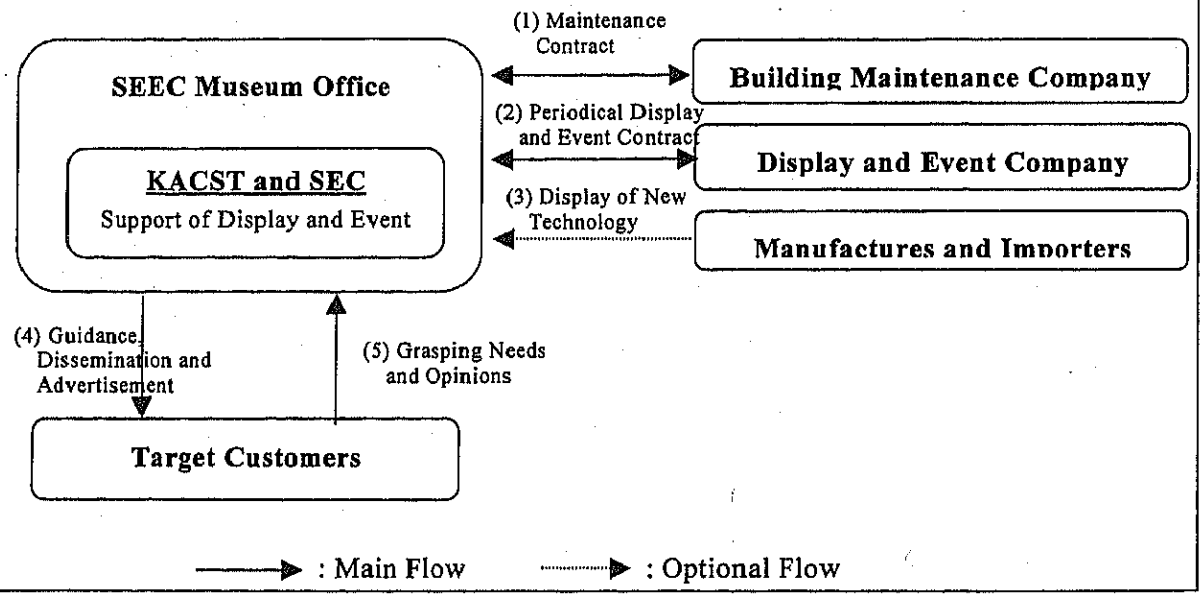
| | |
|---|---|
| Name of Target | Kids and household wives, and adults |
| Expected Action | - Look, touch, ask and take action |

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

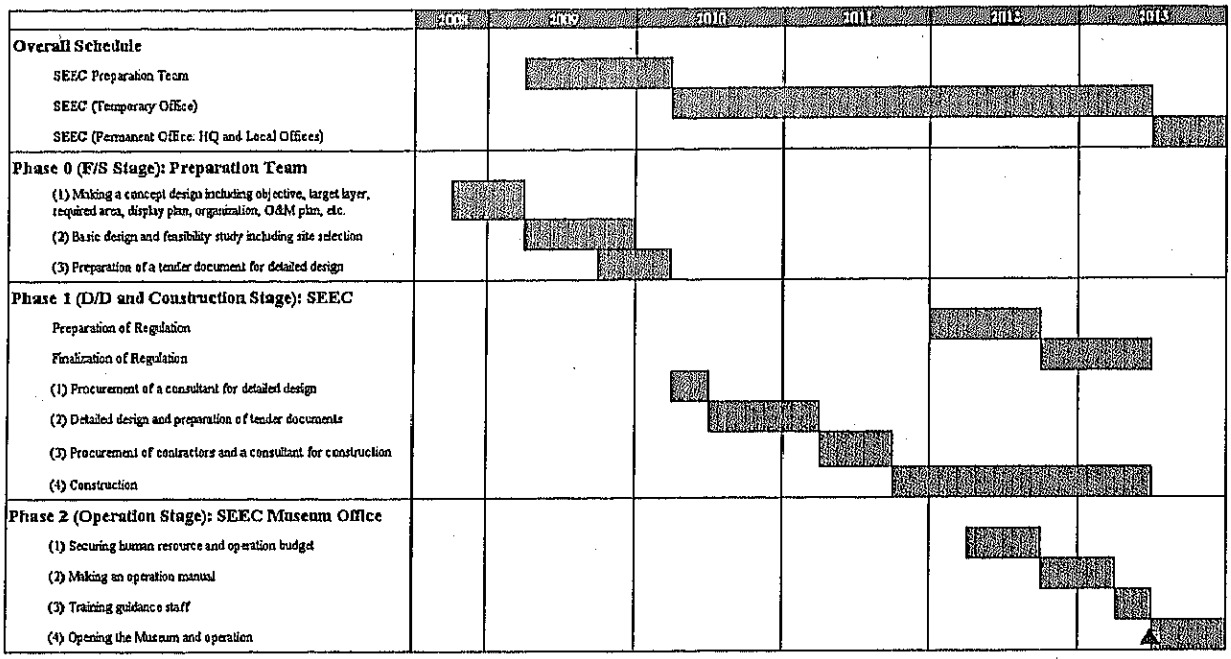
**(9) Required Items**

| | | |
|---|---|---|
| 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)<br>* Land cost is excluded. | 150 million SR<br>(Budget level) |
| | - Display construction | 20 million SR |
| | - Consulting service for building and display construction | 2 million SR<br>(= (100+20) x 5%)) |
| Phase 2 (Operation Stage) | Item | Budget |
| | - Building maintenance | 3.6 million SR/year<br>(= (100+20) x 3%) |
| | - Periodical display (every 3 months)<br>* Periodical display is cooperated by manufactures | 4 million SR<br>(= 1 million SR/times x 4) |
| | - Weekly seminar | 0.12 million SR<br>(=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

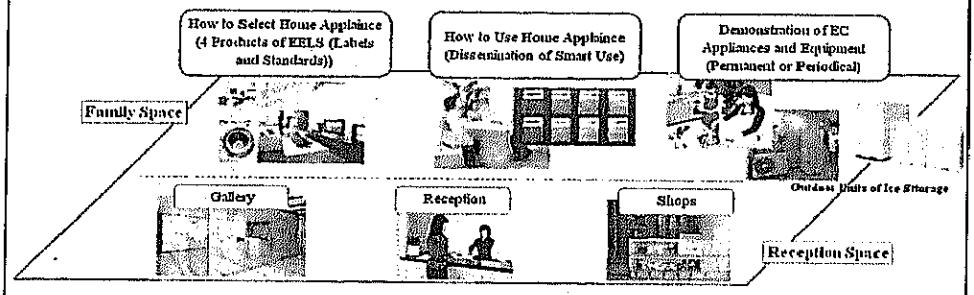



## (12) Attachment

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

**Attachment 9. EC Museum**
**Japan's display sample**

## Image of Museum (Ground Floor)

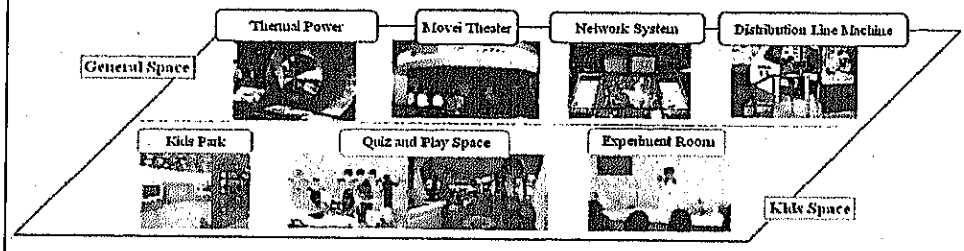



**Concept of the Ground Floor**

(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)

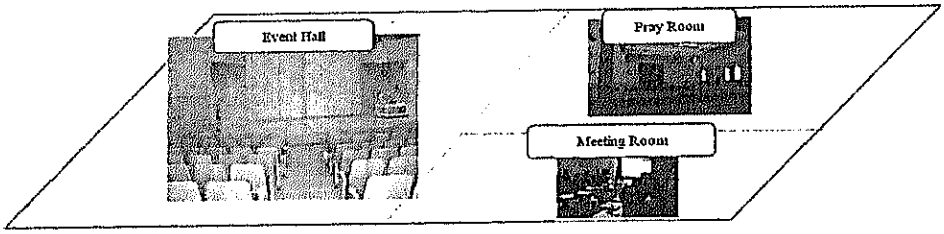



**Concept of the First Floor**

(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<br>- Speech and action<br>- Guidance skill<br>- Office service regulation | 1 hour | Business manner consultant |
| | | 2. Basic Knowledge<br>- Tariff and contract<br>- Power facilities (generation, transmission, distribution, renewable energy)<br>- Energy conservation technology and activity | 4 hours | SEC |
| | | 3. Operation Manuals<br>- Guidance manual of each display<br>- Planning and implementation manual for display and event, etc.<br>- Administration (office maintenance, procurement, disbursement, etc.) | 60 days | OJT by senior staff |
| | | 4. Follow-up Social Manner<br>- Check of speech. Action and guidance skill of each staff<br>- Discussion of their own issues in their work | 3 hours | Business manner consultant |
| Senior Staff Training | Senior Staff | 1. Senior Staff Training<br>- Role of senior staff<br>- 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)<br>- What is EELS?<br>- Role of SASO, Manufactures/Importers, Retail shops<br>- How to read labeled data<br>- 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)<br>- Smart selection<br>- Smart use<br>- Site visitation (retail shops) | 2 days | SEC/Retail Shop /Consultant |
| | | 3. Factory Visitation<br>- How to produce<br>- Manufacture's appealing points | 1 day | Local Manufacture |
| Power Station Visitation Training | All Staff (in turn) | 1. Power Station Visitation<br>- 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)**<br>- SASO has already established standards for various products, including building material.<br>- Saudi Building Code (SBC) is now waiting for its approval. It is expected in two years it will become mandatory.<br>**(This Scheme)**<br>- Setting of target building material in accordance with SBC<br>- Setting of performance standards in accordance with existing SASO standards and SBC<br>- Sending material information to SASO<br>- Registration of performance data<br>- Printing BEPIS mark on building material products<br>- Making database<br>- Random inspection<br>- Monitoring and awareness survey |

| Phase 1<br>(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<br>(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<br>- Collection of existing performance data from domestic and overseas resources<br>- Modification of existing criteria into local present/future condition<br>- Conducting necessary additional tests at laboratories<br>- Publication of BEPIS guideline<br>- Authorization of testing requirements for designated products<br>- Request of performance data registration to Manufacturers and Importers (M&Is)<br>- Making database and publication (booklet and internet)<br>- Designing BEPIS format to be printed on targeted products<br>- Dissemination campaign with workshops<br>- Monitoring and awareness survey<br>- Integration with other rating of building material performance<br>- Updating of BEPIS Database |
| Name of Agency | Saudi Energy Efficiency Center (SEEC) |
| Expected Role | - Dissemination campaign with workshops (transferred from SASO task)<br>- Random inspection of indicated performance data (with MOCI)<br>- Random inspection at construction sites (with MOMRA)<br>- Monitoring and awareness survey (transferred from SASO task)<br>- Updating of BEPIS Database |
| Name of Agency | Ministry of Commerce and Industry (MOCI) |
| Expected Role | - Assisting SASO in setting of target material/performance<br>- Establishment of law to enforce on M&Is.<br>- 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<br>- Random inspection at construction sites (with SEEC guidance) |

**(5) Relating Agency**

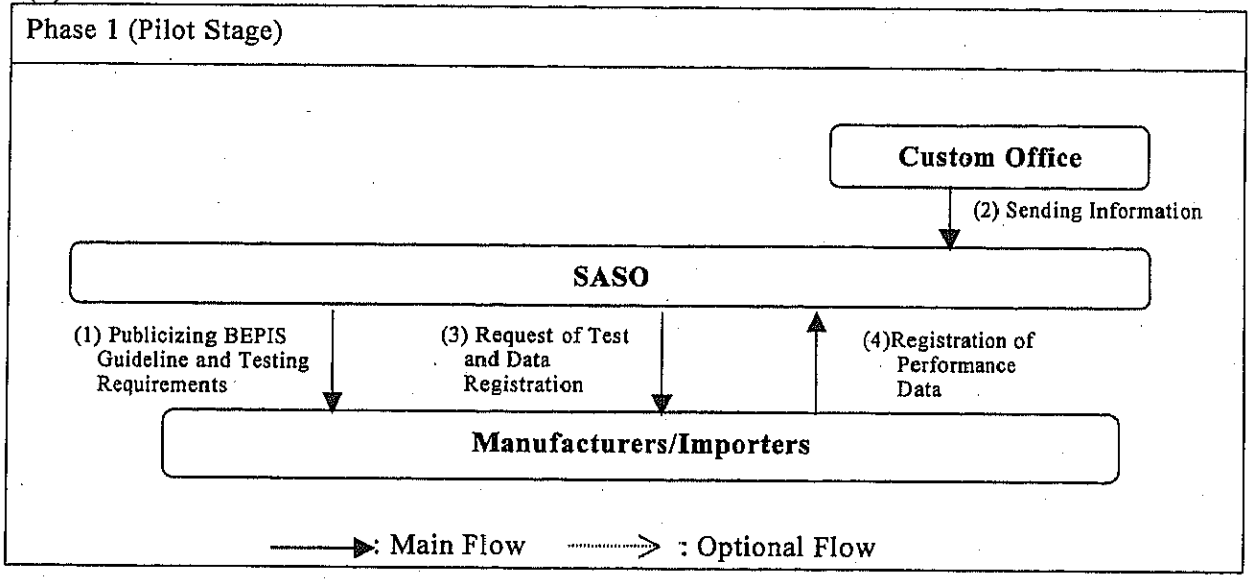
| | |
|---|---|
| Name of Agency | Saudi Building Code Committee (SBCC) |
| Expected Role | - Assisting SASO in setting of target material/performance |
| Name of Agency | King Abdulaziz City for Science & Technology (KACST) |
| Expected Role | - Assisting SASO in conducting necessary additional tests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

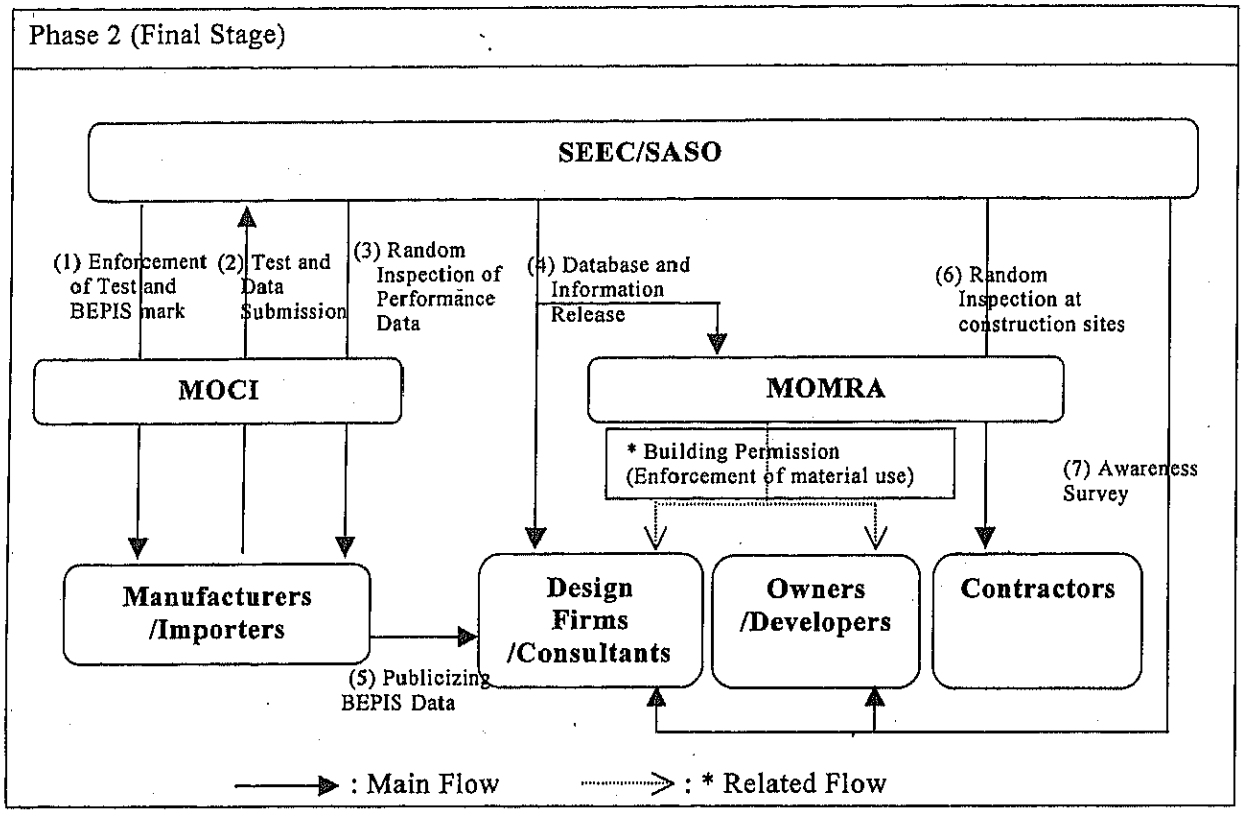
**(6) Target of the Scheme**

| | |
|---|---|
| Name of Target | Manufacturers and Importers (M&Is) |
| Expected Action | - Testing performance of designated products in accordance with SASO standard in authorized laboratories<br>- Publicizing BEPIS data of products<br>- Printing BEPIS mark on designated products |
| Name of Target | Housing/Building design firms and consultants |
| Expected Action | - Use of authorized building material for design<br>- 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)






**(8) Required Permanent Human Resources**

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

**(9) Required Items**

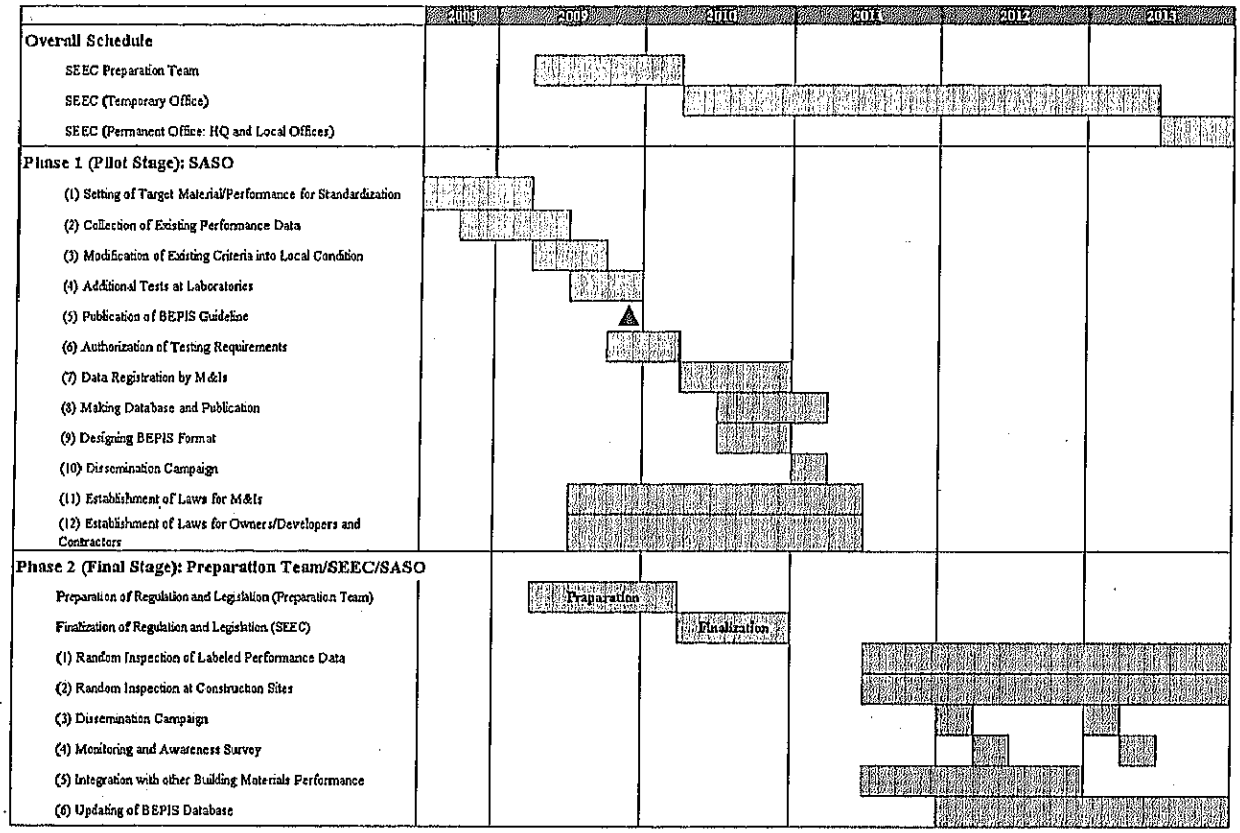
| | | |
|---|---|---|
| Phase 1<br>(Pilot Stage) | Item | Budget |
| | - Database software (SASO)<br>- Internet access system to the database (SASO)<br>- Format of BMEP mark (SASO) | 1 million SR/time<br>0.5 million SR/time<br>- |
| Phase 2<br>(Final Stage) | Item | Budget |
| | - Testing cost for random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

**(10) Expected Legislation for Enforcement**

| | | |
|---|---|---|
| Phase 1<br>(Pilot Stage) | Items to be stipulated in Act | Relating Order/Regulation |
| | - | - |
| Phase 2<br>(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)<br>(2) Standards of judgment for each building material are specified by a Cabinet Order. (to be prepared by SASO, MOCI and SBCC)<br>(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<br>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<br>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<br>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.<br>• 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.<br>• 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<br>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<br>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<br>Penalty | A person who falls under any of the following items shall be punished by a fine of not more than ## Saudi Riyal.<br>• 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<br>- Development of questionnaire sheet for each survey<br>- Implementation of questionnaire survey by interview and/or internet<br>- Presentation of the surveyed result at a workshop in EC month and via internet (workshop / MOWE / KACST / SASO web sites)<br>- Making database for the surveyed results<br>- Analyzing the surveyed results and making recommendation for the future steps<br>- Continuously implementation of the surveys annually | |
| Phase 1 (Pilot Stage) | Task | Responsible Agency |
| | (1) Identification of necessary survey:<br>· Electricity consumption of governmental, industry, commercial and residential sector by utilizing SEC meter (100 each)<br>· EC practice and used EC technology in industry (100)<br>· EC awareness and practice level of governmental, industry, commercial and residential sector (100 each)<br>· Study for effective dissemination on labeling (100)<br>(2) Development of questionnaire sheet for each survey<br>(3) Implementation of questionnaire survey by interview and/or internet<br>(4) Presentation of the surveyed result at a workshop in EC month and via internet (workshop / MOWE / KACST / SASO web sites)<br>(5) Making database for the surveyed results<br>(6) Analyzing the surveyed results and making recommendation for the future steps | SEC<br><br>MOWE<br>MOWE<br><br>SASO<br>Each Agency<br>Each Agency<br><br>MOWE and Each Agency<br>MOWE<br>Each Agency<br><br>MOWE |

| Phase 2 (Final Stage) | Task | Responsible Agency |
|---|---|---|
| | Same as the task of "Phase 1 (Pilot Stage)"<br>(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)**<br>- Identification of necessary survey<br>- Development of questionnaire sheet for each survey<br>- Implementation of questionnaire survey by interview and/or internet<br>- Presentation of the surveyed result at a workshop in EC month and via internet (workshop / MOWE / KACST / SASO web sites)<br>- Making database for the surveyed results<br>- Analyzing the surveyed results and making recommendation for the future steps |
| Name of Agency | Saudi Energy Efficiency Center (SEEC) |
| Expected Role | **(Final Stage)**<br>- Continuously implementation of the surveys annually |

**(5) Relating Agency**

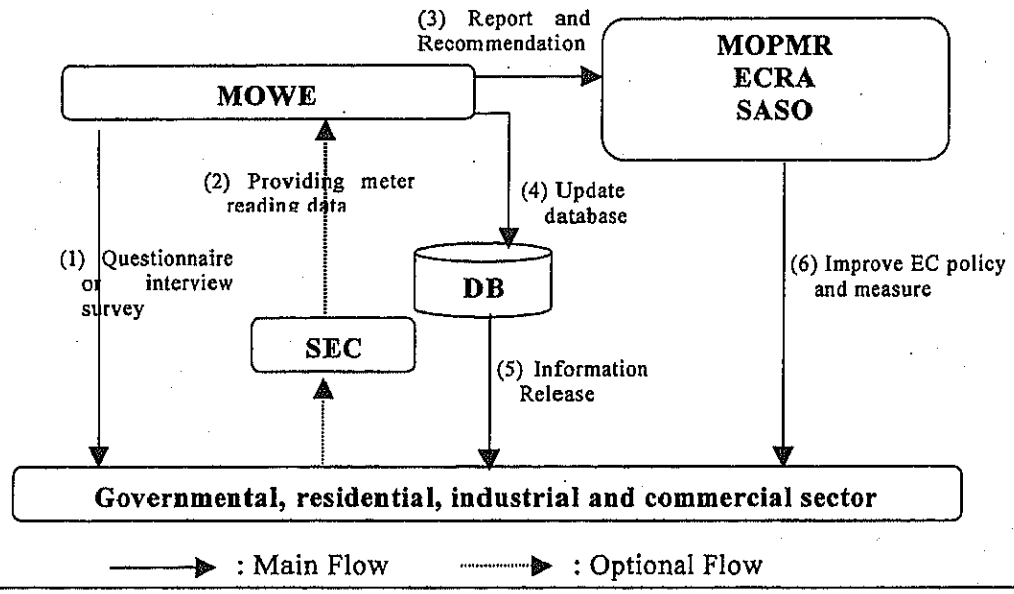
| | |
|---|---|
| Name of Agency | Ministry of Petroleum and Mineral Resources (MOPMR) |
| Expected Role | - Data/Info collection<br>- EC Policy planning based on surveyed result |
| Name of Agency | ECRA |
| Expected Role | - EC Policy planning based on surveyed result |
| Name of Agency | SEC |
| Expected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

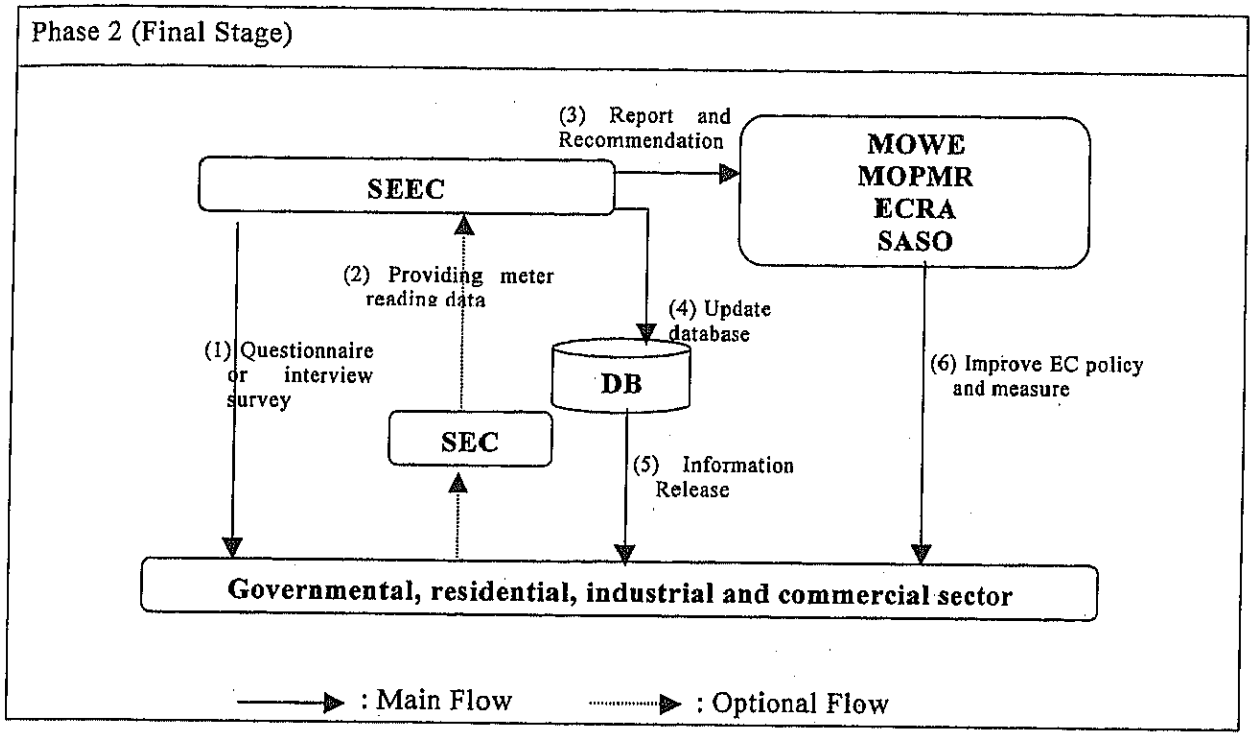
**(6) Target of the Scheme**

| | |
|---|---|
| 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)






**(8) Required Permanent Human Resources**

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

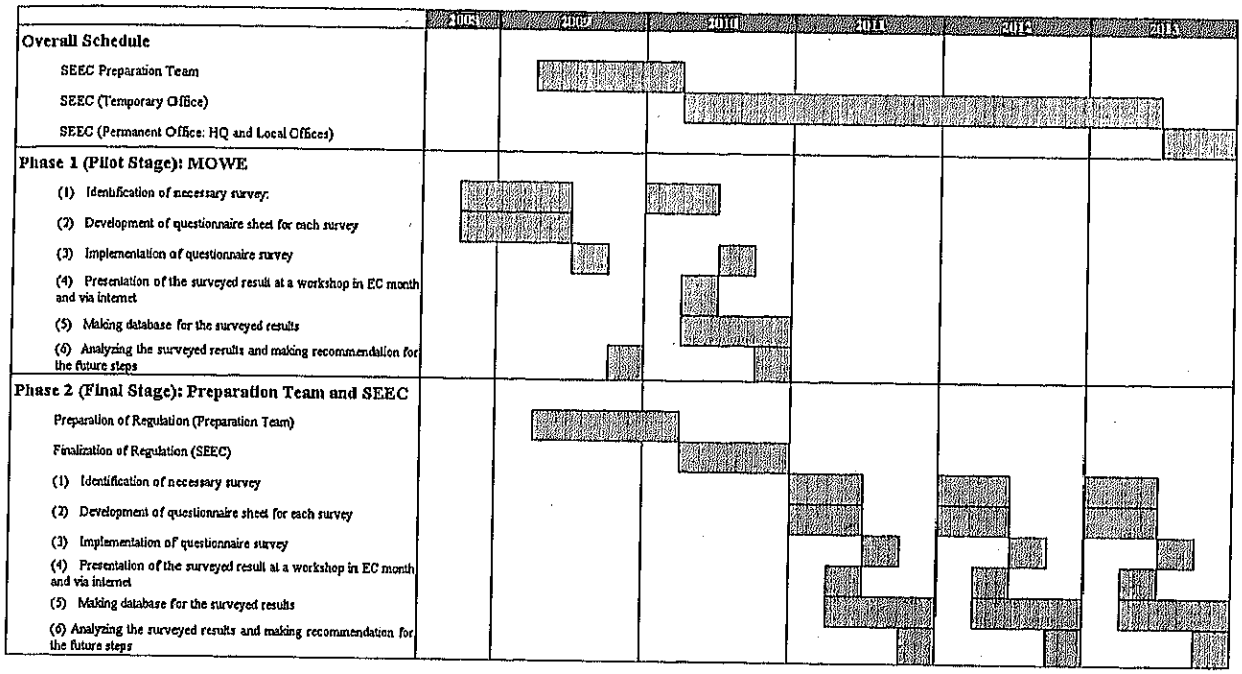
**(9) Required Items**

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

| | | |
|---|---|---|
| (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 anc | 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<br>e. Private business f. Others (_____) |
| Residence | a. Northern area b. Central area c. Southern area d Western area<br>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.<br>- 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<br>➢ Identification of eligible customers (demand size, sector)<br>➢ Minimum requirement of adjustment [xxx kW, or xxx % of the contract capacity]<br>➢ Identification of peak hours when the scheme is applied<br>➢ Maximum number of request per year<br>➢ Lead time of notifying the adjustment [xx hours prior to the start of load adjustment]<br>➢ Estimation of "avoidable cost" with peak shift, which leads to the unit price of tariff discount [incentives for actual adjustment and for stand-by]<br>➢ 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)**<br>- Designing specifications of the contract<br>- Drafting contract document<br>- Implementation of pilot project<br>- Workshops for estimating potential volume of peak shift<br>**(Final Stage)**<br>- Procurement of meters fit for the scheme<br>- Publicity of the scheme to large customers for dissemination<br>- Management and review of the scheme after implementation |

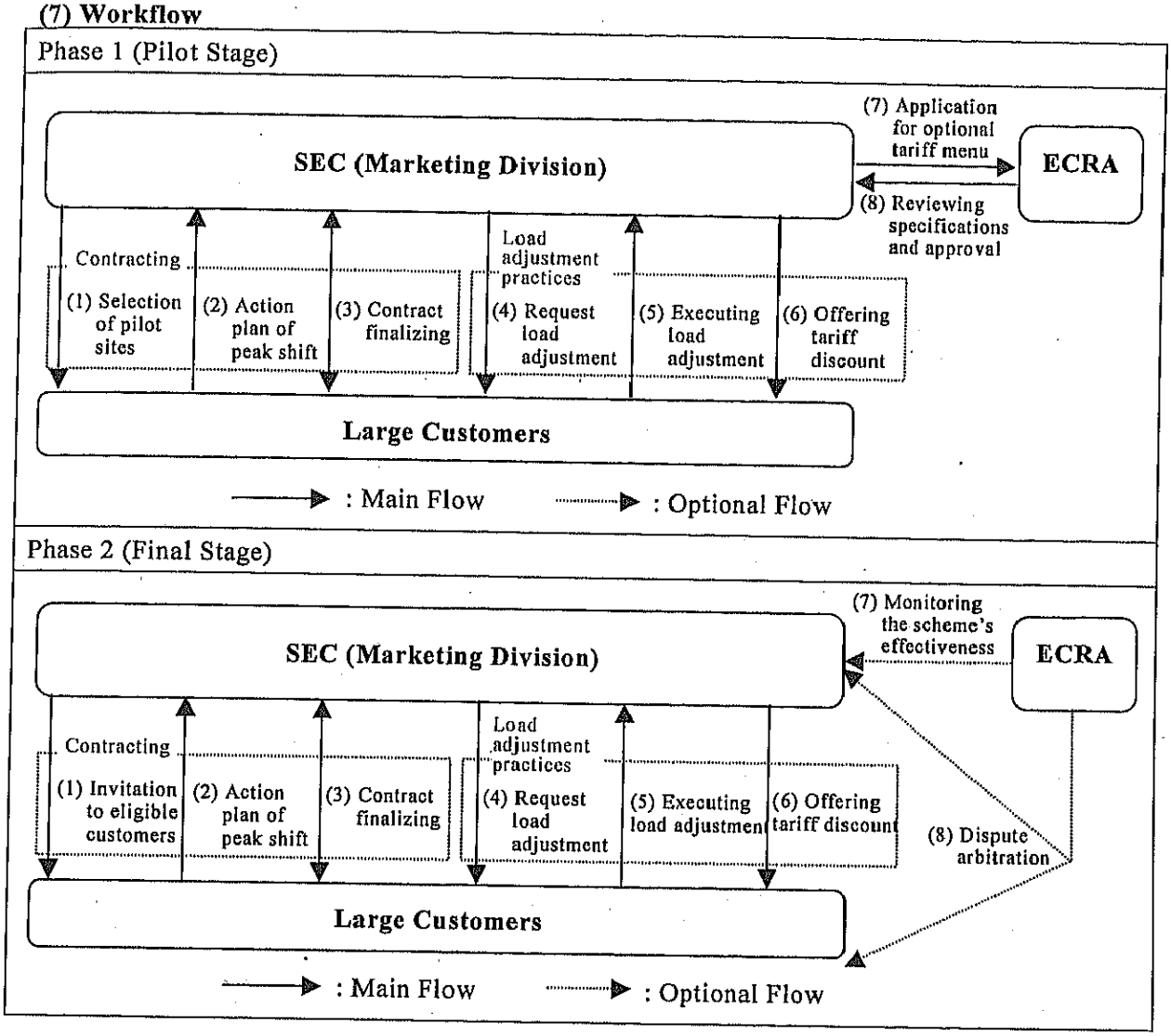
**(5) Related Agencies**

| | |
|---|---|
| Name of Agency | Electricity and Cogeneration Regulatory Authority (ECRA) |
| Expected Role | **(Pilot Stage)**<br>- Authorization of the scheme after reviewing specifications of this scheme submitted by SEC.<br>**(Final Stage)**<br>- Monitoring the scheme's effectiveness and providing suggestions for improvement when needed<br>- 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)**<br>Selected large customers (industrial & commercial)<br>* 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<br>- Estimation of economic value of power demand in peak hours to determine economically optimized volume of demand adjustment<br>- Making action plan of peak shift in emergency<br>- Contracting with SEC<br>- Taking expected actions of load adjustment upon SEC's request<br>- Giving comments for improving the scheme (if any) |
| Name of Target | **(Final Stage)**<br>Large customers<br>(industrial & commercial, specifications of eligibility to be confirmed) |
| Expected Action | - Reviewing their own load pattern<br>- Estimation of economic value of power demand in peak hours to determine economically optimized volume of demand adjustment<br>- Making action plan of peak shift in emergency<br>- Contracting with SEC<br>- Taking expected actions of load adjustment upon SEC's request |

**(7) Workflow**




**(8) Required Permanent Human Resources**

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

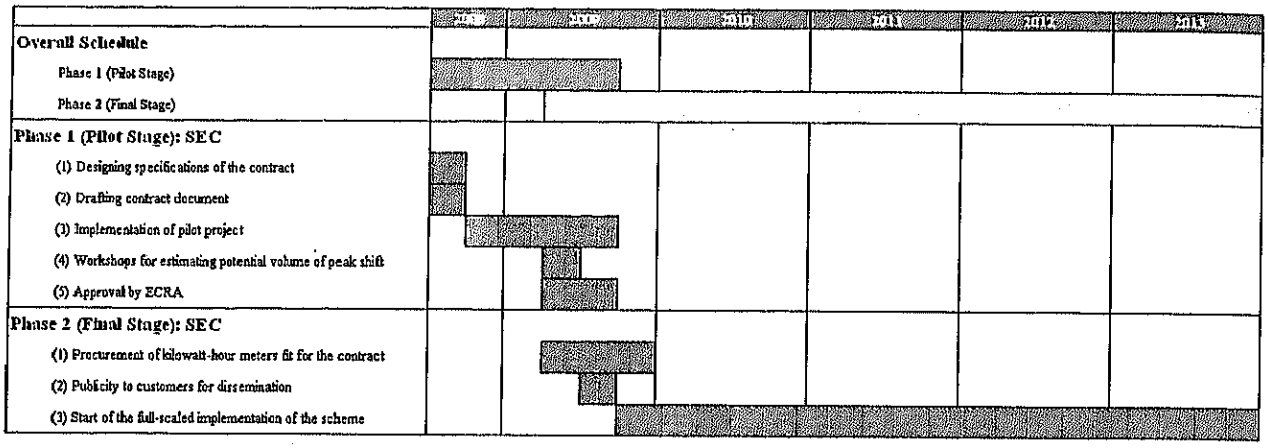
**(9) Required Items**

| | | |
|---|---|---|
| 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<br>(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<br>(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**

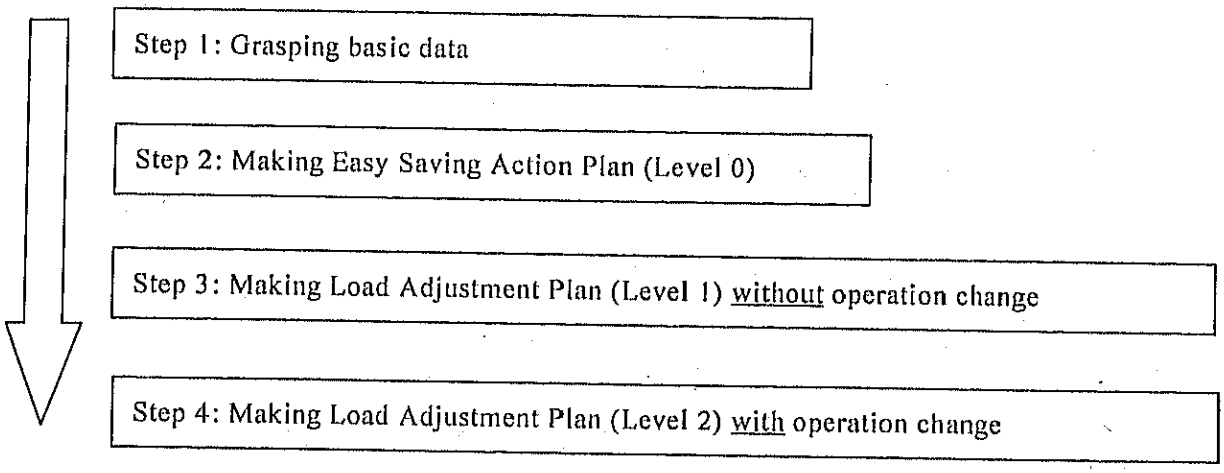
1. Background

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<br>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<br>(2) 10 Minutes<br>(3) 30 Minutes<br>(4) 1 hour<br>(5) 3 hours | | | (1) Soon<br>(2) 10 Minutes<br>(3) 30 Minutes<br>(4) 1 hour<br>(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.<br>- Submission of proposal (application)<br>- Selection of applicants by R&D Committee to be established<br>- Making contract<br>- Implementation and submission of completion report<br>- Evaluation and review<br>- 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:<br>• Basic research (Pioneering research)<br>• Product development (Practical application)<br>• Experimental demonstration project (Verification) | KACST |
| | (6) Identification of R&D themes from needs and seed survey:<br>• Insulation material for building and house<br>• Building and house design<br>• Air conditioning system suitable for KSA<br>• 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)**<br>At first, experimental demonstration project will start.<br><br>(1) Request for proposal to academy and industry, etc.<br>(2) Submission of proposal (application)<br>(3) Selection of applicants by R&D committee to be established<br><br>(4) Making contract<br>(5) Implementation and submission of completion report<br>(6) Evaluation and review<br>(7) Follow-up survey (2 years after completion) | KACST<br>Applicants<br>R&D Committee<br><br>KACST<br>Applicants<br>R&D C<br>KACST |
| Phase 2 (Basic Research) | Task | Responsible Agency |
| | **(Basic Research and Product Development)**<br>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)**<br>- Establishment of R&D Committee<br>- Needs survey on EC research targeting at academic, government and industry<br>- Seeds survey targeting at academy and domestic/foreign manufacturers<br>- Establishment of R&D policy by identifying how R&D can contribute for national EC target<br>- Development of research strategy<br>- Design of scheme to meet research strategy<br>**(Demonstration and Basic Research)**<br>- Request for proposal to academy and industry, etc.<br>- 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)**<br>- Establishment of R&D policy<br>- Identification of R&D themes from needs and seed survey<br>- Making contract<br>- Follow-up survey (2 years after completion)<br>**(Demonstration and Basic Research)**<br>- Selection of applicants<br>- Evaluation and review |

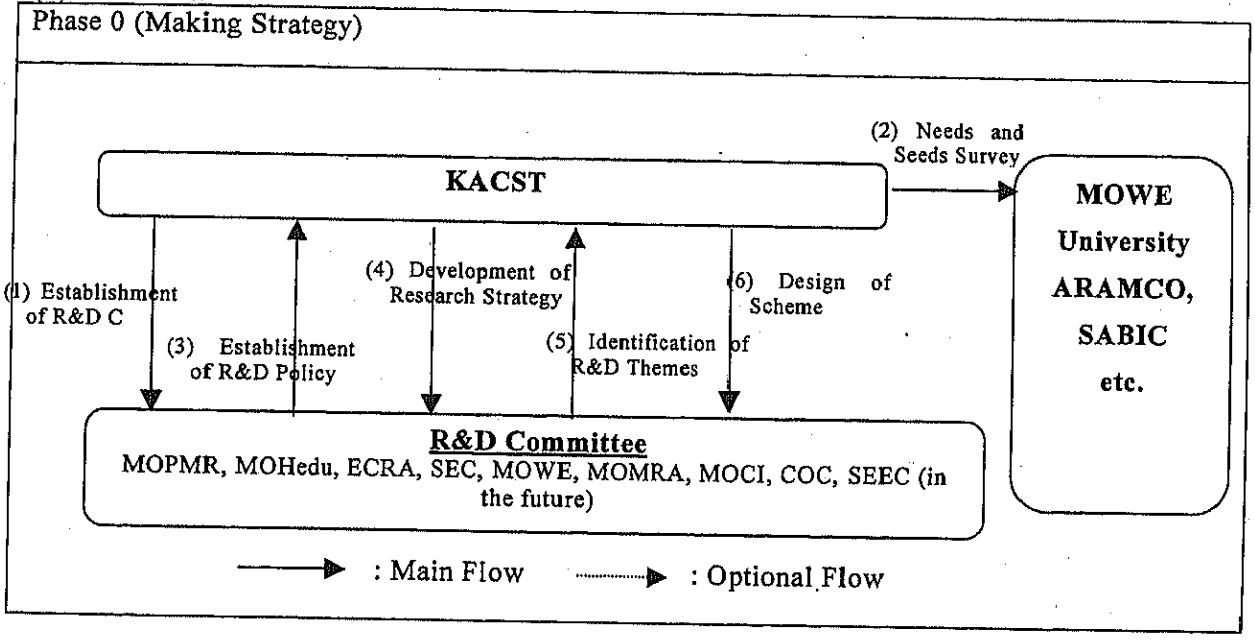
**(5) Relating Agency**

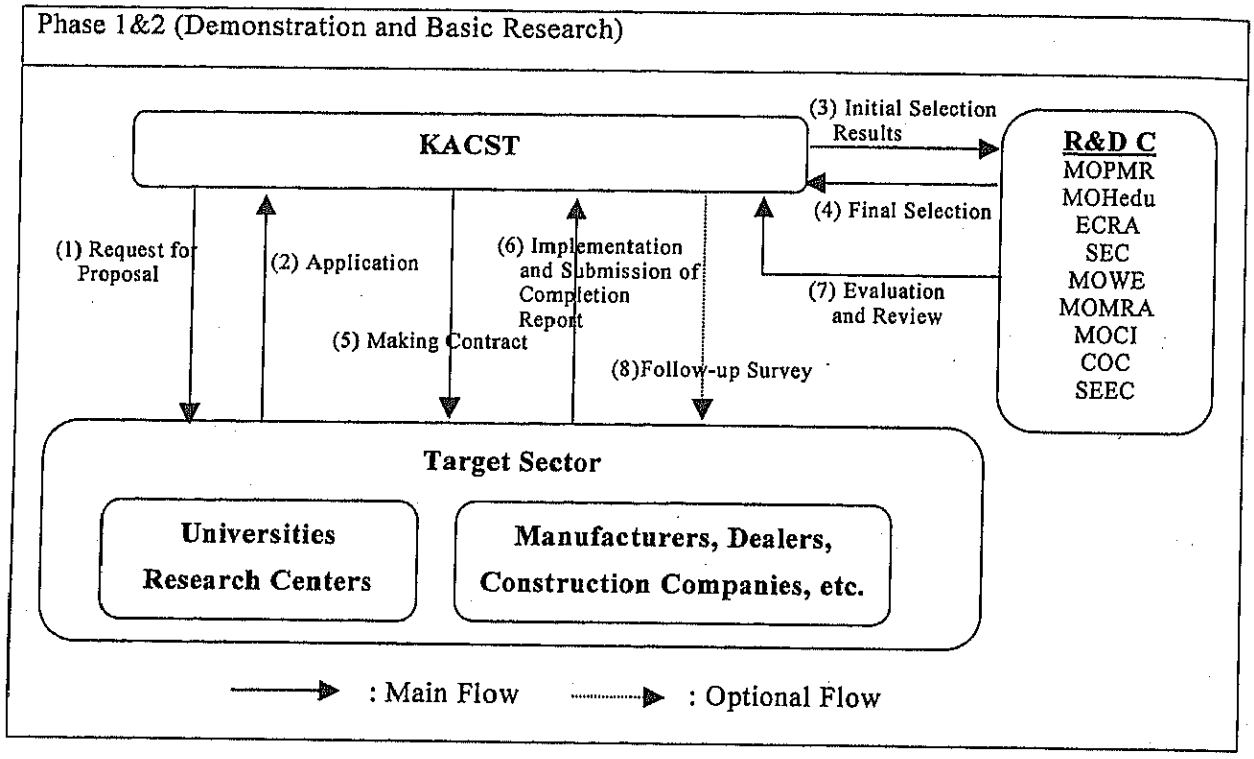
| Name of Agency | MOWE, University, ARAMCO, SABIC, etc. |
|---|---|
| Expected Role | - Providing R&D needs and seeds |
| Name of Agency | MOF |
| Expected Role | - Allocation of budget for a research fund |

**(6) Target of the Scheme**

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

**(7) Workflow**






**(8) Required Permanent Human Resources**

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

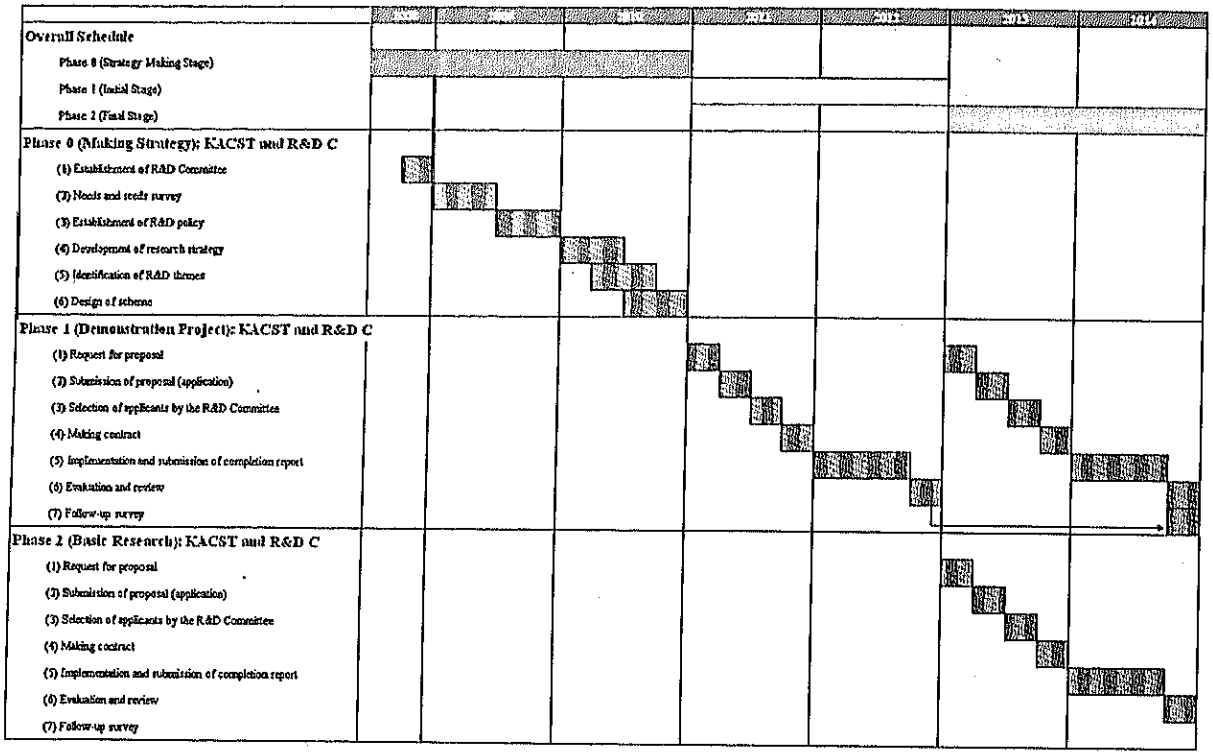
**(9) Required Items**

| | | |
|---|---|---|
| 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<br>B: Basic research (Pioneering research)<br>P: Product development (Practical application)<br>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

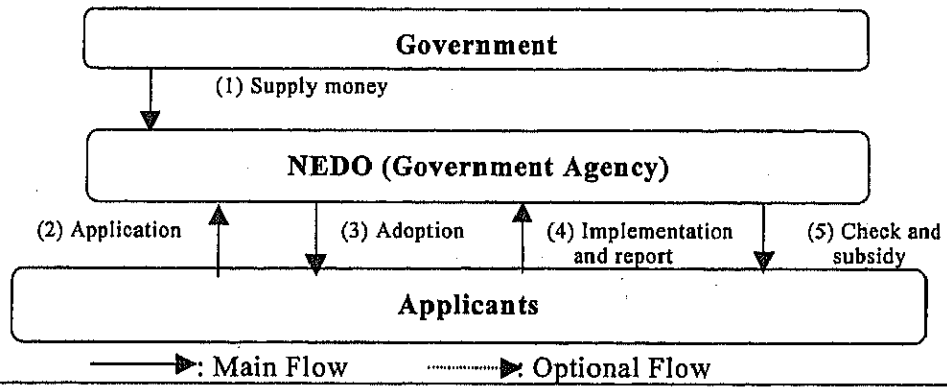
# 付属資料 3

# 中優先度および低優先度省エネ方策のコンセプトペーパー

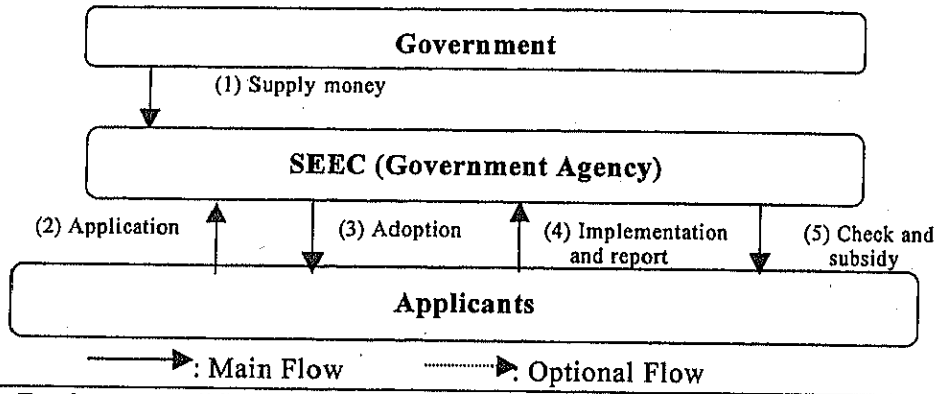
# Middle Priority Measure

1. Subsidy for Energy Conservation Project and Demonstration Project, and Subsidy for Installation of High Efficiency System

(1) Japan's Sample

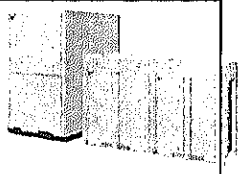
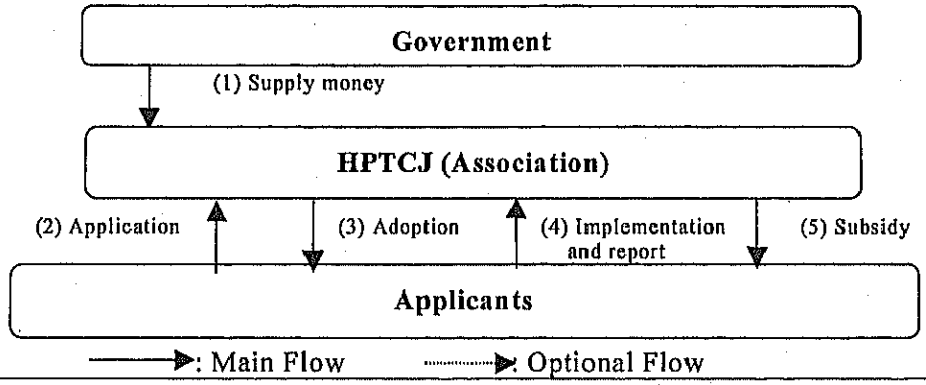
<table>
<tr><td>Program</td><td colspan="2">Subsidy for Energy Conservation Project and Demonstration Project and Subsidy for Installation of High Efficiency System</td></tr>
<tr><td>Players</td><td>Executing Agency:<br>NEDO (Government Agency)</td><td>Target:<br>As described below</td></tr>
<tr><td>Overview</td><td colspan="2">(EC Project)<br>- Target sector is industry and commercial sectors.<br>- Subsidy for 1/3 of total project cost (limit: 500 million Yen/year)<br>- Annual budget in FY2006 is 24,150 million Yen<br>- Expected effect: Reduction of 600,000 kl toe/year<br>- ESCO can also apply to this scheme.<br>(Demonstration Project)<br>- Target sector is local government and commercial buildings.<br>- Subsidy for 1/2 of total project cost (limit: 100 million Yen)<br>- Annual budget in FY2006 was 1,672 million Yen<br>(Installation of High Efficiency System)<br>- Target sector is commercial and residential sectors.<br>- Subsidy for 1/3 of total project cost (limit: 27 million Yen)<br>- Annual budget in FY2006 was 4,512 million Yen<br>- Expected effect: Reduction of 189,000 kl toe/year<br>- Expected technology: heat pump, BEMS, lamp, insulation materials, etc,<br>- 15 % reduction - 25 % reduction is the standard for qualification.</td></tr>
<tr><td>Workflow</td><td colspan="2"> 
</td></tr>
<tr><td>Record and effect</td><td colspan="2">EC Project
<table>
<tr><td></td><td>FY2002</td><td>FY2003</td><td>FY2004</td><td>FY2005</td></tr>
<tr><td>Application</td><td>199</td><td>231</td><td>161</td><td>339</td></tr>
<tr><td>Qualified</td><td>120</td><td>111</td><td>80</td><td>314</td></tr>
</table>
Demonstration Project
<table>
<tr><td></td><td>FY2004</td><td>FY2005</td></tr>
<tr><td>Application</td><td>89</td><td>44</td></tr>
<tr><td>Qualified</td><td>17</td><td>15</td></tr>
</table>
High Efficiency System
<table>
<tr><td>FY2004</td><td>FY2005</td></tr>
<tr><td>849</td><td>1,237</td></tr>
<tr><td>760</td><td>991</td></tr>
</table></td></tr>
<tr><td>Key points for success</td><td colspan="2">- To choose qualified projects, evaluation standard is established and open to the public. Simple and efficient selection procedure should be made.<br>- Checking system for proper use of money is necessary.</td></tr>
</table>

(2) Concept Paper for KSA

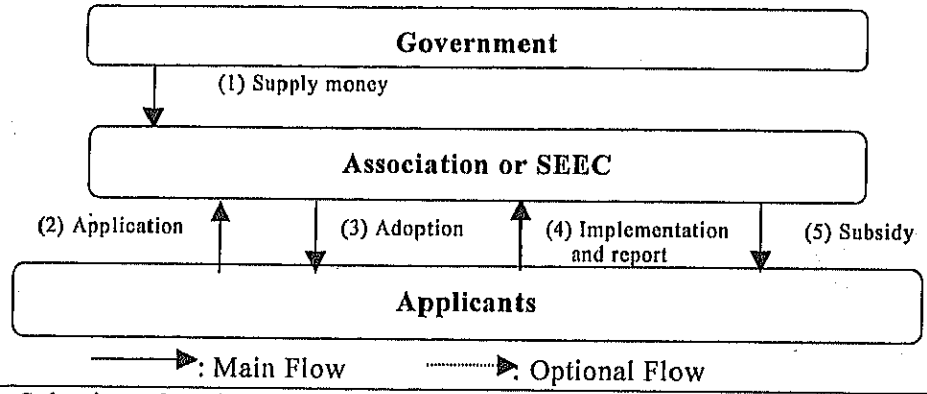
<table>
<tr><td>Program</td><td colspan="4">Subsidy for EC Project and Demonstration Project and Subsidy for Installation of High Efficiency System</td></tr>
<tr><td>Players</td><td colspan="2">Executing Agency:<br>SEEC</td><td colspan="2">Target:<br>As described below</td></tr>
<tr><td>Concept</td><td colspan="4">(EC Project and Demonstration Project)<br>- Target sector is industry, commercial, and agriculture sectors.<br>- Selection and qualified by Government Agency<br>- Monitoring and check are conducted by Government Agency.<br>(Installation of High Efficiency Equipment)<br>- Target sector is industry, commercial, residential and agriculture sectors<br>- Selection and qualified by Government Agency<br>- Monitoring and check are conducted by Government Agency.</td></tr>
<tr><td>Workflow</td><td colspan="4"> 
</td></tr>
<tr><td>Key points for success</td><td colspan="4">- To choose qualified projects, evaluation standard should be established and open to the public. Simple and efficient selection procedure should be made.<br>- Checking system for proper use of money is necessary.<br>- Target sectors should be selected.</td></tr>
<tr><td rowspan="5">Possibility to adopt the scheme for KSA</td><td>Evaluation Criteria</td><td>Level 1</td><td>Level 2</td><td>Level 3</td></tr>
<tr><td>Duration for design, consensus, and finalization</td><td>Long</td><td>Middle</td><td>Short</td></tr>
<tr><td>No. of concerned agencies and stakeholders</td><td>Many</td><td>Several</td><td>Few</td></tr>
<tr><td>Effect on EC</td><td>Small</td><td>Fare</td><td>Large</td></tr>
<tr><td>Comments</td><td colspan="3">It seems to have a large impact for EC. However, check for proper use of money is not so easy. Implementation capacity of applicants is also required.</td></tr>
</table>

2. Subsidy for Specific Equipment

(1) Japan's Sample

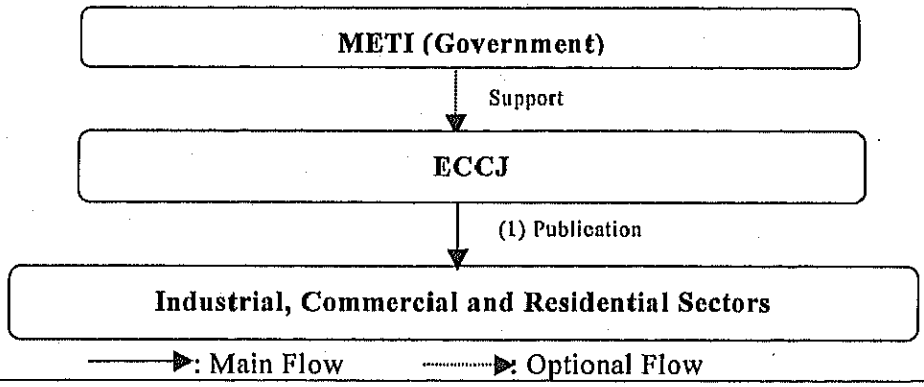
<table>
<tr><td>Program</td><td colspan="2">Subsidy for Specific Equipment (Eco-Cute (hot water server) and ECO-Ice (Ice storage system))</td></tr>
<tr><td>Players</td><td>Executing Agency:<br>Heat Pump and Thermal Storage Technology Center of Japan (HPTCJ) (Association)</td><td>Target:<br>All Sectors</td></tr>
<tr><td>Overview</td><td colspan="2">(Specified Equipment)<br>- High efficiency hot water server (ECO-Cute)<br>- Thermal storage system (ECO- Ice)<br>(ECO-Cute Subsidy)<br>- Fixed subsidy by the scale of equipment<br>- Subsidy: 50,000 – 260,000 yen per 1 unit<br>(ECO-Ice Subsidy) (now closed)<br>- Subsidy for 1/2 of differential cost between standard produce and ECO-Ice<br>(Source of Subsidy)<br>- Government (METI) supply money for the subsidy<br>(Selection)<br>- By the order of proposal submission up to the budget of subsidy (2 times in a year)<br>  Eco-Cute  Eco-Ice</td></tr>
<tr><td>Workflow</td><td colspan="2">  </td></tr>
<tr><td>Record and effect</td><td colspan="2">(ECO-Ice)<br><table><tr><td></td><td>1998</td><td>1999</td><td>2000</td><td>2001</td><td>2002</td></tr><tr><td>No. of Unit</td><td>2,374</td><td>4,617</td><td>6,700</td><td>5,102</td><td>5,177</td></tr><tr><td>Total Subsidy (million JY)</td><td>1,439</td><td>2,877</td><td>3,178</td><td>1,363</td><td>1,264</td></tr><tr><td>Average Subsidy per Unit (JY)</td><td>606,150</td><td>623,132</td><td>474,328</td><td>267,150</td><td>244,157</td></tr></table>- More than 24,000 sold (as of 2005)<br>- 1.6 GW peak shift effect (as of 2005)<br>- Subsidy had already closed at 2002.<br>(ECO-Cute)<br><table><tr><td></td><td>2002</td><td>2003</td><td>2004</td><td>2005</td><td>2006</td></tr><tr><td>No. of Unit (estimate)</td><td>20,000</td><td>35,000</td><td>35,000</td><td>100,000</td><td>190,000</td></tr></table></td></tr>
<tr><td>Key points for success</td><td colspan="2">- Fixed subsidy simplifies the procedure for ECO-Cute.<br>- TOU option supports the ECO-Ice (thermal storage system)</td></tr>
</table>

(2) Concept Paper for KSA

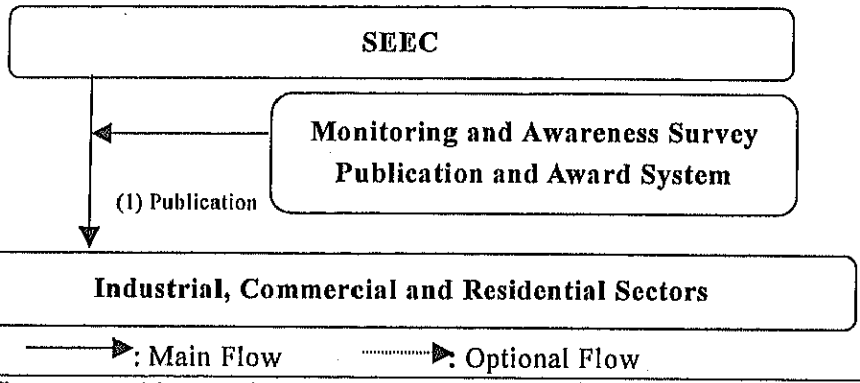
<table>
<tr><td>Program</td><td colspan="4">Subsidy for Specific Equipment</td></tr>
<tr><td>Players</td><td colspan="2">Executing Agency:<br>Association or SEEC</td><td colspan="2">Target:<br>Industrial, Commercial and Residential Sectors</td></tr>
<tr><td>Concept</td><td colspan="4">(Selection of Specific Equipment)<br>- Target equipment should be decided first, considering impact on EC, local product promotion, etc.<br>- Maybe small equipment (lamp) and luxury equipment (TV) are not applied in this scheme.<br>(Subsidy Procedure)<br>- Fixed subsidy is preferable because of simple procedure.<br>(Executing Agency)<br>- Association is possible to implement this scheme supported by Government</td></tr>
<tr><td>Workflow</td><td colspan="4"> 
</td></tr>
<tr><td>Key points for success</td><td colspan="4">- Selection of equipment should be examined.<br>- Simple procedure is better.</td></tr>
<tr><td rowspan="5">Possibility to adopt the scheme for KSA</td><td>Evaluation Criteria</td><td>Level 1</td><td>Level 2</td><td>Level 3</td></tr>
<tr><td>Duration for design, consensus, and finalization</td><td>Long</td><td>Middle</td><td>Short</td></tr>
<tr><td>No. of concerned agencies and stakeholders</td><td>Many</td><td>Several</td><td>Few</td></tr>
<tr><td>Effect on EC</td><td>Small</td><td>Fare</td><td>Large</td></tr>
<tr><td>Comments</td><td colspan="3">For example, high efficiency air-conditioner, high efficiency refrigerator, high efficiency might be applicable. Selection should be decided through long-term vision.</td></tr>
</table>

3. Instruction Booklet (by Government or Association)

(1) Japan's Sample

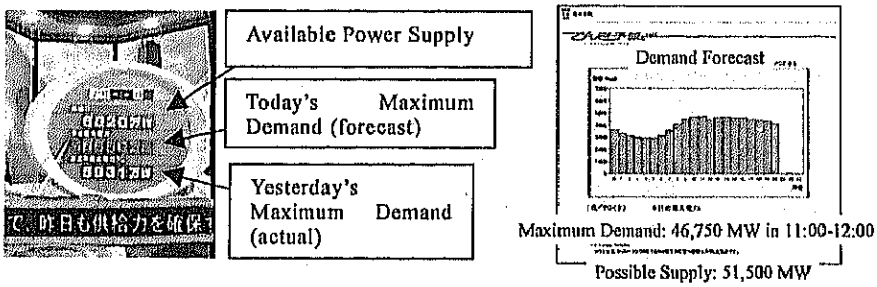
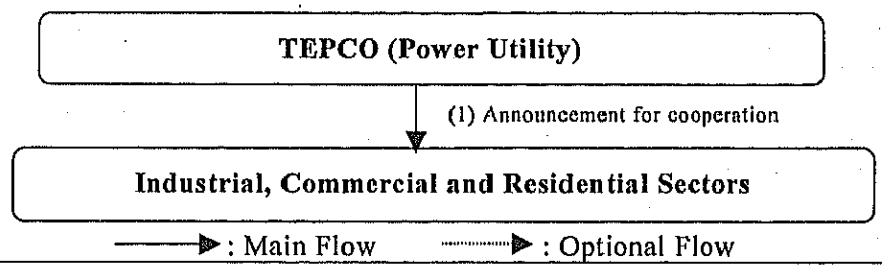
<table>
<tr><td>Program</td><td colspan="2">Instruction Booklet (by Government or Association)</td></tr>
<tr><td>Players</td><td>Executing Agency:<br>ECCJ</td><td>Target:<br>All Sectors</td></tr>
<tr><td>Overview</td><td colspan="2">(Objective)<br>- Dissemination, and instruction of EC measures in 3 phases (replacement, renovation and operation improvement).<br>   <br>(List of the Books)<br><u>General Contents</u><br>- Instruction for Factory EC Measures<br>- Instruction for Building EC Measures<br><u>Specific Contents</u><br>- Instruction for Office Building<br>- Instruction for Shopping Center<br>- Instruction for Hotel<br>- Instruction for Hospital<br>- Instruction of Operation Improvement for Commercial Building<br><u>Household Appliances</u><br>- Instruction for Household Appliances<br>(Publication)<br>- ECCJ publishes the above booklets.<br>- Website can be utilized to get pdf of the booklets.</td></tr>
<tr><td>Workflow</td><td colspan="2">  </td></tr>
<tr><td>Record and effect</td><td colspan="2">- No data</td></tr>
<tr><td>Key points for success</td><td colspan="2">- Practical samples or illustration is used in the booklets.</td></tr>
</table>

(2) Concept Paper for KSA

<table>
<tr><td>Program</td><td colspan="4">Instruction Booklet (by Government or Association)</td></tr>
<tr><td>Players</td><td colspan="2">Executing Agency:<br>SEEC</td><td colspan="2">Target:<br>Industrial, Commercial and Residential, Sectors</td></tr>
<tr><td>Concept</td><td colspan="4">(Expected Books)<br>- Instruction for Factory EC Measures<br>- Instruction for Building EC Measures<br>- Instruction of Operation Improvement for Commercial Building<br>- Instruction for Household Appliances</td></tr>
<tr><td>Workflow</td><td colspan="4"> 
</td></tr>
<tr><td>Key points for success</td><td colspan="4">- At first, general instruction booklets can be made.<br>- To make specific instruction booklets such as hotel, shopping center, etc., data and information collection is necessary.<br>- Various survey results (Monitoring and Awareness Survey, Publication and Award System, etc) should be reflected on instruction booklets.</td></tr>
<tr><td rowspan="5">Possibility to adopt the scheme for KSA</td><td>Evaluation Criteria</td><td>Level 1</td><td>Level 2</td><td>Level 3</td></tr>
<tr><td>Duration for design, consensus, and finalization</td><td>Long</td><td>[Middle]</td><td>Short</td></tr>
<tr><td>No. of concerned agencies and stakeholders</td><td>Many</td><td>Several</td><td>[Few]</td></tr>
<tr><td>Effect on EC</td><td>Small</td><td>[Fare]</td><td>Large</td></tr>
<tr><td>Comments</td><td colspan="3">Instruction book is helpful for energy manager in factory and building. Instruction booklet is one tool of publication of "Monitoring and Awareness Survey" and "Publication and Award System" that are high priority measure.</td></tr>
</table>

4. Announcement of Daily Demand and Supply Forecast

(1) Japan's Sample

<table>
<tr><td>Program</td><td colspan="2">Announcement of Daily Demand and Supply Forecast</td></tr>
<tr><td>Players</td><td>Executing Agency:<br>TEPCO</td><td>Target:<br>All Sectors</td></tr>
<tr><td>Overview</td><td colspan="2">(Objective)<br>- To request cooperation for energy saving by announcement of today's power supply and capacity balance.<br>- Since 2003, the Denki Forecast started. The year of 2003 was the emergent year for power supply.<br>(Information of the Announcement)<br>- Available power supply ability on the day<br>- Maximum power demand forecast on the day<br>- Request for saving power consuming<br>- Maximum power demand on the day before (only on TV and a Web site)<br>- Maximum power demand every hour (only on a Web site)<br>(How to Announce)<br>  <br><br>**TV Announcement** **Website of TEPCO**</td></tr>
<tr><td>Workflow</td><td colspan="2">  <br></td></tr>
<tr><td>Record and effect</td><td colspan="2">- Since 2003, TEPCO has started the Denki Forecast</td></tr>
<tr><td>Key points for success</td><td colspan="2">- Make known to the public widely through media</td></tr>
</table>