

Annex

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【Materials for Reference】

Summary of "Evaluation Criteria for Factories and Business Establishment"(METI Notification No.65/ March 29, 2006)

Category	Control	Measurement and Recording	Maintenance and Inspection	Measures to be Taken for the New Installation of Equipment
1 Rationalization of Fuel Combustion	<p>(1) Control of Fuel Combustion (a) Air ratio shall be controlled according to the type of the combustion equipment and fuel used therein. "Management Standard" (b) For combustion equipment, the air ratio shall be lowered based on the value of the Attachment No.1(A). "Criteria" (c) In a case of multiple equipment use, overall thermal efficiency shall be controlled by the load adjustment. "Management Standard" (d) For the purpose of enhancing combustion efficiency, fuel properties shall be controlled.</p> <p>2-1 Heating Units, etc. (1) Control of Heating, Cooling, and Heat Transfer (a) In a system using heat medium, the temperature, pressure, and quantity of such heat medium shall be controlled. "Management Standard" (b) For industrial furnaces, it shall be necessary to improve heat patterns for enhancing thermal efficiency. "Management Standard" (c) The quantity of matters to be heated/cooled and their arrangement in a furnace shall be controlled to avoid overload/underload. "Management Standard" (d) In a case of multiple equipment use, the overall efficiency shall be enhanced by load adjustment. "Management Standard" (e) For an iterative process, waiting time between the processes shall be minimized. "Management Standard" (f) Intermitent operations shall be made more continuous. "Management Standard" (g) For water supply to boilers, the water quality shall be controlled. (h) For a steam unit, the valve shall be turned off when unnecessary. (i) With regard to the seam from a heating unit, the quality of wet vapor shall be maintained. (j) In other processes required for heating, etc., affairs relating to heat medium used and matters to be heated shall be controlled. "Management Standard"</p>	<p>(2) Measurement and Recording pertaining to Fuel Combustion The fuel amount supplied, temperature of an exhaust gas amount of oxygen in an exhaust gas, etc. shall be measured and recorded. "Management Standard"</p> <p>(2) Measurement and Recording pertaining to Heating, etc. For the matters to be heated/cooled and their heat medium such as steam, the temperature, pressure, and flow volume shall be measured and recorded. "Management Standard"</p>	<p>(3) Maintenance and Inspection of Combustion System For the combustion system, periodic maintenance and inspection shall be performed to keep the good condition. "Management Standard"</p> <p>(3) Maintenance and Inspection of Equipment Required for Heating, etc. Heat transfer parts of boilers/heat exchangers shall be maintained/inspected and dust or scale, etc. shall be periodically removed to prevent reduction in heat-transfer performance. "Management Standard"</p>	<p>(4) Measures to be Taken for the New Installation of Combustion Equipment (a) Combustion equipment shall be introduced which is capable of adjusting the fuel supply and the air ratio to a proper level according to load fluctuations. (b) A ventilation system shall be introduced after regulating the air flow rate and the combustion chamber pressure.</p> <p>(4) Measures to be Taken for the New Installation of Equipment Required for Heating Process. (a) For the heat exchange section, materials with high thermal conductivity shall be used. (b) The array of the heat exchangers shall be optimized to enhance overall thermal efficiency.</p>
2 Rationalization of Heating, Cooling, and Heat Transfer	<p>2-2 Air-conditioning Equipment and Hot Water Supply System, etc. (1) Control of Air-conditioning Equipment and Hot Water Supply system, etc. (a) In controlling air-conditioning equipment, blind controlling for the compartmented zone shall have to be performed to alleviate peak loads and several factors relating to the equipment such as operation hours, indoor temperature, air exchange rate, humidity shall be controlled according to the actual usage. "Management Standard" For cooling/heating temperatures, government recommended value shall be considered. "Management Standard" (b) For the heat source equipment for air-conditioning system, the overall efficiency thereof shall be enhanced by adjusting the seasonal variation of external air conditions, etc. "Management Standard" (c) In a case where the heat source unit for air-conditioning system is composed of a plurality of heat source equipment, such heat source unit shall be controlled in order to enhance the overall efficiency—by adjusting the variation of external air conditions, etc. in a manner of coordinating the number of the operating heat source equipment, and selecting such equipment. "Management Standard" (d) In a case where the air-conditioning system is composed of a plurality of air-conditioning units within the same block, such air-conditioning system shall be controlled in order to enhance the overall efficiency—by adjusting the variation of external air conditions, etc. in a manner of coordinating the number of the operating heat source equipment, and selecting such equipment. "Management Standard" (e) For hot-water supply system, the supply place shall be regulated according to the season and/or the nature of the work. And also, matters to be required for efficiency improvement, such as hot-water supply temperature/pressure, shall be controlled. "Management Standard"</p>	<p>(2) Measurement and Recording pertaining to Air-conditioning Equipment and Hot Water Supply System (a) The temperature and humidity, etc. shall be measured and recorded on an each compartment basis. "Management Standard" (b) Measurement and recording shall be performed to improve efficiency on individual equipment basis and overall basis. "Management Standard" (c) For the hot-water supply system, matters to be required for improving the efficiency, such as the amount and temperature of hot water shall be measured and recorded. "Management Standard"</p>	<p>(3) Maintenance and Inspection of Air-conditioning Equipment and Hot Water Supply System (a) Maintenance and inspection of air-conditioning equipment shall be performed to improve efficiency on individual equipment basis and overall basis. "Management Standard" (b) Maintenance and Inspection of hot water supply system shall be performed to improve efficiency. "Management Standard" (c) Automatic control system for the air-conditioning equipment shall be maintained and inspected. "Management Standard"</p>	<p>(1) Measures to be Taken for the New Installation of Air-conditioning Equipment and Hot Water Supply System (a) When air-conditioning equipment is newly installed, efficient energy utilization shall be implemented. 1) Responding to changes in thermal demand, and differential thermal control heat pumps shall be adopted. 2) A high efficiency heat source including heat pumps shall be adopted. 3) A high efficiency operation system, for example, coordination of the number of the equipment/system, shall be adopted. 4) Variable air volume/rate system (revolution control etc.) shall be adopted. 5) Appropriate measurement equipment, etc. required for achieving the necessary matters to promote efficiency improvement shall be installed at each air-conditioning zone. Additionally, BEMS or other management systems shall be adopted to facilitate proper air-conditioning control.</p>
Category	Control	Measurement and Recording	Maintenance and Inspection	Measures to be Taken for the New Installation of Equipment

2 Rationalization of Heating, Cooling, and Heat Transfer	<p>(f) For the heat source control of hot-water supply system, controlling of not only heat source equipment but also auxiliaries including pumps shall be performed to enhance overall efficiency according to load fluctuations. "Management Standard"</p> <p>(g) A hot water supply system composed of a plurality of heat source units shall be controlled by coordinating the number of the units according to load conditions. "Management Standard"</p>			<p>6) Newly-installed air-conditioners shall have a better efficiency than the standard energy consumption efficiency.</p> <p>(b) When hot-water supply system is newly installed, the following measures shall be taken for achieving the effective energy use. Such measures are responding to load fluctuations in hot-water supply, and localizing areas where hot-water demand is lower.(c) The following equipment shall have a better efficiency than the standard energy consumption efficiency.</p> <ol style="list-style-type: none"> 1) Air-conditioners 2) Stoves 3) Gas Water Heaters 4) Oil Water Heaters 5) Gas Cooking Appliance
3 Recovery and Utilization of Waste Heat	<p>(1) Standards of Recovery and Utilization of Waste Heat</p> <p>(a) Based on the type of exhaust gas discharge equipment, the exhaust gas temperature and the waste heat recovery rate shall be controlled. "Management Standard"</p> <p>(b) Based on the value of the Attachment No.2(A), the exhaust gas temperature and the waste heat recovery rate shall be controlled. "Criteria"</p> <p>(c) For steam drains, the temperature, steam amount, properties shall be controlled. "Management Standard"</p> <p>(d) In recovery and utilization of the following, each recovery range shall be controlled: sensible heat, latent heat, pressure, and combustible components, etc. of both heated solid and fluid. "Management Standard"</p> <p>(e) Waste heat shall be properly utilized.</p>	<p>(2) Measurement and Recording pertaining to Waste Heat</p> <p>The temperature, heat quantity, components shall be measured and recorded to understand the actual waste heat conditions and to facilitate the utilization. "Management Standard"</p>	<p>(3) Maintenance and Inspection of Waste Heat Recovery System</p> <p>For the heat recovery system, dust and dirt on the heat transfer surface shall be removed. And also, maintenance and inspection shall be performed to prevent fluid leakage, etc. "Management Standard"</p>	<p>(4) Measures to be Taken for the New Installation of Waste Heat Recovery System</p> <p>(a) For the flue gas ducts and/or tubes, measures for maintaining the waste heat temperature shall be taken.</p> <p>(b) Improvement of the property/shape of the heat transfer surface shall be made and other desirable measures, such as increasing of heat transfer area, shall be taken in order to enhance the waste heat recovery efficiency.</p>
4 Rationalization of the Conversion of Heat into Mechanical Power, etc.	<p>4-1 Exclusive Generation System</p> <p>(1) Control of Exclusive Generation System</p> <p>(a) The operation of exclusive generation system shall be controlled to maintain the high-efficiency operation "Management Standard".</p> <p>(b) In a case where low pressure operation of the steam turbine in a thermal power plant is possible, such operation shall be controlled to the optimal level. "Management Standard"</p> <p>4-2 Cogeneration System</p> <p>(1) Control of the Cogeneration System</p> <p>(a) The operation of a plurality of boilers, etc. for a cogeneration system shall be controlled. "Management Standard"</p> <p>(b) When extractor/back-pressure turbines are used for a cogeneration system, allowable minimum value of extraction pressure/backpressure shall be controlled. "Management Standard"</p>	<p>(2) Measurement and Recording pertaining to Exclusive Generation System</p> <p>For the exclusive generation system, measurement and recording of matters pertaining to thermal efficiency shall be periodically performed. "Management Standard"</p> <p>(2) Measurement and Recording pertaining to Cogeneration System</p> <p>(a) Thermal efficiency of the system shall be measured and recorded. "Management Standard"</p> <p>(b) When the turbine is operated at the lowest pressure, the inlet/outlet pressures, extraction pressure, back-pressure, etc. shall be measured and recorded. "Management Standard"</p>	<p>(3) Maintenance and Inspection of Exclusive Generation System</p> <p>For the exclusive generation system, maintenance and inspection shall be performed to keep the thermal efficiency at a higher level. "Management Standard"</p> <p>(3) Maintenance and Inspection of Cogeneration System</p> <p>For cogeneration system, maintenance and inspection shall be performed to keep the thermal efficiency at a higher level. "Management Standard"</p>	<p>(4) Measures to be Taken for the New Installation of Exclusive Generation System</p> <p>(a) Exclusive generation system shall have a proper level capacity determined after full consideration of the actual demand and the future trend in electrical power demand.</p> <p>(b) When an exclusive generation system is newly installed, the efficiency shall not be significantly lower than the average generation efficiency at the receiving end of domestic thermal power plant equipment.</p> <p>(4) Measures to be Taken for the New Installation of Cogeneration System</p> <p>Cogeneration system shall have a proper level capacity determined after full consideration of the actual demand and the future trend in electrical power demand.</p>
Category	Control	Measurement and Recording	Maintenance and Inspection	Measures to be Taken for the New Installation of Equipment

<p>5 Prevention of Energy Loss due to Radiation, Conduction, Resistance, etc.</p>	<p>5-1 Prevention of Heat Loss Due to Radiation, Conduction, etc.</p> <p>(1) Standards of Thermal Insulation</p> <p>(a) Insulation work for heat utilizing equipment shall be performed in compliance with the JIS standard and other appropriate standards.</p> <p>(b) For a newly-installed industrial furnace, thermal insulation measures shall be taken based on the value of Attachment No.3 (A) (furnace outer wall surface temperature). “Criteria”</p> <p>In a case where such insulation measures are available to existing furnaces, the same measures shall be taken. “Criteria”</p> <p>5-2 Prevention of Electricity Loss due to Resistance, etc.</p> <p>(1) Control of Power Receiving/Transformation System and Distribution facility</p> <p>(a) For transformers, etc., the proper demand factor shall be maintained. “Management Standard”</p> <p>(b) For the power receiving/transformation system, the array and the voltage of such system shall be optimized and shortening the distribution line shall be performed. “Management Standard”</p> <p>(c) The power factor at the receiving end shall be 90% or higher, and such enhancement of power factor shall be achieved, based on the values of Attachment No.4 as the “Criteria”, by installation of a phase-advance capacitor, etc.</p> <p>(d) Phase-advance capacitors shall be controlled by an on and off operation in response to the type of the installed equipment. “Management Standard”</p> <p>(e) When a single phase load is connected to the three-phase system, the voltage imbalance shall have to be prevented during the system control. “Management Standard”</p> <p>(f) When electric using appliances are in service, the maximum current shall have to be reduced by leveling the electric power load. “Management Standard”</p> <p>(g) In addition, electrical power loss in the receiving/transformation system and in the distribution facility shall be reduced. “Management Standard”</p>	<p>(2) Measurement and Recording pertaining to Heat Loss</p> <p>The furnace outer wall surface temperature, temperature of matters to be heated, and exhaust gas temperature, etc. shall be measured and recorded on an equipment basis. Also, the heat balance analysis shall be performed to record the obtained results. “Management Standard”</p> <p>(2) Measurement and Recording pertaining to Power Receiving/Transformation System and Distribution Facility</p> <p>Measurement and recording pertaining to the electrical usage, and the voltage/current, etc. of power receiving/transformation system and distribution facility shall be performed. “Management Standard”</p>	<p>(3) Maintenance and Inspection of Heat Utilizing Equipment</p> <p>(a) The maintenance and inspection of heat utilizing equipment shall be performed by taking heat-loss- prevention measures, such as heat insulation work. “Management Standard”</p> <p>(b) The maintenance and inspection of the equipment shall be performed to prevent steam leakage from the steam trap. “Management Standard”</p> <p>(3) Maintenance and Inspection of Power Receiving/Transformation System and Distribution Facility</p> <p>Power receiving/transformation system and distribution facility shall be maintained and inspected in order to keep their good condition. “Management Standard”</p>	<p>(4) Measures to be Taken for the New Installation of Heat Utilizing Equipment</p> <p>(a) For heat utilizing equipment, the thermal insulation properties shall have to be enhanced. In addition, the thermal- and fireproof-insulators having a sufficient performance shall have to be used, specifically, in heatproof- and fireproof-property.</p> <p>(b) Openings of the equipment shall be minimized or sealed up in order to prevent the heat loss due to radiation.</p> <p>(c) The path of heat medium conveying pipes shall be rationalized to reduce the radiating area.</p> <p>(4) Measures to be Taken for the New Installation of Power Receiving/Transformation System and Distribution Facility</p> <p>(a) For the Power receiving/transformation system and distribution facility, after full consideration of the actual demand and future trend in electric power demand, the array of power receiving/transformation system, the distribution voltage, and the equipment capacity shall be determined.</p> <p>(b) A newly-installed transformer shall have a better efficiency than the standard energy consumption efficiency provided in the “Judgment Standard Regarding Improvement of Transformer Performance for the Manufacturer, etc.”</p> <p>(4) Measures to be Taken for the New Installation of Electric Motor Appliances</p> <p>When it is expected that the electric motor appliances are used continuously under heavy load conditions, such appliances shall have some appropriate configuration to facilitate the adjustment of the running state according to the load fluctuations.</p>
<p>6 Rationalization of the Conversion of Electricity into Mechanical Power, and Heat, etc.</p>	<p>6-1 Electric Motor Appliances and Electric Heating Appliances, etc.</p> <p>(1) Control of Electric Motor Appliances and Electric Heating Appliances, etc.</p> <p>(a) In some cases, after consideration of the starting power requirement, electric motor appliances may be stopped in order to reduce the electrical power loss due to the idle running. “Management Standard”</p> <p>(b) When multiple motors are used, the proper demand factor shall have to be maintained. And also, the coordination of the number of such motors and the proper load distribution shall be implemented. “Management Standard”</p> <p>(c) For fluid machines, by considering the end pressure and the discharge pressure, controlling of the number of the machines shall be made to adjust the send-out volume/pressure to a proper level and to help reduce the motor load. “Management Standard”</p> <p>(d) For induction furnaces, improvement of the way, for example, of loading the matters to be heated shall be made to enhance thermal efficiency. “Management Standard”</p> <p>(e) For electrolytic equipment, the electrode interval and electrolyte concentration, etc. shall be controlled to a proper level in order to enhance electrolysis efficiency. “Management Standard”</p> <p>(f) Voltages and currents, etc. shall be controlled on the basis of electric equipment in order to reduce the electrical power loss. “Management Standard”</p>	<p>(2) Measurement and Recording pertaining to Electric Motor Appliances and Electric Heating Appliances, etc.</p> <p>For the electric motor appliances and electrical heating appliances, etc., measurement and recording of the voltages/currents, etc. shall be performed. “Management Standard”</p>	<p>(3) Maintenance and Inspection of Electric Motor Appliances and Electric Heating Appliances, etc.</p> <p>(a) The maintenance and inspection of such appliances shall be performed to reduce the mechanical loss of load machines, power transmission parts, and electric motors. “Management Standard”</p> <p>(b) The maintenance and inspection of fluid machinery shall be performed to prevent the fluid leakage and to reduce the pipe resistance. “Management Standard”</p> <p>(c) The maintenance and inspection of electrical heating appliances, etc. shall be performed to reduce resistance loss of the wiring connections and switch contacts. “Management Standard”</p>	<p>(4) Measures to be Taken for the New Installation of Electric Motor Appliances</p> <p>When it is expected that the electric motor appliances are used continuously under heavy load conditions, such appliances shall have some appropriate configuration to facilitate the adjustment of the running state according to the load fluctuations.</p>

Category	Control	<p>6-2 Lighting System, Elevating Machines, Office Appliances, and Consumer Equipment</p> <p>(1) Control of Lighting System, Elevating Machine, and Office Appliances</p> <p>(a) Lighting system shall be controlled in compliance with the JIS standard and other standards.</p> <p>"Management Standard"</p> <p>(b) For elevating machines, the number of the machines in operation shall be coordinated.</p> <p>(c) Office appliances shall turn power-off when not in use. Also, a low power mode shall have to be available for such appliances.</p>	<p>Measurement and Recording of Lighting Systems</p> <p>For a lighting system, the illuminance shall be measured and recorded. "Management Standard"</p>	<p>Maintenance and Inspection of Lighting System, Elevating Machines, and Office Appliances</p> <p>(a) The lighting system shall be maintained and inspected by, for example, cleaning and replacement. "Management Standard"</p> <p>(b) Elevating machines shall be maintained and inspected in order to reduce the mechanical loss. "Management Standard"</p> <p>(c) Office appliances shall be periodically maintained and inspected.</p>	<p>Measures to be Taken for the New Installation of Equipment</p> <p>(4) Measures to be Taken for the New Installation of Lighting System, Office Appliances, and Consumer Equipment</p> <p>(a) When the lighting system is to be newly installed, after careful consideration of matters relating to lighting system that are provided in building codes or regulations, efficient energy use shall be implemented by taking measures to address the following points:</p> <ol style="list-style-type: none"> 1) Adoption of energy conserving type lighting system 2) Adoption of high efficiency lamps such as HID lamps 3) Consideration of maintenance performance such as cleaning 4) Consideration of overall light efficiency such as an efficiency of lighting circuit/light fixtures 5) Other lighting circuit for the area where the day light is utilized <p>(b) The following equipment shall have a better efficiency than the standard energy-consumption- efficiency (Top Runner Program).</p> <ol style="list-style-type: none"> 1) Lighting system using fluorescent lamps only as the light source 2) Copying machines 3) Computers 4) Magnetic disk 5) Television sets 6) Video cassette recorders 7) Electric refrigerators 8) Electric freezers 9) Electric toilet seats 10) Vending machines
6 Rationalization of the Conversion of Electricity into Mechanical Power, and Heat, etc.					

The Program for the Promotion of the Certification of Products, Processes and Services

CONUEE

11th September, 2010

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1. Antecedents

1.1 Legal framework

1.1.1 Law for the Sustainable Use of the Energy (LASE)

The Law for the Sustainable Use of the Energy (LASE), published in the Official Newspaper of the Confederacy (DOF) November 28, 2008, mentions in its article 26 that the individuals will be able in voluntary form, through the certification of processes, products and services, to carry out a methodological exam of its operations regarding the degree of incorporation of the energy efficiency, as well as the degree of compliance of the Regulatory nature in the matter and of the international parameters and of practices of operation and applicable engineering, with the purpose to define the necessary corrective and preventive measures to optimize its energy efficiency. Of equal forms mentions that the National Commission for the Efficient Use of the Energy (Commission), will develop a program directed to promote the processes certification execution, products and services, and will be able to supervise its execution. For which it should carry out the following activities:

- To Establish an approval system for experts and auditors, determining the procedures and necessary most minimum requirements that should comply them interested to be incorporated to said system, owing, in its case, to observe it arranged by the Federal Law on Metrología and Normalization.
- To Develop programs for training in matter of reports and audits of energy character.
- To Effect a system of recognitions that permit to identify to the industries that have certified their processes, products and services.
- To Promote the creation of regional centers of support to the median and small industry, in order to facilitating the certification of processes, products and services in certain sectors.
- To Agree or to arrange with physical or moral people, public or private, the processes certifications execution, products and services.

1.1.2 Regulation of the Law for the Sustainable Use of the Energy (RLASE)

The Regulation of the LASE, published September 11, 2009, in the Chapter I SAW "Of the certification and the voluntary processes", Articles 31 and 32, the following thing is mentioned:

Article 31. The Commission will offer a distinctive one that the individuals will be able to exhibit in the products that have been certificates, according to it predicted in the article 26 of the Law, for which should devise the features to be able to obtain said recognition and to publish them in its electronic page. The Commission will carry a registration of the products that include said distinctive according to it indicated in the present article.

Article 32 The Commission will offer a certificate of person or institution energy head to those individuals recognized by to have certified its processes and services, according to it indicated in the article 26 of the Law, or well, that have obtained outstanding results regarding the degree of incorporation of the Energy Efficiency, by means of the execution of voluntary processes, according to the features that they be established for the system of recognitions to which does Reference the fraction IV of the same article. The registration of people and energy responsible institutions will be at the disposal of the public in the electronic page of the Commission and that will be brought up to date in a quarterly way.

1.1.3 National Programs for the Sustainable Use of the Energy

The National Program for the Sustainable Use of the Energy 2009-2012 (PRONASE), published in the DOF November 27, 2009, indicates in its Objective 3 the "to Improve the efficiency of the new products and to promote the acquisition of efficient products by the end users" and in its Objective 5 the "to Reduce the consumption of energy by conditioning of environment in buildings", having specifically, each one of them, the following Courses of action:

- Course of action 3.1.1, to Implement program and campaign of certification and distinctive of teams.

Reduce the consumption of energy in teams of the home and of real estate through the

efficient teams purchase promotion. The action is evident in launching a program and campaign of certification and distinctive of efficient teams in the 2011. According to the article 31 of the Regulation of the Law for the Sustainable Use of the Energy (RLASE), the Commission will offer a distinctive one for products that have been certificates like efficient, according to the methodologies that the Commission establish and according to the Article 26 of the LASE.

· Course of action 5.2.3, to Develop a certification of the reckoned of energy consumption of new buildings.

Promote a conscience in the population on the savings energy and economic by-product of the energy efficiency measures implementation in buildings. To develop a certification, the most efficient buildings in energy terms should be distinguished. This recognition will be attached to it stipulated in the Article 26 of the LASE and the Article 31 of the RLASE.

1.2 Field of Application of the Program

The Program of Promotion to the Certification of Processes, Products and Services (Program) applies to the subject products to the compliance of the Official Norms Mexicans of energy efficiency of product, that market and they distribute in the country, as well as to the new residential buildings (new dwellings), new not residential buildings (commercial buildings and of the public administration) and industrial plants, that be located inside the national territory.

2. Reach and Objective

2.1 Reach

The present Program is of voluntary character and is designed to recognize the efforts, in matter of energy efficiency carried out by the individuals and the companies and dependences of the public administration in the area of Products (teams and apparatuses that for their operation consummate energy); as well as in that of Processes and Services in New Residential Buildings; not Residential Buildings, and Industrial Plants.

2.2 Objectives

- To Establish the features, terms and mechanisms by means of which the users will be able to be adhered to the Program.
- To Establish the features, terms and mechanisms for the obtaining of a Distinctive one in Products and of Recognitions to New Residential Buildings; not Residential Buildings, and Industrial Plants.

3. Distinctive Characteristic for Products

3.1 Definition of the Distinctive Characteristic

The Distinctive one for products is the symbol of Federal government-backed energy efficiency that helps to consume less energy, to save money and to contribute to the protection of the environment through energy efficient products.

The Distinctive one for products is created for the purpose of diminishing the consumption of energy and the emissions of greenhouse gases and other contaminants caused by the inefficient use of the energy and to facilitate the consumers the to identify and to buy products of low consumption of energy that offer savings in the bill without sacrificing performance, characteristic and comfort.

3.2 Features to obtain the Distinctive one

The Distinctive one for products will be offered to teams and apparatuses that be understood inside the field of application of some of the Official Norms Mexicans of energy efficiency (NOM-ENER).

The individuals will be able to exhibit the Distinctive one in the products that comply with the technical specifications established in the Official Norms Mexicans of energy efficiency and that possess a greater efficiency among an assembly of products of a same category.

To obtain the Distinctive one, the products should include an efficiency or greater efficacy or I consume smaller, to it specified in the following Official Norms Mexicans of

Energy Efficiency NOM-ENER.

With the purpose to determine the percentage of greater efficiency or efficacy or of smaller consumption, the information will be analyzed that provide the agencies of certification on the products certificates. The Commission will publish in its electronic page to more delay in a year the indices of efficiency or greater efficacy or I consume smaller to it specified in the Official Norms Mexicans of Energy Efficiency NOM-ENER.

From that date the individuals will be able to request in a voluntary way the Distinctive one for which they should be held to the System to obtain the same one.

3.3 Cases of review of the specification to obtain the Distinctive Characteristic

When a portion of the market of products in a private category, to which was offered the Distinctive one, be equal or greater at 50% percent, a review of the specification of the minimum energy efficiency will be carried out or I consume maximum that should comply. Additionally, they should be taken into account other factors, such as:

- Updating or emission of official norms Mexicans of energy efficiency
- Technological Changes with advances in energy efficiency that permit to grasp additional savings
- Availability of the products

3.4 System to obtain the Distinctive one

The products should be submitted to the process of certification according to it established in the Federal Law on Metrología and Normalization and to be tested in a laboratory of tests and certificates by an agency of certification, both properly reputable by a company of accreditation and approved by the Commission.

The manufacturer or commercial sectors should remit to the Commission, copies certificates, of the report of result of the tests of laboratory, as well as of the certificate of compliance of the product with the NOM-ENER corresponding.

The Commission subject to review of the previous documentation will authorize the individuals the use of the Distinctive one in its diverse areas, in the products that treat.

The force of the authorization of the use of the Distinctive one will be the same one that that of the certificate, which can be for one or three years, according to the modality of certification.

The Commission, through the agency of certification, will be able at any moment to request a verification of the compliance of the product with it specified in the Boards, pertaining to each NOM-ENER, of this Program.

It will be cause of retreat of the authorization of the use of the Distinctive one, when have finished its force or the product, comply not with the specifications of the NOM-ENER and the Boards, pertaining to each NOM-ENER, of the present instrument.

3.5 Complaints and Accusations

If the product does not comply satisfactorily the specifications established in the features established in the point 3.2, the Commission, to request of the interested, will be able to authorize I was performed another verification in the terms of the Federal Law on Metrología and Normalization, article 93 says:

"If the product or the service do not comply satisfactorily the specifications, the Office of the secretary or the competent dependence, at the request of the interested he will be able to authorize another verification in the terms of this Law be performed.

This verification will be able to be performed, in the opinion of the dependence, in the same laboratory or in another reputable one, in whose case they will be in charge of the producer, manufacturer, importing, commercial sectors or of the lender of services the expenses that be originated. If in this second verification was shown that the product or the service comply satisfactorily the specifications, will consider itself devaluated the first result.

3.6 Registration of Products with Distinctive

The Commission will carry a registration and will publish the listing of products with Distinctive on the Internet website. The Commission will withdraw of the listing of its page of Internet, the products whose certificate have conquered or, when the product does not comply with the specifications of the NOM-ENER and the Boards, pertaining to each NOM-ENER, of this Program.

4. Recognition to Buildings

4.1 Recognition to Buildings for Commercial use and Public Administration

4.1.1 Description of the Recognition

It is the action to recognize, on the part of the Commission, to buildings for commercial use and Public Administration that comply with the official norms Mexicans of energy efficiency and that besides they make use of efficient technologies.

4.1.2 Features to obtain the Recognition

The buildings for commercial use and Public Administration that comply with the official norms Mexicans of energy efficiency in force and that they include a qualification over the national base they will be able to request the Recognition.

So, the buildings for commercial use and Public Administration they should be submitted to an energy audit and to the process of verification according to it established in the Federal Law on Metrology and Normalization, by a Unit of Verification (UV), properly accredited by a company of accreditation and approved by the Commission. The owner of the building should present to the Commission the Opinion of verification of the compliance of the building according to the electric Power Density Norms for lighting, that of envelope for buildings and that of thermal insulating materials, NOM-007-ENER-2004, NOM-008-ENER-2001 and the NOM-018-ENER-1997 respectively.

To determine the performance of an installation, the Commission will compare the

consumption of energy of the building in the same type of installations in a scale from 1 to 100.

To obtain the Recognition, a building should have a scoring of 25 up the percent on the energy average performance (50 points) of the Energy Efficiency Classification System. That is to say, the buildings that reach a scoring of 75 or more they will be able to be eligible to receive the recognition. The Commission will include a system of classification that will take into account the differences in the conditions of operation, the climatic regions and other important considerations.

The qualification of energy efficiency will be a reference to evaluate the energy efficiency of the buildings, in relation to other similar. The system of qualification will consider a scale 1-100 where a qualification of 50 will indicate the energy average performance, while a qualification of 75 or more will indicate the maximum performance.

With the purpose to determine the energy average performance, the information of the buildings will be analyzed, such as its size, location, number of occupants, number of teams and apparatuses that consume energy, among others. The previous thing, will permit that the system reckon the quantity of energy that the building would use if was that of better performance, that of worse performance, and all the levels in the middle.

For it, the information through the suitable instruments should be grasped, as are the surveys and censuses that applies the INEGI, to build the base of information and that the system compare the real data of consumption of energy and the performance of the building in relation to its peers be determined.

To more delay in two years the Commission will include the Energy Efficiency Classification System and from that date the individuals will be able to request in a voluntary way the Recognition for which they should be held to the System to obtain the same one.

4.1.3 System to obtain the Recognition

The owner, should obtain the reports of verification of the system of lighting and of the envelope of its building, emitted by an UV, reputable and approved to evaluate the

compliance with the norms: NOM-007-ENER-2004 and NOM-008-ENER-2001, in the case of commercial buildings and of the Public Administration besides complying with the previous thing, they should show the result of the energy diagnosis carried out by an expert, in which the use of efficient technologies be indicated.

The owner should remit to the Commission, copy certificate of the compliance verification reports with the NOM-007-ENER-2004 and NOM-008-ENER-2001, as well as of the energy diagnosis carried out and other information that the Commission requires him.

The Commission, subject to review of the previous documentation and when the qualification on performance of energy of the building in question be equal or over 75 points will offer the Recognition. In the cases in which itself be not complied with the NOM-ENER of systems and products and/or the performance of energy be lower to the 75 points, will be able to hold to a voluntary process of improvement and to request again an audit or an energy diagnosis as be the case.

The force of the Recognition will be of three years and will be able to be renewed once by the same period. The Commission, to bias, of an UV will be able to request in a random way, or when thus determine it, the verification of the compliance of the NOM-ENER, as well as of the energy diagnosis carried out.

It is cause of the retreat of the Recognition, when have finished its force or when turned out of a verification, breach with it be identified established in the NOM-ENER and/or the performance of energy of the building be lower to the 75 points.

4.1.4 Registration of Commercial Buildings and of the Public Administration with Recognition.

The Commission will carry a registration and will publish in its page from Internet the listing of commercial buildings and of the Public Administration with Recognition.

The Commission will withdraw of the listing of its page of Internet, the commercial buildings and of the Public Administration whose Recognition have conquered, the qualification on its performance of energy be smaller to 75 points or when the building comply not with it established in the NOM-ENER of systems.

4.2 Recognition to New Dwellings

4.2.1 Description of the Recognition

It is the action to recognize, on the part of the Commission, to new dwellings that comply with the Official Norms Mexicans of energy efficiency and that besides they make use of efficient technologies.

4.2.2 Features to obtain the Recognition

The buildings for housing use one-family, apartment, and new dwellings should comply with it indicated in the draft of Norm ANTE-PROY-NOM-020-ENER, for which they should hire the services of an expert to whom they should deliver the architectural project of the building for housing use, with the following information as a minimum:

- The location where is built (city, delegation or municipality)
- Flat of the four facades and roof; in which can be obtained the areas and orientation.
- Material they utilized in the facades and the roof (thicknesses and thermal conductivity). In the case that in some of the facades they have various materials, is necessary to know that area occupies each one of them.
- For the glasses of the windows is necessary to indicate, if is simple or double glass; as well as its thickness, its coefficient of shaded (CS) and the surface that occupies.

The expert will do the evaluation of the envelope of the building for housing use and will indicate the builder if complies with the draft of norm.

- If the new dwelling complies, the expert delivers the report of compliance to the builder.
- If the new dwelling does not comply, the builder should do the necessary modifications to its architectural project and the expert he will send it again, this activity he is carried out until the architectural project comply with the ANTE-PROY-NOM-020-ENER.

The owner of the new dwelling, should present to the Commission the report of compliance of the envelope of the building for housing use according to the ANTEPROY-NOM-020-ENER.

4.2.2.1 Compliance with the NOM-ENER of Products

The subject teams to the Official Norms Mexicans of Energy Efficiency of product, that be utilized in the new dwellings they should include a copy of the certificate according to the NOM-ENER that apply him:

The new dwelling besides complying with it established in the ANTE-PROY-NOM-020-ENER, should comply with the NOM-ENER of product that turn out to be applicable.

4.2.2.2 Material insulating thermal

The thermal insulating materials should include a copy of the certificate of compliance according to the NOM-018-ENER-1997.

4.2.3 System to obtain the Recognition

The builder should obtain the report of compliance of the envelope of the building for housing use according to the ANTEPROY-NOM-020-ENER.

The builder should remit to the Commission, copy certificate of the report of compliance of the envelope of the building for housing use according to the ANTEPROY-NOM-020-ENER and of the NOM-ENER of product that turn out to be applicable.

The Commission, subject to review of the previous documentation will offer the Recognition. In the cases in which itself be not complied with the ANTEPROY-NOM-020-ENER and/or of the NOM-ENER of product that turn out to be applicable, will be able to hold to a voluntary process of improvement and to request again an audit or a diagnosis as be the case.

The force of the Recognition will be of three years and will be able to be renewed once by the same period.

The Commission, to bias, of an UV will be able to request in a random way, or when thus determine it, the verification of the compliance of the ANTEPROY-NOM-ENER-020 and/or of the NOM-ENER of product that turn out to be applicable.

It is cause of the retreat of the Recognition, when have finished their force or when turned out of a verification, breach with it be identified established in the ANTEPROY-NOM-ENER-020 and/or of the NOM-ENER of product that turn out to be applicable.

4.2.4 Registration of new dwellings with Recognition

The Commission will carry a registration and will publish in its page from Internet the listing of new dwellings with Recognition.

The Commission will withdraw of the listing of its page of Internet, the new dwellings whose Recognition have conquered or, when the building comply not with it established in the ANTE-PROY-NOM-ENER-020 and the NOM-ENER of product that turn out to be applicable.

5. Recognition to Industrial Plants

5.1 Definition of the Recognition

The effect of competitiveness of the national products is directly related to the energy, or better efficiency said, with its energy consumption indicators. As it is known, the developing countries have energy consumption indices considerably over the developed countries, what represents disadvantages in a world globalized.

Of the main element that understands an energy management program, the comparative evaluation of the use of the energy is one of the most important because permits to the plants to establish objectives of improvement and monitoring of the advances.

The Recognition to industrial plants is the action to recognize, on the part of the Commission, to the industrial plants whose energy consumption index is down to the averages reported.

5.2 Features to obtain the Recognition

In this sense, the Commission will establish energy consumption indices for the industry that will permit its executives the evaluation of energy efficiency of its plants in relation to the remainder of the industry.

Through the energy consumption index so much the energy efficiency of the operations is determined like the energy savings potential, besides that is a valuable instrument for the monitoring of the energy behavior of the plant through the time and serves as element of comparison among others plants of the same branch.

The classification will be taken into account, among others, the compliance of the official norms Mexicans of energy efficiency and the indices of energy intensity in different branches of the industry.

The classification of energy efficiency of a plant will be determined in a scale from 1 to 100 to evaluate the efficiency with the one that a plant utilizes the energy in comparison with the industry to national level.

Besides generating information on the scoring for the plant, the Indicator will also provide information on medium index and efficient index of the plants to national level. The efficient index will be defined like the 75° percentile of all the plants.

With the purpose to determine the energy efficiency average classification of a plant, the information of branches selected of the industry will be analyzed. The previous thing, will permit to reckon the quantity of energy that a plant would use if was that of better performance, that of worse performance, and all the levels in the middle.

For it, the information through the suitable instruments should be grasped, as are the surveys and censuses that applies the INEGI to build the base of information and that the system compare the real data of consumption of energy and the energy efficiency of

a plant in relation to its peers be determined.

To more delay in two years the Commission will include an Energy Efficiency Classification System and from that date the individuals will be able to request in a voluntary way the Recognition for which they should be held to the System to obtain the same one.

5.3 System to obtain the Recognition

The owner of the industrial plants, should obtain the reports of verification of the Energy Consumption Index, emitted by a firm of engineering or business of consultancy approved by the Commission, according to the results presented in the report of the energy diagnosis carried out by happiness firm or consultancy to the plant.

The energy diagnosis and other information that be required should be presented for the interested to the Commission.

The Commission subject to review of the energy diagnosis and to count the plant with a classification over the 75^o percentile of all the plants will offer the Recognition. In the cases in which the plants comply not with the values of the indices of above-mentioned classification, mentioned will be able to hold to a voluntary process of continuous improvement and to request again its evaluation by means of the execution of another energy diagnosis.

The force of the recognition will be for three years and will be able to be renewed for the same period.

The Commission, through a firm of engineering or of a business of consultancy will be able to request in a random way, or when to itself determine it, the verification of the compliance of the energy consumption index.

5.4 Registration of Industrial Plants with Recognition

The Commission will carry a registration and will publish in its page from Internet the listing of the industrial plants with Recognition.

The Commission will withdraw of the listing of its page on the Internet, to the plants whose recognition have conquered or when, the plant comply not with the reported energy consumption index.

6. System of Approval

6.1 Certification Agencies Approval

6.1.1 Definition of the Certification Agencies approval

In the process of normalization two can be distinguished large phases, that of elaboration of a norm that concludes with the emission of the same one and that of application of the Norm that concludes with the certification of the compliance of a product with the Norm or the opinion of verification of the compliance of a system with the norm.

To achieve the certification of a product ó the opinion of verification of a system, counts on itself the companies of accreditation whose function is to recognize the technical competence of the agencies of certification, laboratories of test and units of verification (UV), according to the norms NMX corresponding:

NMX-EC-065-IMNC-2000 - Agency of Certification NMX-EC-17025-IMNC-2005 -
Laboratory of Tests ·
NMX-EC-17020-IMNC-2000 - Units of Verification

6.1.2 Features for the Certification Agencies approval,

The process of approval of the agencies of certification, laboratories of test and units of verification is very similar. The Mexican Company of Accreditation (EMA), receives the request of accreditation and subsequently carries out the following actions:

- EMA program visits:
- Initial Evaluation
- Evaluation of monitoring or caution
- Evaluation of renewal

- Integration of the Group evaluator:
- Evaluator leader
- Evaluator
- Evaluator in training
- Technical Representative of the Dependence (Commission)
- Documentary Evaluation
- System of Quality Security
- Procedures
- Technical Evaluation
- Evaluation of the personnel
- Evaluation of the team

The results of the evaluation will determine if the agency of certification, laboratory of test or unit of verification can obtain the accreditation. The cases of the results are the following:

The agency complies satisfactorily the evaluation, is accredited and approves there are observations of the group evaluator, the corrective actions to the company of accreditation they are presented and the Dependence. They are satisfactory, is accredited and approves is Not prepared. It can try it again, requests new evaluation.

6.1.3 System to obtain the Certification Agencies approval

The agency of certification, laboratory of test or unit of verification, once they have obtained the accreditation on the part of the EMA will be able to request to the Commission, the corresponding approval.

The agency of certification should present to the Commission a copy certificate its accreditation on the part of the EMA.

The Commission, subject to review of the documents, will offer the approval to the agency of certification.

6.1.4 Approved Certification Agencies Registration

The Commission will carry a registration and will publish in its page from Internet the

listing of the Agencies of Certification approved.

The Commission will withdraw of the listing of their page on the Internet, to Agencies of Certification whose approval have conquered or when, these they comply not with the features and the approval of the Commission.

6.2 Approval of Experts and Auditors.

6.2.1 Definition of Expert.

It is the physical person or morale with capacity to carry out energy diagnoses, approved by the Commission.

For the purposes of the process of voluntary certification will be understood like the expert to the specialist that assesses to an organization with the improvement points to find purpose in its system of energy management.

6.2.1.1 Profile of the Expert

The expert in energy management should be an engineer or technical superior university titled specialist with at least 5 years of recent work experience in projects of the energy area, brought up to date in his area of specialty. Likewise should include know-how in:

- Technical energy: energy efficiency, electric power / thermal, flammable, automation and control, measurement teams management, productive processes, efficient technologies and renewable energies (to be the case). Design the integral programs of energy conservation.
- Systems of energy management.
- Consultancy: capacity of analysis, strategic planning, management of personnel and teamwork, communication, integration and training / support groups motivation, planning of good, sequential activities practices of administration and management.
- Financial Analysis: projects economic-technique evaluation, economy, finances, pricing framework and projects of investment, among others.

- Normative and regulatory Framework: regulatory nature and applicable procedure (NOM, NMX / ISO) and features of Commission.

6.2.2 Definition of Auditor.

It is the physical or moral person, with capacity to carry out the verification of the compliance of a program of improvement of the energy efficiency of a process or service, recognized by the Commission.

For the purposes of the process of voluntary certification an auditor will be that expert that verify the compliance of a series of standards, criteria or features that is carrying out an organization in matter of management of the energy.

6.2.2.1 Profile of the Auditor

The auditor in energy management should be a professional (level degree) titled with at least 5 years of recent practical experience in systems of energy management and/or projects of energy efficiency, brought up to date in his area of specialty. Likewise should include know-how in:

- Technical energy: energy efficiency, electric power / thermal, flammable, teams of measurement.
- Systems of energy management.
- Applicable energy regulatory Nature: NOM, NMX / ISO and features of the Commission.
- Methodology of analysis in energy efficiency, comparative analysis and evaluation of results.

It is desirable that the auditors comply with it established in the Mexican norms NMX-CC-10019-IMNC-2008 "Guidelines for the management systems consultants selection of the quality and the utilization of its services" and NMX-CC-SAA-19011-IMNC-2002 "Guidelines for the audit of the systems of management of the quality and/or environmental" and the norm NMX-EC-17020-IMNC-2000 "general Criteria for the operation of various types of units

(agencies) that develop the verification (inspection) as be The case.

6.2.3 Features to obtain the approval as the Expert and Auditor

The applicant should be an Engineer or technical superior university titled specialist with work experience in themes of energy efficiency, low of five years and to comply with the previous requirements of corresponding profile.

6.2.4 System to obtain the approval as the Expert and Auditor

The person involved in the approval should present its request to the Commission and to deliver its curriculum, with the documentation that accredit its profession and its work experience and of other recognitions, certifications or distinctions.

The involved, physical person should present an exam in the Commission or Institution with the one that the Commission thus agrees it, and to qualify, as a minimum, with the 80% of successes. The involved, legal entity person should appoint the people that will present the exam and to qualify, as a minimum, with the 80% of successes.

The Commission subject to review of the information presented by the applicant and of the results obtained in the exam will offer the approval to the expert or auditor.

6.2.5 Registration of Experts and Auditors.

The Commission will carry a registration and will publish in its page from Internet the listing of the Experts and Auditors approved.

The Commission will withdraw of the listing of their page on the Internet, to the Experts and Auditors whose approval have conquered or when, these they comply not with the features and the approval of the Commission.

7. Promotion and Diffusion of the Program

7.1 Antecedents

The Law for the Sustainable Use of the Energy establishes in its Article 5 that in the design and application of the programs in matter of sustainable use of the energy, the social participation will be promoted and the coordination, in order to linking to the institutions of the Public Sector, to the organizations of the civil company and of the private sector, to the academic institutions and to the population in general Coordinating its activities in the environment of this law. Likewise, in their Article 11, clause X, establishes that themselves of should offer technical advising in matter of sustainable use of the energy to the dependences and companies of the Federal Public Administration, as well as to the governments of the states and municipalities that request it, and to celebrate covenants for such effect. Finally, in its Article 26 Clause V, establishes that the creation of Regional Centers of support to the Small and Medium Business will be promoted, in order to facilitating the certification of processes, products and services in you said sectors.

Inside this context the Commission has designed the profile of the Regional Centers for the Support to the Certification.

7.2 Regional Centers of support to the Small and Medium Business

7.2.1 Definition of the Regional Centers

The Regional Centers of support to the Small and Medium Business are units of promotion and technical support, in matter of efficient use of the energy, promotion to the research and development, installed contribution covenant way with the Commission, in institutions of upper technical teaching or other that thus consider the Commission.

7.2.2 Vision of the Regional Centers

Having a competent and efficient cover of the needs and opportunities of the efficient use of the energy, the sustainable use of the renewable sources and the research and development applied in the region of influence of the Centers.

7.2.3 Mission of the Regional Centers

Offering technical support and to prompt the innovation and technological development in matter of energy, in order to promoting and to consolidate a culture of efficient use and of the use of renewable sources that contribute to the sustainable growth of our country.

7.2.4 Objective of the Regional Centers

- To Carry out the installment of technical services in the areas of its competence.
- To Assess to the administrations and private and public institutions and to represent to the Commission in the forums in which this request it.
- To Be center of reference in the environments of its competence
- To Promote the activities by-products of its activities in the fields of the scientific-technical diffusion, the education and, in its case, the transfer of technology
- To Collaborate with other National Centers, Centers of technical Support and Investigation and Development as well as, universities and businesses.
- To Cooperate with intergovernmental agencies and centers of technical support and Investigation and Development of other countries with special attention to the Latin America and North America
- To Promote and to execute activities of research and development in technological, environmental, and energy matter.

7.2.5 Services of the Regional Centers

- Advice and technical Support
- Promotion of the certification of energy efficient businesses
- Technological Diffusion
- Information.
- Formation.
- National and international Cooperation

7.2.6 Contribute of the Regional Centers

- Next Infrastructure to the businesses and other users of energy
- Knowledge of the Mexican industry, as well as of the concrete needs of the businesses with the ones that work and to the ones that they help to solve the technical problems that them are presented

- Channeling of leading edge technologies, approaching and helping the businesses to adapt the last advances, and to facilitate the research and development projects execution.
- Experience and knowledge in support to the conception and execution of business politics in matter of efficient use of the energy.

7.2.7 System for the establishment of the Regional Centers

The establishment of these Centers will unfold a Centers installation strategy that include, among others, technological institutes and technological universities. For it, these institutions thinking will be elected about taking advantage of the technological know-how of the students of the last semesters as well as the of its educators, besides its infrastructure, which permits them to carry out a work of promotion and diffusion of the sustainable use of the energy as well as the promotion of the present Program.

The different users, chiefly originating from the industrial sector and of services, as well as other individuals and local governments will be able to respond to the Regional Centers to request information or support that permit them to implement, in its respective environments, actions of sustainable use of the energy.

7.3 Strategy of promotion and diffusion of the Program

According to the Article 26 of the LASE, will be implemented in a strategy of promotion and diffusion that is focused in emphasizing the objective of unifying all the efforts of certification and promotion of the products, processes and energy efficient services in Mexico, through the Distinctive one and the Recognition that will offer the Commission. The strategy of promotion and diffusion of the Program will be brought up to date each year.

7.3.1 Objective for the Diffusion of the Program

Promoting, through the mass media, the actions of the Institution in favor of the efficient use of the energy and of the advantages of voluntary certification, as well as of consuming the products that have obtained the distinctive one and/or to use the services of a person or energy responsible institution, that emphasize the future current,

economic, ecological, and social benefits that the Commission pursues.

7.3.2 Objective for the Promotion of the Program

Generating and to promote a culture of energy efficiency and sustainable use of the energy, as well as of innovation of the matter, in the academic, social, productive sectors and to population in general by means of actions, strategies, goals and objective specific for each sector.

7.3.3 Axes to the ones that the promotion will be destined:

- Population in general (information on the teams and apparatuses that require use of electric power, programs for the sustainable use of the energy and campaigns of awareness-raising)
- Small and Medium Industry through the Regional Centers
- Great Industry
- Distinctive of energy efficiency to products
- Recognition to people and energy responsible industries
- Education and Investigation
- Covenants and Agreements
- Publications

8. Glossary of Terms

-Accreditation: It is the act by which a company of accreditation recognizes the technical competence and reliability of the agencies of certification, of the laboratories of test, of the laboratories of calibration and of the units of verification for the evaluation of the conformity.

-Auditor: It is the physical or moral person, with capacity to carry out the verification of the compliance of a program of improvement of the energy efficiency of a process or service, recognized by the Commission.

-Certification: procedure by which is assured that a product, process, system or service is adjusted to the norms or features or recommendations of agencies dedicated to the

normalization, national or international.

-Commission: The National Commission for the Efficient Use of the Energy.

-Opinion of verification: document that emits and signs under its responsibility the Unit of Verification, in which causes is evident that the building complies with the applicable norms.

-Building: any structure that limits a space through ceilings, walls, flat and lower surfaces, that requires of a permission or license of the municipal or delegate authority for its construction, whether building for housing use or not residential building.

-Building projected: The building that intends to build.

-Building of reference: It is the building that conserving the same orientation, the same conditions of contiguous and the same dimensions in plant and elevation of the building projected, is utilized to determine a maximum energy budget.

-Evaluation of the conformity: the decision of the degree of compliance of the building with the applicable norms, by means of the verification.

-Envelope of a building: It is formed by ceiling, walls, vain, flat and lower surfaces, that conforms the interior space of a building.

-Agency of certification: the moral people that consider object to carry out functions of Expert certifications. It is the physical person or morale with capacity to carry out energy diagnoses, recognized by the Commission.

-Proprietary: physical person or morale interested in obtaining a certificate of its building.

-Buildings certification system: elaborate program and executed by the Commission, in which they are offered to the individuals the certification of their buildings.

-Unit of Verification (UV) : the physical or moral person that carries out acts of verification, according to the arranged thing in the LFMN, that he is found properly

reputable and approved to verify the compliance with the norms:
NOM-007-ENER-2004 and NOM-008-ENER-2001.

-Verification: the ocular verification or verification by means of sampling, measurement, tests of laboratory, or exam of documents, that are carried out to evaluate the conformity in a specific moment.

-Visits of verification: the visit that be performed to the building, with the purpose to verify its compliance with the official norms Mexicans of applicable energy efficiency.

【Presentation】

Energy Efficiency Policy & Measures in Japan

July, 2010

JICA Study Team

How to make the "Low-carbon Economy and Society"

$$\text{"Low-carbon economy and society"} = \text{Non-fossilization of energy supply} \times \text{Energy Efficiency Improvement} \times \text{Economic growth}$$

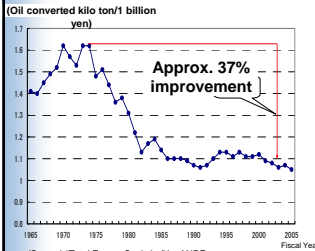
$$\text{CO}_2 \text{ emissions} = \frac{\text{CO}_2 \text{ emissions}}{\text{Energy supply}} \times \frac{\text{Energy supply}}{\text{GDP}} \times \text{GDP}$$

- Expansion of the introduction of new energy
 - Promotion of nuclear energy
 - Expanded utilization of biofuels
 - Others
- Promotion of energy Efficiency
 - Improvement of energy utilization intensity
 - Improvement of fuel efficiency performance
 - Others

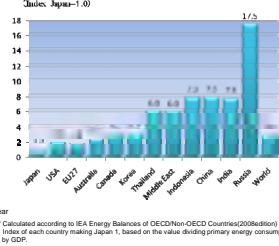
Energy Conservation Efforts of Japan after Oil Crises

- Japan improved the energy efficiency by 37% in last 30 years after the oil crises in the 1970s, as a result of activities made by both public and private sectors.
- Japanese primary energy consumption per GDP is the lowest in the world owing to various energy conservation measures taken by the respective industrial sectors.

Energy use per real GDP of Japan

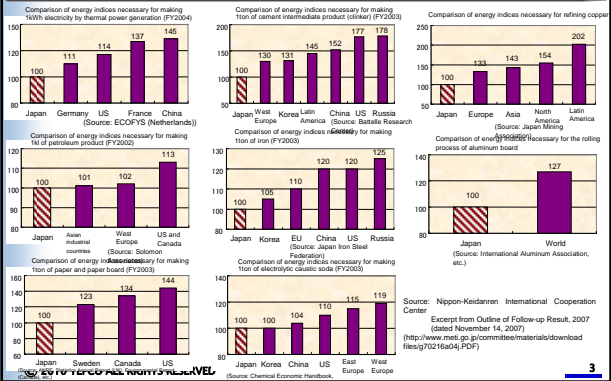


Primary energy supply per GDP unit of each country (2007)

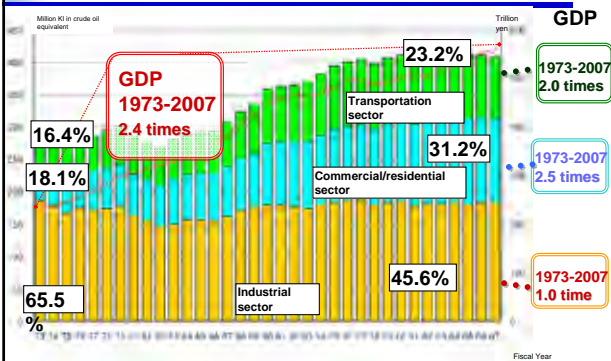


Energy Consumption Efficiency of Each Sector

The energy consumption efficiency of Japanese manufacturers is the highest in the world.

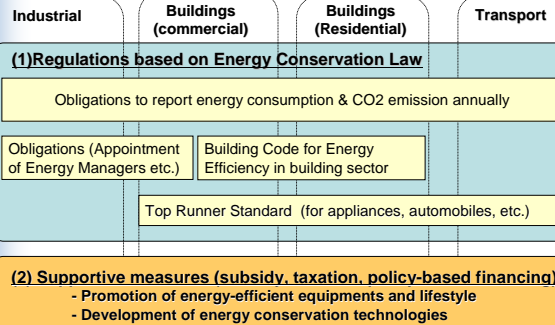


Transition of Final Energy Consumption by sectors



Overall Picture of Energy Efficiency Policy

Energy Efficiency is promoted through both regulatory and supportive measures for each sector.



(1) Regulations

Major points of the Law Concerning the Rational Use of Energy.
(Energy Conservation Law)

(1) Energy Management System

- Energy Manager
- Periodical Report to the Government
- 1 % Reduction Plan
- Management Standards for Equipments

(2) others

- Building Code
- Top-runner regulation
- Transportation Sector
- etc

Energy Conservation Law (1)

Existing Large Factories and Buildings



Large-scale Factories

Annual energy use: 3,000kl in crude oil equivalent or larger



Large-scale Buildings

Annual energy use: 3,000kl in crude oil equivalent or larger



Medium-size Factories and Buildings

Annual energy use: 1,500kl in crude oil equivalent or larger

- (1) Appointment of Energy Manager on site
- (2) Submission of Periodical Report of Energy
- (3) Formulation & Submission of Mid/Long- term plans to reduce energy consumption

- (1) Appointment of Energy Management Staff
- (2) Submission of Periodical Report of Energy
- (3) Formulation & Submission of Mid/Long-term plans to reduce energy consumption

- (1) Appointment of Energy Management Staff
- (2) Submission of Periodical Reports of Energy

Energy Conservation Law (2)

Construction of New Buildings & Retrofitting

Total floor space of 2,000m² or more

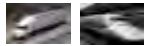
Submission of Report on Energy Saving measures upon new construction, extension or rebuilding, or extensive repair

Machines and Equipment

Passenger cars, air conditioners, televisions, etc.

Requirement to meet the Energy conservation criteria
(Top runners program)

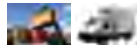
Transportation



Specific carriers (freight, Passengers)

Over 200 cargo trucks, Over 300 railcars

- (1) Obligation to submit a medium and long-term energy plan
- (2) Periodic reporting on the situation of energy use



Specific cargo owners(cosigners)

Annual carrying capacity exceeds 30 million kg.

- (1) Obligation to submit energy plan
- (2) Periodic reporting on the situation of energy use related to consignment transport

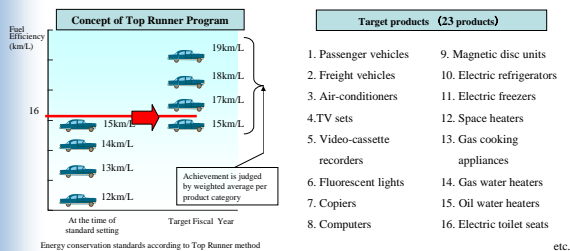
Building Codes for Energy Efficiency in Buildings

Building Envelop	Equipments
Perimeter Annual Load (PAL)	Coefficient of Energy Consumption(CEC)
Performances of Insulations, Windows	Performances of HVAC, Lighting, Hot water supply unit, Elevator
are defined depending on types of buildings.	are defined.

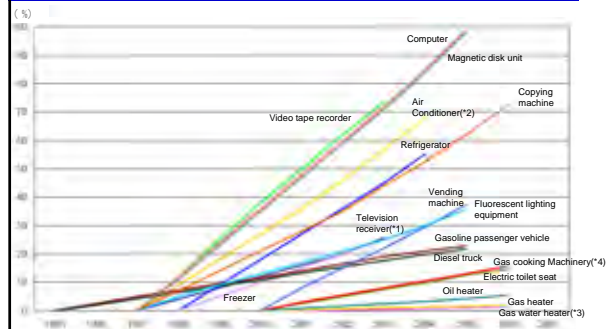
85% of the newly constructed buildings cleared these Codes in 2005.

Top Runner Program

Fuel consumption standards for vehicles and energy efficiency standards for electric appliances shall be set, after certain years, higher than the best value of each product item which is available now in the market.



Energy Efficiency Improvement by Top Runner Program



*1:Television receiver(cathode-ray tube television)
*2:Air conditioner(room air conditioner)
*3:Gas water heater(instantaneous gas water heater,gas heated bath)
*4:Gas cooking machinery(cooker)

(2) Supportive Measures

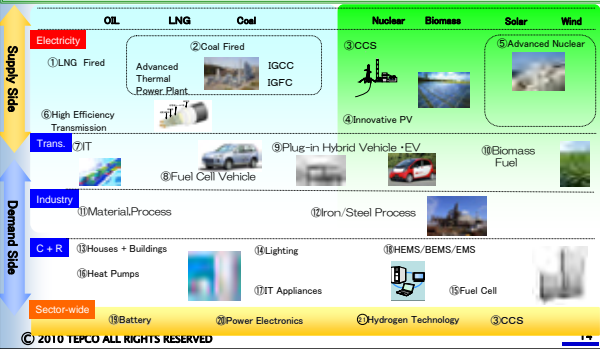
- Financial Support
 - Subsidy
 - Taxation
 - Policy-based financing
- Research & Development
 - Cool Earth – Innovative Energy Technology Plan
- Promotion of energy-efficient equipments
 - PR activities by ECCJ
 - PR activities by Utilities
 - PR activities by Retailers (stores / shops)
- Promotion of energy-efficient lifestyle
 - Cool Biz
 - 28°C in Office in Summer
 - Business without neckties from June to September

Financial Support

Subsidy	<p>For promotion + pilot projects + demonstration +international cooperation + R&D</p> <ul style="list-style-type: none"> - 1/3 to 1/2 of the EE investments are subsidized by the Government etc.
Taxation	<p>For 88 Energy Efficient equipments</p> <ul style="list-style-type: none"> - 7% of price of EE equipments are deducted from the income tax of the company etc.
Policy-based Financing	<p>For Equipments of 25% Energy Efficient or more</p> <ul style="list-style-type: none"> - Loan from the Development Bank of Japan (DBJ) for big companies - Loan from Japan Finance Corporation (JFC) for smaller companies <p>etc.</p>

Cool Earth – Innovative Energy Technology Plan

- 21 Technologies which will dramatically reduce CO2 were selected by the Government, and released in March 2008 as "Cool Earth – Innovative Energy Technology Plan" which covers both supply and demand side.



Promotion of High-Efficiency Hot water Supply System

- Energy demand for hot-water supply dominates approximately 30% of total energy consumption in a typical Japanese household.
- A subsidy has been introduced to promote the energy efficient hot-water systems.

<p>CO2 Refrigerant Heat-Pump Boiler (ECO CUTE)</p> <p>Utilizing the principle of a heat-pump used in an air-conditioner, it can be heated with energy of approximately 3 times more than input energy. Energy saving of approximately 30% compared to a traditional combustion-type boiler is achieved.</p>	<p>Latent-heat Recovery Boiler (ECO JOZU)</p> <p>Recovers the latent heat of exhausted gas, which is usually wasted. Energy saving of approximately 13% compared to a conventional combustion-type boiler is realized.</p>	<p>Gas Engine Boiler (ECO WILL)</p> <p>Uses the gas-powered engine's exhaust heat and power to provide heat (main) and electricity (sub) for approximately 10% of overall energy saving for a building.</p>
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Energy Saving Label

- The Revised Law Concerning the Rational Use of Energy requires that retailers shall make efforts to provide information. A guideline including "Energy Saving Label" was formulated.
- Televisions and air conditioners are applied by this system.

Uniform Energy Saving Label

[Rating system]

- Energy-saving performance is indicated by 5 stages, from 1 to 5 stars, from low to high performance.
- In order to clarify the level with the Top Runner Standard, arrows are placed under the stars.

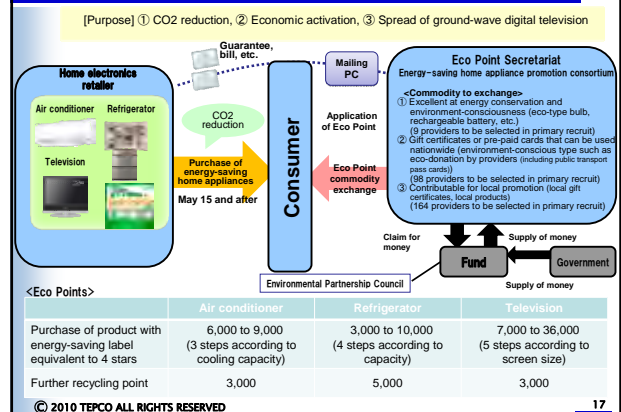
[Energy-saving labeling system]

- Products which achieved the Top Runner Standard carry a green "e" mark, while others carry an orange "e" mark.
- Achievement level and estimated annual electricity consumption are also indicated.

[Expected annual electricity bill]

- The expected annual electricity bill is indicated.

"Eco Point" for energy-saving home appliances



Provision of Information by private sectors

The Energy Conservation Law requires provision of information of energy conservation by Electric Power Companies, Gas Companies, and Retailers.

Electric Power Companies
Gas Companies



Online energy conservation navigation service by TEPCO

Consumer Electronics Retailers



- (1) Promotion of energy efficient equipment to consumers
- (2) Provision of energy-saving information to consumers
- (3) Publication of brochures

Provision of information on energy conservation (annual consumption of power, fuel cost, etc) at stores

Thank you for your kind attention !

Introduction of Nation-wide Energy Management System (EMS)

TEPCO
Yasushi Kawano

Topics

1. Basic Concept of Energy Management System (EMS)
2. Other Countries Experience (Japan, India, Australia and European Standard)
3. Details of Japanese Energy Management System
4. Key Factors for Designing EMS
5. How to Discuss Design Options

2

1. Basic Concept of Energy Management System (EMS)

Background and Objective of the Scheme

Background:

- Numerical target in energy efficiency has been adopted by some countries.
- Energy efficiency in industrial and building sector is one of the important factors to achieve nation-wide numerical target.

Objective:

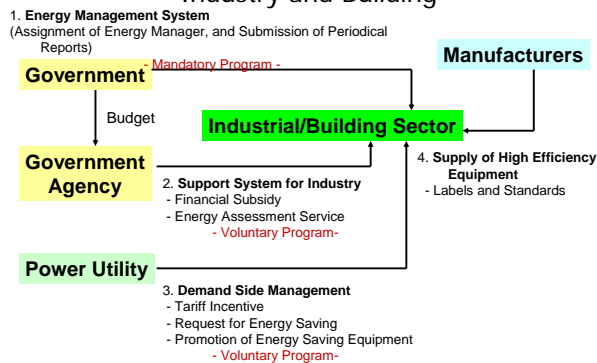
- Periodical monitoring by the mandatory reporting system can contribute to **gradual improvement of energy efficiency**.
- Such monitoring system can help to link national energy database.

Methods:

- To promote **EE&C activities** within a designated unit by **mandatory reporting and assignment of energy manager**.
- Energy manager is assigned by the top of the designated unit, as a responsible person of EE&C activities. **Qualified energy manager** should have a high level status to strongly promote EE&C.

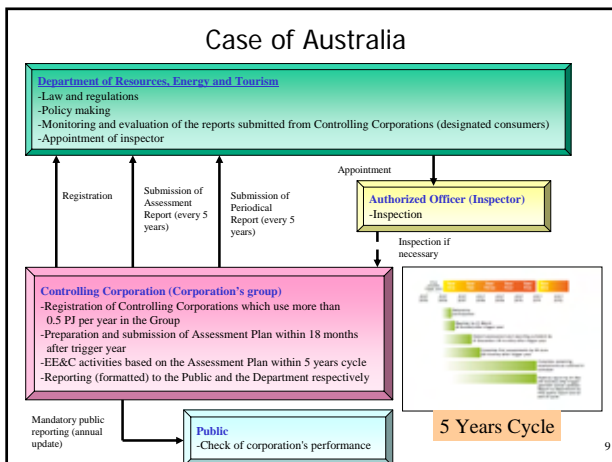
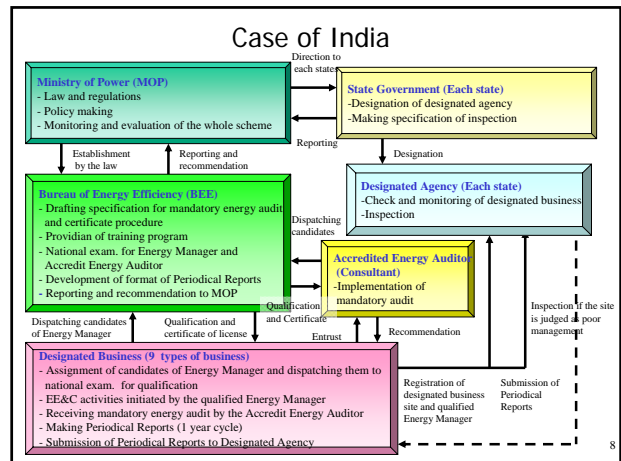
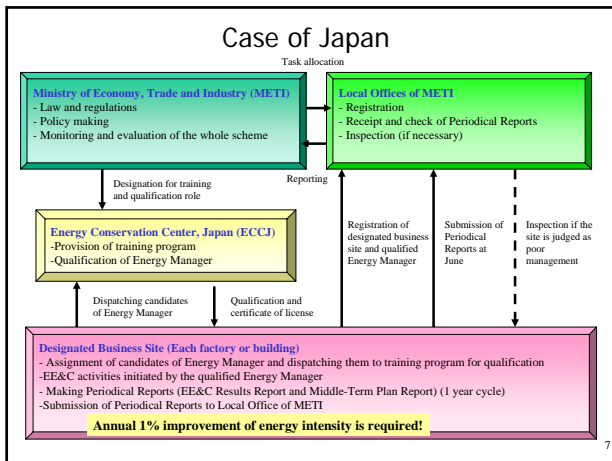
4

Overview of EE&C Scheme surrounding Industry and Building



5

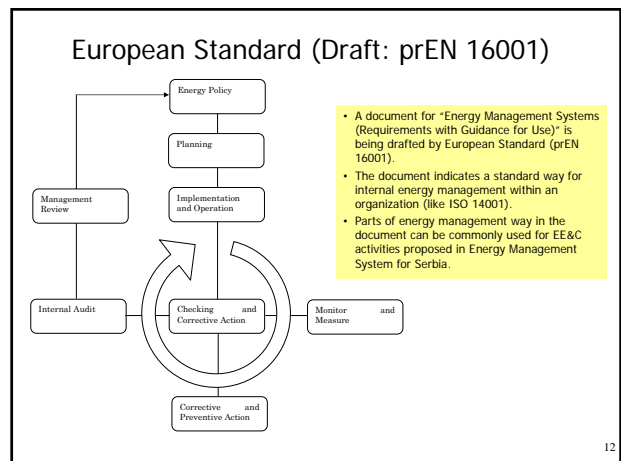
2. Other Countries Experience (Japan, India, Australia and European Standard)



Comparison among Other Countries

	Japan	India	Australia
Target Energy	Fuel, Electricity and Heat	Fuel, Electricity and Heat	Fuel, Electricity and Heat
Unit to be Designated	Each Factory or Building	9 Type of Business (by site)	Group Corporations incl. subsidiaries, JV, etc.
Threshold	3,000 kl- crude oil equivalent/year	30,000 toe/year	0.5 PJ/year (12,900 kl-coe/year)
Responsible Person	Qualified Energy Manager	Qualified Energy Manager	Top Management
Training Provider	ECCJ	BEE	Not specified
Periodical Reports	Every 1 year	Every 1 year	Gov: Every 5 years Public: Annual update
Monitor and Evaluation of Reports	METI Local Offices	Designated agency appointed by each State Government	Department of Resources, Energy and Tourism
Inspection	METI Local Offices	Designated agency	Appointed Officer by the Department

- ### Lessons Learned from Other Countries
1. Target energy in the sampled 3 countries was all type of fuel, electricity and heat.
 2. Boundary to be monitored is by site (Japan and India), or by group corporation (Australia).
 3. Consumers are designated by criteria, volume of primary energy consumption (Japan) and final energy consumption (Australia and India).
 4. Responsible person in EE&C is "Energy Manager" (Japan and India) or top management (Australia).
 5. Japan and India appointed an authority of training provider for Energy Manager. Australia does not specify an official training provider.
 6. Periodical reports are submitted once a year in Japan and India. Australia has 5 years cycle and submit the report at the end of the cycle.
 7. All 3 countries adopted an inspection system.



3. Details of Japanese Energy Management System

Key Items in Japanese EMS

1. Making Periodical Reports (formatted): Mandatory
2. Assignment of Energy Manager: Mandatory
3. Annual Schedule: General Schedule

Periodical Report (Energy Consumption Calculation Sheet)

Table 1: Quantity of energy use and quantity of energy sold or by-product

Type of energy	Unit	Quantity of use		Quantity of energy sold or by-product		Quantity of energy sold or by-product	
		Quantity	Value (kWh)	Quantity	Value (kWh)	Quantity	Value (kWh)
TOTAL ENERGY	Electricity	...	...	...	...	...	...
	Gas	...	...	...	...	...	...
	Heat	...	...	...	...	...	...
	Water	...	...	...	...	...	...

ENERGY

- Energy consumption calculation sheet (annual) is submitted.
- Fuel consumption, purchase of heat, and purchase of electricity are converted to **primary energy** of crude-oil (Japanese case).

Periodical Report (Equipment Operation List)

Table 2: Brief summary of facilities related to rational use of energy and major facilities consuming energy and situations of operation including new installation, remodeling or dismantling

	Name of facilities	Outline of facilities	Operational status	New installation, remodeling or dismantling
Subsidiary energy consuming facilities

Major facilities consuming energy

- For analysis of potential of energy efficiency. Grasping equipment and operation status is very important.
- A list which shows energy consuming equipment and their operation (days and hours) are submitted.

Periodical Report (Energy Intensity)

Table 3: Production quantity, y and others

Production quantity (y)	(Fiscal year)	Comparison vs. production fiscal year (%)
-------------------------	---------------	---

Table 4: Unit energy consumption

Unit energy consumption =	Quantity of energy used (excludes by-product) (kWh) / (Production quantity) (t)	(Fiscal year)	Comparison vs. production fiscal year (%)
---------------------------	---	---------------	---

Table 5: Status of change in unit energy consumption for past five years

Unit energy consumption (kWh/t)	(Fiscal year)	(Fiscal year)	(Fiscal year)	(Fiscal year)	(Fiscal year)	Change in average unit consumption (past five years) (%)
...

Table 6: Reasons for (A) or (B) in case where unit energy consumption for past five years was not improved by 1% or more or (B) in case where unit energy consumption for past five years was not improved from the previous fiscal year

Reasons for (A) above	Reasons for (B) above
...	...

- To monitor extent of energy efficiency, unit energy consumption (energy intensity) is calculated. Energy Intensity = Energy consumption calculated in the calculation sheet / Annual Production Quantity.
- Past 5 years record of the Unit energy consumption should be recorded. In Japan, 1% annual improvement is requested by the guideline.
- If efficiency target (1% improvement) is not achieved, reasons are described.

1% improvement is the target of all designated consumers regulated by the guideline.

Periodical Report (Middle-Term Plan)

I. Term of the plan

Fiscal year	to	fiscal year
-------------	----	-------------

II. Details of the plan and expected effects on the rational use of energy

Process	Details of the plan	Expected effects of the rational use of energy
...
...
...

III. Comparison with the plan of the previous year

Process	Withdrawn plan	Reason
...
...

- M plan targets at 3 years in Japan.
- Planning program/project and expected effects are estimated.
- Comparison of last year's plan is also shown.

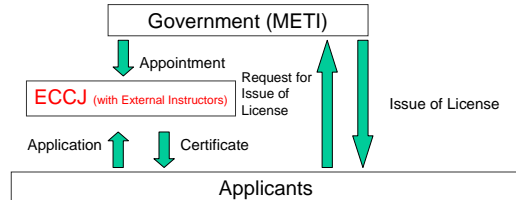
Definition of Energy Manager in Japanese Law

Article	Explanation
Article Energy Manager	Designated Business Operator shall appoint Energy Manager for each of its Designated Energy Management Factories from among persons who have a qualified Energy manager's license, and notify to the Minister of Economy, Trade and Industry.
Article Qualified Energy Manager's License	A qualified Energy manager's license shall be granted by the Minister of Economy, Trade and Industry to persons who fall under any of the following items. <ul style="list-style-type: none"> - Person who has passed an examination for qualification. - Person who has been recognized by the Minister of Economy, Trade and Industry as having equal or greater knowledge and experience than the person
Article Duty of Energy Manager	Energy Managers shall, with regard to the rational use of Energy in Designated Energy Management Factories, manage the maintenance of Energy-consuming facilities, the improvement and supervision of methods for using Energy, and other affairs specified by an Ordinance of the Ministry of Economy, Trade and Industry.

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Qualification of Energy Manager

- Energy Manager is a national qualified status.
- National qualification is needed.
- Regarding qualification of Energy Manager, ECCJ (Energy Conservation Center, Japan) is entrusted by METI.
- There are 2 methods for qualification, namely national examination (1 day examination) and training program with certificate examination (6 days training program and 1 day examination).



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License of Energy Manager (Case of Japan)

	< in 2005 >
1. National examination	
❖ Once a year	Applicant 8,950
❖ 1 day, 4 subjects	Succeeded 2,290
❖ Requirement: At least 1 years experience	(22.5%)
2. Training program with certificate examination	
❖ Once a year	Applicant 2,765
❖ 6 days training & 1 day examination	Succeeded 1,800
❖ Requirement: At least 3 years experience	(65.1%)

ECCJ (Energy Conservation Center, Japan) is assigned to carry out the national examination and training program with certificate examination.

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Annual Schedule (Japanese Case)

PR: Periodical Reports

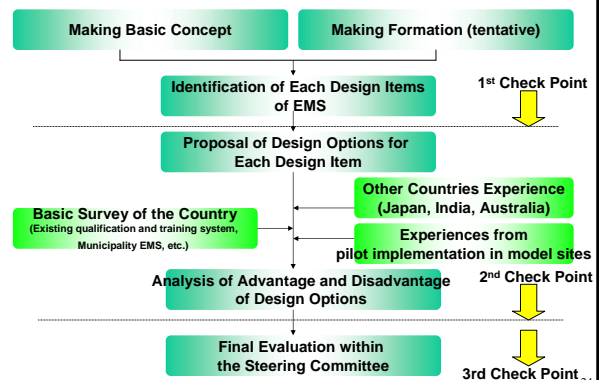
	Apr	May	Jun	Jul	Aug	Sep
Control Agency		Registration		Clarification of submitted PR		Check of PR
Designated Consumers		Registration	Submission of PR	Response to the Clarification		
	Oct	Nov	Dec	Jan	Feb	Mar
Control Agency	Check of PR	Random Check on Site		Inspection (if the site is judged as poor management)		Instruction
Designated Consumers		Response to the Random Check on Site		Response to Inspection		

Even after instruction from Control Agency, if EE&C activities of the site is not improved, penalty (Fine 4,000 Euro and Public Announcement of the Name) is levied for the company.

22

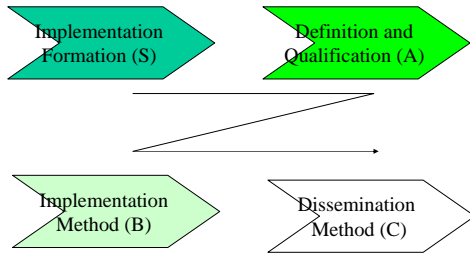
4. Key Factors for Designing EMS - From the Project of Serbia -

Scheme Design Schedule



24

Prioritization of Design Item



25

Design Items to be Decided (1)

1. Designation of Energy and Consumers Priority (A)
 - Target Sector
 - Target Energy
 - Criteria of Designated Consumers (Threshold)
 - Unit (boundary) to be Designated
2. Formation Priority (S)
 - Roles of Executing Agencies (Ministry and Agency)
 - Judgment Flow of Poor Management
 - Annual Schedule and Task Allocation
 - Mandatory External Audit by the Accredited Energy Auditor
3. Status of Energy Manager and Accredited Energy Auditor Priority (A)
 - Certification Methods for Energy Manager, Accredited Energy Auditor (and Inspector)
 - Procedure of Issue of Energy Manager's License
 - Energy Manager's Duty and Status
 - Energy Officer, Accredited Energy Auditor, Inspector's Duty and Status
 - Assignment of Energy Manager and Energy Officer
4. EE&C Activities within the Unit
 - Evaluation Criteria (Guideline) and Management Standards

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Design Items to be Decided (2)

5. Periodical Reports
 - Contents of Periodical Reports
 - Collection Method of Periodical Reports
6. Monitoring and Check
 - Introduction of Numerical Targets (ex. 1 % annual improvement) and its Status
 - Quality Management for Proper Reporting by the Monitoring Agency
 - Evaluation Method for Periodical Reports
 - Evaluation Method for Mandatory External Audit
 - Utilization of Obtained Data (Benchmark)
7. Inspection and Penalty
 - Inspection Method (Inspection Formation, Appointment of Inspector, Procedure, etc.) and Evaluation
 - Penalties and Methods (Public Announcement of Company's Name, Fine, etc.)

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5. How to Discuss Design Options (Sample from a JICA Study conducted by TEPCO)

Roles of Executing Agencies

Option 1

Ministry:
-Law and Regulation
-Registration of designated consumers and Energy Manager
-Check and monitoring of designated consumers
-Inspection

Agency:
-Training and Qualification Authority
-Arranging Training Program and Examination

Option 2

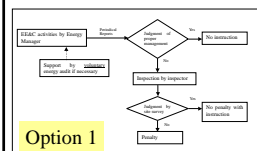
Ministry:
-Law and Regulation

Agency:
-Registration of designated consumers and Energy Manager
-Check and monitoring of designated consumers
-Inspection
-Training and Qualification Authority
-Arranging Training Program and Examination

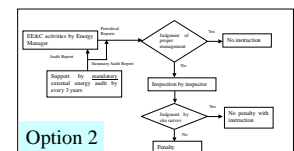
	Option 1	Option 2
Workload	Tasks of monitoring and qualification/training are shared to Ministry and Agency.	All tasks of EMS including training and qualification are done by Agency.
Empowerment	Ministry has a power for monitoring and inspection.	Power for monitoring and inspection is given to Agency.
Budget	Budget for EMS is shared to Ministry and Agency.	All budget for EMS is concentrated on Agency.

29

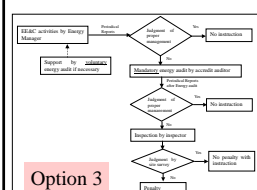
Judgment Flow of Poor Management



Option 1



Option 2



Option 3

	Option 1	Option 2	Option 3
Opportunity of Inspection	Opportunity of inspection is expected more.	Opportunity of inspection is expected less because of mandatory audit.	Opportunity of inspection is expected less because of mandatory audit.
Cost borne by Designate Consumer	Cost is the least.	Cost for hiring mandatory auditor (every 3 years) is taken. (EE&C fund should be considered)	Only poor management consumers judged by Periodical Reports have to hire mandatory audit.
Acceptability by Designated Consumer	Suddenly inspection after judgment of Periodical Reports might be strict.	Good consumers might have complaints for mandatory audit for all consumers.	Only poor management consumers judged by Periodical Reports have to hire mandatory audit. This seems to be fair for good consumers.

30

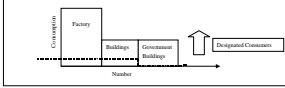
Target Sector

1. Category of Target Sector

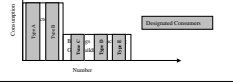
- **Category A:** Factories and buildings, and central Gov. buildings
- **Category B:** Transformation sector consisting of power utility, oil refinery, coal transformation, district heating system, etc.

2. Designation (Case of the Category A)

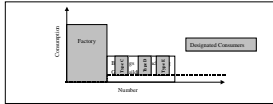
Option 1



Option 2

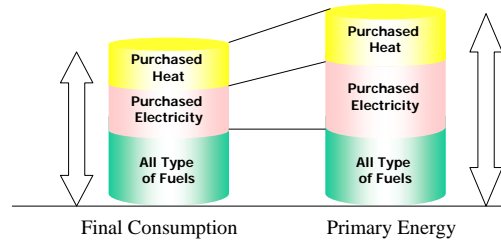


Option 3



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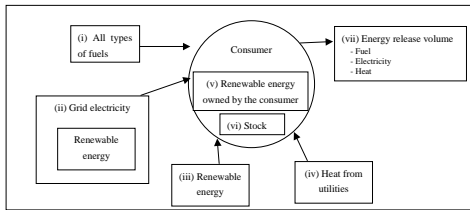
Target Energy (Final Consumption or Primary Energy)



	Option 1 (Final Consumption)	Option 2 (Primary Energy)
Easiness	Final consumption is easy to calculate. Workload is not so much.	Conversion factor is necessary. Average conversion factor in electricity and heat supply should be reviewed periodically.
Country-wide Viewpoint	Final consumption does not represent country-wide consumption. It represents on-site consumption.	Primary energy represents "real energy consumption" from the viewpoint of the country.
EU directives	Final consumption is used.	N.A.
Electricity	Electricity is evaluated at smaller volume compared with other fuels. It might happen to shift fuels use to electricity use.	Electricity is appropriately evaluated compared with other fuels.

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Target Energy (Renewable Energy)



Option 1

In case that directly connected renewable energy (iii) and on-site renewable energy (v) are **neglected** from the target energy:

$$\text{Target Energy} = (i) + (ii) + (iv) - (vi) - (vii)$$

Option 2

In case that directly connected renewable energy (iii) and on-site renewable energy (v) **counted** into the target energy:

$$\text{Target Energy} = (i) + (ii) + (iii) + (iv) + (v) - (vi) - (vii)$$

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Evaluation criteria (standards section) items & target equipment

- ① Rationalisation of fuel burning
Boiler, melting furnace, heating furnace, drying furnace etc...
- ② Rationalisation of heat transfer associated with heating & cooling
Steam heater, absorption refrigeration machine, hot water system etc...
- ③ Recovery & reuse of exhaust heat
Boiler, melting furnace, heating furnace etc...
- ④ Rationalization of conversion to thermal heat
Generation & cogeneration equipment
- ⑤ Prevention of energy loss by radiation, conduction & resistance
Steam piping, chilled/hot water piping, power distribution equipment etc...
- ⑥ Rationalisation of electrical power conversion to heat & mechanical power
Electric motors, pumps, fans etc...

7

Evaluation Criteria Sample: Rationalization of fuel burning

	Control	Metering and recording	Maintenance / Inspection	Measures to be implemented prior to new installation
1	(1) Control of fuel combustion ① Control of combustion air ratio for combustion equipment and type of fuel ● Control standards 1 ② Rationalization of combustion air ratio for combustion equipment based on attachments 1(A) Standards ① ③ Various standards for load regulation and total control of fuel efficiency ● Control standards 2 ④ Control of fuel properties for the improvement of combustion efficiency	(2) Fuel combustion related metering and recording Amount of fuel supply, exhaust gas temperature, metering and recording of amount of oxygen content in exhaust gas ● Control standards 3	(3) Combustion equipment maintenance / inspection Carrying out of scheduled to keep combustion equipment in good condition ● Control standards 4	(4) Measures to be implemented prior to new installation of combustion equipment ① Regulation of amount of fuel and combustion air ratio for combustion equipment ② Ventilation arrangement for ventilation volume and combustion chamber pressure regulation

8

Management Standards

- In order to appropriately & efficiently implement the rationalisation of energy usage in factories, it is necessary to determine the "management standards"
- "Management standards" include:
 - ① Management (Operation manual)
 - ② Measurement & records
 - ③ Maintenance & inspection
 to be carried out only after you have prepared and circulated your own manual to relevant personnel.

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Sample: Management standards (Case of Boiler)

- It shall cover the main points of operational management that minimise use of as far as possible and important points to remember depending on the characteristics, functions etc. of each energy related system. Furthermore, the proper conditions for that equipment shall be clearly indicated.

No.	Equipment (fuel)	Control standards	
		Control items	Standard value
1	No. 8 Boiler (Black liquor)	Air ratio	< 1.3
		Exhaust gas temperature	< 200°C
		Evaporation factor	4.6~5.0 [t/pt]

10 10

2. Status of Random Check

Background

1. History
 - Random check is undertaken by METI. This program has been introduced in 2001 in order to further strictly monitor Designated Factories and Buildings.
 - The objective is to confirm compliance of Evaluation Criteria (Guideline) in Designated Factory and Building by site survey.
2. Objective
 - The site survey reinforces information on compliance with Evaluation Criteria and grasp a real situation of activities of the Designated Consumers (not only Periodical Reports).
 - The selection of site survey is made by "at random". If the results of the site survey is evaluated as "Poor: less than 60 points", Inspector can be dispatched to the site. The "at random" system can be an incentive to urge compliance with the Evaluation Criteria.
3. Methods
 - 1 or 2 surveyors are dispatched to the selected site. They are entrusted by METI as an legal basis surveyor.
 - Before the site survey, a questionnaire sheet is sent to the site and the site must return the sheet filled by themselves.

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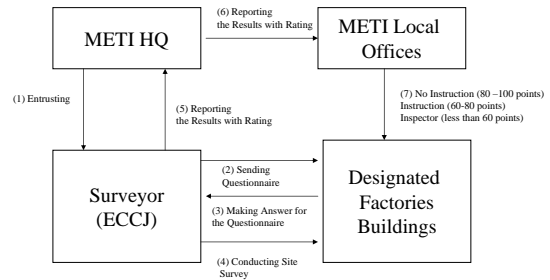
Basis of Law (Article 6)

Article 6 (Guidance and Advice)

- The competent minister may, when he/she finds it necessary in order to ensure the proper implementation of the rational use of Energy in Factories, provide business operators using Energy in Factories with **necessary guidance and advice** with regard to the implementation of the matters listed in the items of paragraph 1 of the preceding Article, by taking into consideration the standards of judgment prescribed in the same paragraph.

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Players of Random Check



1. Planning and Executor: METI HQ
2. Surveyor (entrusted by METI HQ) and Rating: ECCJ
3. METI Local Offices: Instruction or Inspection (when the points are not so good)

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Treatment after Evaluation

- The Surveyor team evaluates the compliance according to the check list.
- The evaluation is made by check list which can calculate evaluation points (Full: 100 points).
- In case that the evaluation is **less than 60 points**, Inspector can be dispatched to the site later on. Inspection by Inspector has an enforcement power to the site.
- In case that the evaluation is **60 points to less than 80 points**, some instruction will be made by METI Local Offices. The organization must submit a "Rationalization Plan".
- In case that the evaluation is **more than 80 points**, no instruction is basically made. However, if energy intensity does not achieve 1 % improvement, some comments might be made.

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3. Implementation and Evaluation

Selection

1. Selection

METI HQ makes a plan and select random check site.

2. Case of FY 2010

- (1) Designation of Business Type
 - 1/3 of Food Industry
 - 30 % of Manufacturer of Transportation Equipment
- (2) At Random Selection for Site
 - 200 Factories or Buildings
- (3) At Random Selection for HQ
 - 10 HQ

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Survey Methods

(1) The Surveyor (ECCJ) sends a Questionnaire Sheet with "**Self-Check List for Compliance with Evaluation Criteria**".



(2) The Designated Organization must prepare the answer to the Questionnaire Sheet with Self-Check List before the site survey.



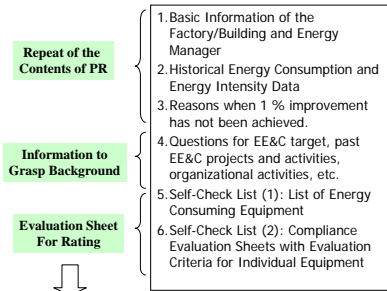
(3) The Surveyor visits the site and reviews the "Self-Check List" (rating by the Surveyor).



(4) The Surveyor submits the results of the rating evaluation to METI HQ and METI Local Office.

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Composition of Questionnaire Sheet



This Self-Check List is re-evaluated by the Surveyor at the site survey.

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Self-Check List

List of Energy Consuming Equipment

1. Equipment List of A Section

- Capacity, Number of Units
- Annual energy consumption

2. Equipment List of B Section

- Capacity, Number of Units
- Annual energy consumption

3. Equipment List of C Section

- Capacity, Number of Units
- Annual energy consumption

Compliance Evaluation Sheets for Individual Equipment

1. Check of Compliance with Evaluation Criteria

- Establishment of Management Standards and its Compliance
- Establishment of Measurement and Record Standards and its Compliance
- Establishment of Maintenance and Inspection Standards and its Compliance

2. Rating Sheet for Individual Equipment

20

Format (1)

Area	Item	Check	Remarks	Score	Total
In-Plant	1. Basic Information	○		10	10
	2. Historical Data	○		10	20
	3. Reasons for Improvement	○		10	30
	4. EE&C Activities	○		10	40
Equipment List	1. Capacity/Units	○		10	50
	2. Annual Consumption	○		10	60
	3. Management Standards	○		10	70
	4. Measurement Standards	○		10	80
Compliance	1. Management	○		10	90
	2. Measurement	○		10	100
	3. Maintenance	○		10	110
	4. Inspection	○		10	120
Total				120	

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Format (2)

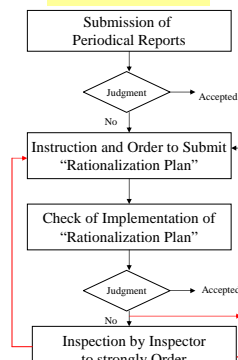
Area	Item	Check	Remarks	Score	Total
In-Plant	1. Basic Information	○		10	10
	2. Historical Data	○		10	20
	3. Reasons for Improvement	○		10	30
	4. EE&C Activities	○		10	40
Equipment List	1. Capacity/Units	○		10	50
	2. Annual Consumption	○		10	60
	3. Management Standards	○		10	70
	4. Measurement Standards	○		10	80
Compliance	1. Management	○		10	90
	2. Measurement	○		10	100
	3. Maintenance	○		10	110
	4. Inspection	○		10	120
Total				120	

22

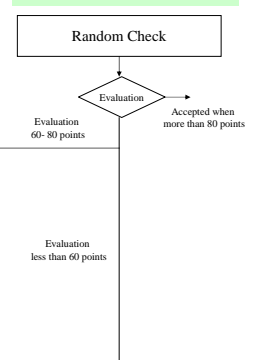
4. Treatment after Random Check

Instruction and Inspection

Normal Procedure



Random Check Procedure



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Instruction and Submission of Rationalization Plan

1. Based on the results of evaluation (60-80 points), METI Local Office gives instruction to the Designated Consumer with evidence that they do not comply with Evaluation Criteria.
2. When the Designated Consumer received the instruction to be improved, they must prepare and submit a "Plan on Rational Use of Energy" to METI LO.
3. METI LO monitors the implementation of the Plan. If METI LO judges that the Designated Consumer has not improved their performance, METI LO can dispatch Inspector to strong order implementation.

Article 16(Instructions and Orders on Rationalization Plans)

The competent minister may, when he/she finds that the status of the rational use of Energy in a Type 1 Designated Energy Management Factory is significantly insufficient in light of the standards of judgment prescribed in Article 5, paragraph 1, instruct the Type 1 Specified Business Operator pertaining to the Type 1 Designated Energy Management Factory to prepare and submit a plan on the rational use of Energy (hereinafter referred to as a "Rationalization Plan"), while presenting the grounds for his/her judgment.

Sector-wise Benchmark Approach (SBA)

August 2010
JICA Study Team
Susumu TAKAHASHI

1

Sector-wise Benchmark Plan of Japan

2

Objective

(Energy Management System)

- Japanese EMS has adopted a target "1% annual improvement of energy intensity" for all designated consumers.
- But a definition of "Energy Intensity" is decided by each designated consumer. Because the intensity is used for internal evaluation (not for external comparison).



(Domestic Issue)

- Currently, some designated consumers met a difficulty to annually improve 1%. They insisted that they had already made efforts and a fair "yardstick" should be introduced.

(World Trend)

- International framework (IEA, EU-ETS and APP) is now developing Sector-wise Benchmarking Approach (SBA).



(Objective to Introduce SBA)

- Japanese Gov. wants to introduce SBA to mitigate the above domestic issue and want to lead the world trend in the design of world benchmark framework.

3

Schedule of Introduction of SBA

FY	Consultation in the ISCM	Execution
2008	3 sub-sectors (power, iron&stell (3 types furnace) and cement) were selected and authorized as a first stage.	
2009	Next sub-sectors (chemical, paper&pulp, oil refinery) are under consultation.	
2010		From 2010 FY, the first 3 sub-sectors will be executed.
2011		From 2011 FY, the next 3 sub-sectors are planned to be executed.

Before execution, amendment of legal basis is necessary.

4

Benchmark of the Sub-Sectors

Sub-sector	Benchmark	Boundary
Iron business using blast furnace	0.531 kl/ton	BY company (summation of all factories)
Normal Steel business using electric furnace	0.143 kl/ton	BY company (summation of all factories)
Special steel business using electric furnace	0.36 kl/t	BY company (summation of all factories)
Power generation business	100.3 %	BY company (summation of all factories)
Cement business	3,891 MJ/ton	BY company (summation of all factories)

5

Benchmark of the Sub-Sectors

Sub-sector	Benchmark	Boundary
Paper	8,532 MJ/ton	BY company (summation of all factories)
Board Paper	4,944 MJ/ton	BY company (summation of all factories)
Oil Refinery	0.876	BY company (summation of all factories)
Oil Chemistry Product	11.9 GJ/t	BY company (summation of all factories)
Soda	3.45 GJ/ton	BY company (summation of all factories)

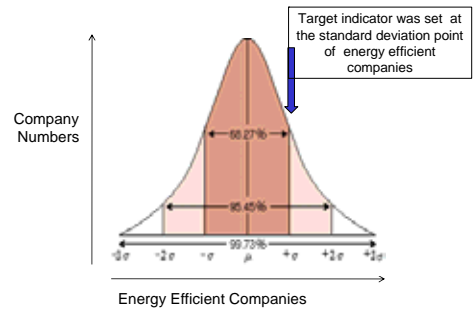
6

Evaluation Criteria Committee

- 1) Members
26 members from various sector associations, universities and institutes
- 2) Discussion Points on Benchmark
Position of benchmark on EE&C law
Target sectors
Target indicators of benchmark
- 3) Coverage
Approximately 60% from energy consumption of industrial sectors would be covered after execution

7

How to set The Target Indicators of Benchmark



8

Indicators of Iron & Steel Sector

Iron business using blast furnace

$$\frac{\text{Total Energy Consumption}}{\text{Crude Steel Output}}$$

Normal Steel business using electric furnace

$$\frac{\text{Energy Consumption of Steel Product}}{\text{Crude Steel Output}} + \frac{\text{Energy Consumption after the Process of Rolling}}{\text{Rolling Steel Output}}$$

Special steel business using electric furnace

$$\frac{\text{Energy Consumption of Steel Product}}{\text{Crude Steel Output}} + \frac{\text{Energy Consumption after the Process of Rolling}}{\text{Product Output}}$$

9

Calculation of Benchmark

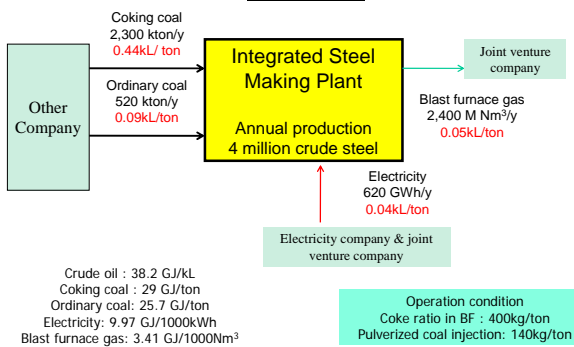
$$\text{Benchmark} = \frac{\text{Annual total energy consumption}}{\text{Annual total crude steel production}}$$

$$\begin{aligned} \text{Annual total energy consumption} &= \text{Purchased energy(Coking coal + Ordinary coal + Electricity) - Sold energy(Blast furnace gas)} \\ &= 66,700 \text{ TJ} + 13,364 \text{ TJ} + 6,181 \text{ TJ} - 8,184 \text{ TJ} = 78,061 \text{ TJ} \end{aligned}$$

$$\begin{aligned} \text{Benchmark} &= 78,061 \text{ TJ} \div 4,000,000 \text{ ton} = 19.5 \text{ GJ/ton} \\ &= 19.5 \text{ GJ/ton} \div 38.2 \text{ GJ/kL} = 0.51 \text{ kL/ton} \end{aligned}$$

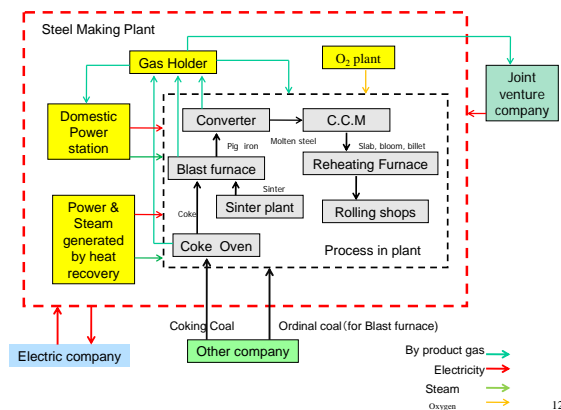
10

Benchmark : 0.51kL/ton



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Boundary of Steel Making Plant



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Power Sector (Thermal Power Station)

Official Indicator

Gross Thermal Efficiency (high heat value) at the Rated Output Test

 Design Thermal Efficiency

Additional Information

Output

 Input

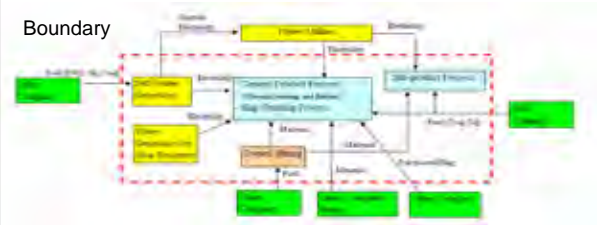
13

Cement Sector

Indicator

Energy Consumption of Material Process
 Material Output (Clinker equivalent)
 +
 Energy Consumption of Fueler Process
 Fuelled Output as Fueler Process (Various Cement equivalent)
 +
 Energy Consumption of Burning Firing Process
 Output of Clinker as Burning Firing
 +
 Energy Consumption of Slagging Process
 Slagging Output (Various Type of Cement and Clinker)

Boundary



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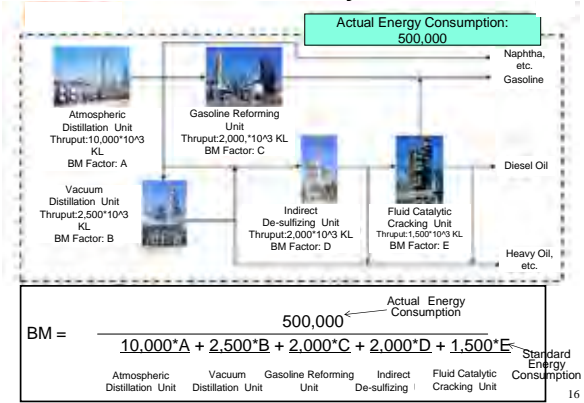
Bench Mark of Petroleum Refineries

Bench Mark(BM) of Refineries = $\frac{\text{Actual Energy Consumption}}{\text{Standard Energy Consumption}}$

- Equation
 Standard Energy Consumption
 = $\sum (\text{Throughput of Each Plant} \times \text{BM Factor of Each Plant})$
- BM Factor is derived from the average of plants in the world based on **the Solomon's data** (340 refineries)
- The target of bench mark was decided as 0.876.

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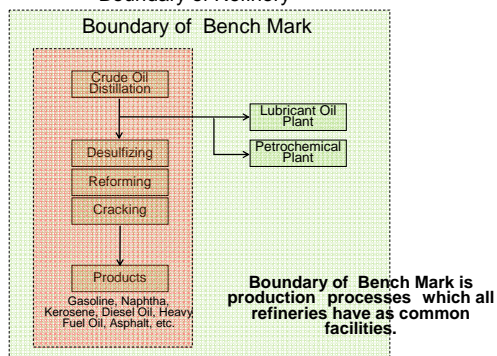
Petroleum Refinery Sector



16

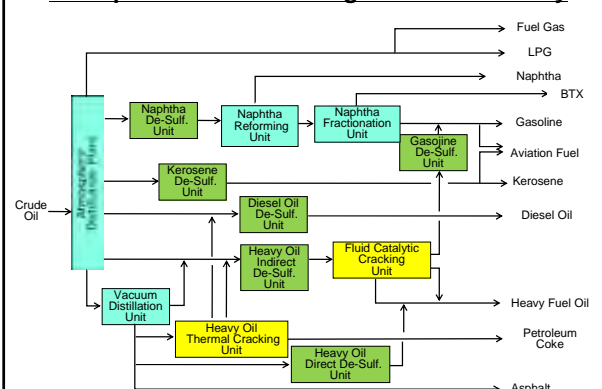
Boundary of Bench Mark

Boundary of Refinery
 Boundary of Bench Mark



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Example of Process Configuration in Refinery



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Sector-wise Benchmark Plan of EU

(still under discussion)

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EU Benchmark Indicator Planning(1)

Sector	Products	Benchmark Indicator (Planning) (Unit: per product Ton)	Remarks
Iron & Steel	Cokes production/Cokes	0.090t-CO ₂	
	Sinter production/Sintered ore	0.119t-CO ₂	
	Blast furnace/Liquid pig iron	1.286t-CO ₂	
	Electric furnace/Crude steel	0.058t-CO ₂	
Chemical	Nitric acid	0.00121t-CO ₂	
	Steam cracking	0.5~0.7t-CO ₂	
	Ammonia	1.46t-CO ₂	
	Adipic acid	5.6t-CO ₂	
	Hydrogen	8.9t-CO ₂	
	Sodium carbonate	0.73t-CO ₂	

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EU Benchmark Indicator Planning(2)

Sector	Product	Benchmark Indicator (Planning) (Unit: per product Ton)	Remarks	
Chemical	Aromatic compound	Aromatic solvent extraction	5.25CWT	
		Toluene	2.45CWT	
		Thiamine diphosphate/Toluene diisocyanate	1.85CWT	
		Cyclohexane	3.00CWT	
		Xylene isomer	1.85CWT	
		Para xylene	6.40CWT	
		Ethylbenzene	1.55CWT	
		Cumene	5.00CWT	
		Carbon black	2.62t-CO ₂	

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EU Benchmark Indicator Planning(3)

Sector	Products	Benchmark Indicator (Planning) (Unit: per product Ton)	Remarks
Cement	Clinker	0.78t-CO ₂	
Petroleum refinery	Petroleum refinery	0.03t-CO ₂ /CWT	
Paper Pulp	Kraft pulp	0.048t-CO ₂ /Air Dry MetricTon	
	Sulfite pulp/Mechanical pulp	0t-CO ₂ /Air Dry MetricTon	
	Recycled paper	0.0187t-CO ₂ /Air Dry MetricTon	
	News paper	0.318t-CO ₂ /Air Dry MetricTon	
	Fine paper	0.405t-CO ₂ /Air Dry MetricTon	
	Coated paper	0.463t-CO ₂ /Air Dry MetricTon	
	Facial tissue	0.343t-CO ₂ /Air Dry MetricTon	
	Containerboard	0.368t-CO ₂ /Air Dry MetricTon	
	Boardpaper	0.418t-CO ₂ /Air Dry MetricTon	

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EU Benchmark Indicator Planning(4)

Sector	Products	Benchmark Indicator (Planning) (Unit: per product Ton)	Remarks
Glass	Sheet glass	0.606t-CO ₂	
	Insulating glass	0.250t-CO ₂	
	Glass wool	1.003t-CO ₂	
Aluminum	Almina	0.39t-CO ₂	
	pre-baked anode	0.33t-CO ₂	
	Primary aluminum	1.57t-CO ₂	
	Aluminum product	0.22t-CO ₂	
—	—	—	

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EU Benchmark Indicator Planning(5)

Sector	Products	Benchmark Indicator (Planning) (Unit: per product Ton)	Remarks
Ceramics	Mineral wool	0.664t-CO ₂	
Gypsum	Dry gypsum/land plaster	0.01t-CO ₂	
	Gypsum	0.05t-CO ₂	
	Gypsum block/Gypsum Board/ Glass wool reinforced Gypsum board	0.08t-CO ₂	
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Training Programs for Energy Manager in Japan

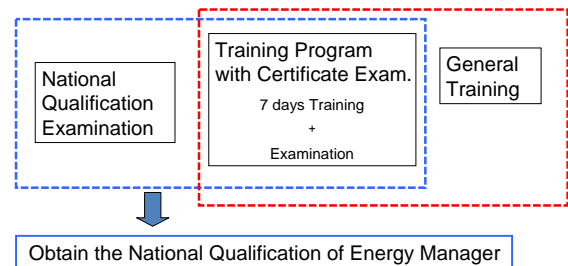
JICA Study Team

Contents

- I . Introduction
- II . Qualification System of Energy Manager
- III . General Training Programs
- IV . Operation of Training Programs
- V . Outline of ECCJ

I . Introduction

Qualification System and Training Programs



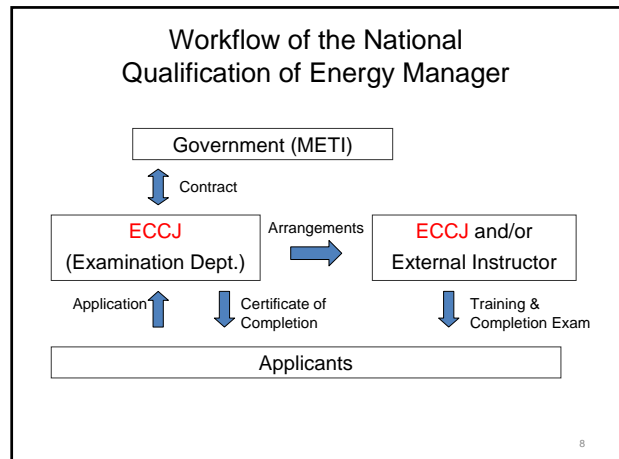
Classification of Training Programs

Classification	Contents
Training program with certification examination for candidates of Energy Manager	<ul style="list-style-type: none"> ●Lecture of law and regulations of the EMS ●Basic knowledge of heat and electricity ●Theory and practice of EE&C activities within a business unit ●Measurement and data collection, and analysis ●How to make Periodical Reports ●(Certification examination)
General training programs for proper implementation of the EMS	<ul style="list-style-type: none"> ●Lecture of law and regulations of the EMS ●How to make Management Standards ●Theory and practice of EE&C activities within a business unit ●Measurement and data collection, and analysis ●Theory of heat and electricity in EE&C ●Lecture for individual technology (pump, AC, boiler, etc.)

EE&C Activities and Tasks of Energy Manager (1)

	Activity	Task of Energy Manager
1	Energy-saving fundamental policies	Gives assistance when drafting the energy-saving fundamental policy. Calculates investments/costs based on the fundamental policy.
2	Energy-saving promotion framework	Develops an energy-saving promotion organization plan. Decides on the energy-saving promotion organization framework. Convenes meetings of the energy-saving promotion committee.
3	Management standards	Develops the mandatory management standards as evaluation criteria. Designates the department responsible for the management standards. Provides related departments with necessary information.
4	Identifying actual energy consumption	Investigates actual energy consumption, and makes out the basic units management chart.
5	Energy-saving plan and target setting	Designates the energy-saving tasks for the entire company and for each department once a year, and quantitatively sets out applicable targets.

	Activity	Task of Energy Manager
6	Education and prize-giving for employees	Educates employees. Works with the employer to establish a prize-giving scheme.
7	Periodic internal reporting on energy-saving efforts	Reports energy-saving efforts to the employer and each department on a monthly and yearly basis by using the energy basic units management chart.
8	Improvements in energy-saving efforts	Develops an improvement plan after hearing opinions from related departments. Drafts a workplace-level improvement plan after hearing opinions from related departments.
9	Procedures/reporting scheme in accordance with Energy Conservation Law	Drafts the periodic report, and prepares a preliminary draft of the medium-to-long term plan.
10	Self-development by energy managers	Remains informed of state-of-the-art technologies and other firm's best practices.



Profile of ECCJ

Legal status:	* NPO Incorporated foundation under the supervision of METI
Establishment:	* October, 1978 (just after the 2nd oil crisis)
Purpose of establishment:	* Core organization responsible for promotion of energy conservation
Office location:	* Tokyo Head office & 8 branches
Supporting member:	* 2,719 companies (as of July 3, 2009)
Staff:	* 131 persons (as of May 1, 2009)
Budget:	* 4,735million yen in 2008FY (35.04million euro) Subsidy Project (38%), Assigned Project (27%), State Examination (11%), Trainings (6.1%), Supporting Membership Fee (4.4%), Others (13.5%)
Fields of activity:	* Industrial, Residential/Commercial, Transportation and Cross sectors

II . Qualification System of Energy Manager

National Qualification Examination

Course	Subjects
Electricity Course	1. Outline of energy management and Law and Regulations
	2. Basic theory in Electricity
	3. Facility and Equipment
	4. Application of Electricity
Heat Course	1. Outline of energy management and Law and Regulations
	2. Basic Theory in Heat and Fluid
	3. Fuel and Combustion
	4. Heat Utilization Facility and its Management

Training Program with Certificate Exam.

Course	Subjects	Hrs
Electricity Course	1. Outline of Energy Management and Law and Regulations	9
	2. Basic Theory in Electricity	8
	3. Facility and Equipment	12
	4. Application of Electricity	23
		52
Heat Course	1. Outline of Energy Management and Law and Regulations	9
	2. Basic Theory in Heat and Fluid	18
	3. Fuel and Combustion	7
	4. Heat Utilization Facility and its Management	18
		52

Achievement of 2008

	Applicant	Succeeded	%
National Qualification Examination	9,980	2,954	20.6
Training Program with Certificate Exam	1,872	1,191	63.6

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III. General Training Programs

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EC Technology Training Courses

Classification	Objectives	Subjects	Methodology	Duration
EC Training Program	Coverage of wide EC subjects	EC Law EC Technologies Management Electricity Heat Project finding Building etc.	Lecture Exercise Operation Measurement at site	1-2 days
Training Delivery Scheme	Customized Training	EC in factories EC in buildings etc.	Dispatch of trainer to customers	Usually 0.5 days

Training Programs of Heat Course

	Duration	Theme	Contents
First Term	2 days	EE&C Technology of Heat and Combustion Management	EE&C Technology of Heat Fuel Combustion Calculation Hands on Practice of Combustion
Second Term	2 days	Steam Management and Steam Trap	EE&C of Steam Hands on Practice of Steam
Third Term	2 days	Energy Assessment of Heat Facility	Heat Balance Calculation and Assessment Practice of Finding Potential of EE&C
Fourth Term	2 days	Good Practice of EE&C of Heat	Introduction of Good Practice of EE&C in Heat Site Visit of EE&C Technology Application

(Source: ECCJ Website)

Training Programs of Electricity Course

	Duration	Theme	Contents
First Term	2 days	EE&C of Building	EE&C of Building Measurement of Electricity Hands on Practice of Electricity Measurement
Second Term	2 days	EE&C of Compressor	EE&C of Compressor Hands on Practice of Compressor
Third Term	2 days	EE&C of Pump and Fan	EE&C of Pump and Fan Hands on Practice of Pump and Fan
Fourth Term	2 days	Good Practice of EE&C of Electricity	Introduction of Good Practice of EE&C in Electricity Site Visit of EE&C Technology Application

(Source: ECCJ Website)

Other Training Programs

Course	Duration	Theme	Contents
How to Find EE&C Potential	2 days	Practice to Find EE&C Potential in Electricity and Fuel Consuming Factory	1. Issues and countermeasure in promotion of EE&C 2. Methods to find EE&C potential and its application 3. Practice
Energy Assessment of Building	2 days	EE&C in Building Facility and Operation	1. Law and regulations 2. EE&C of lighting 3. EE&C of AC 4. EE&C of pump and fan 5. Good practice of building EE&C 6. Practice of energy assessment of building
How to Make Management Standards	2 days	Practice of Making Management Standards	1. Law and regulations 2. Practice of making Management Standards
Site Visits of Good Practice Factory and Building	2 days	Site Visits and Practice of Energy Assessment	1. Lecture · Law and regulations · Points of EE&C in factory and building 2. Practice

(Source: ECCJ Website)

Training Delivery Package

- Training program dedicated to a particular user and customized to its requirements
- Typical pattern:
 - In-house training;
 - Seminar organized by the government and/or public offices targeting an indefinite number of audience
- ECCJ's scope:
 - Program planning;
 - Instructor dispatch;
 - Arrangements making;
 - Training implementation.

Achievement of 2008

Classification	Course	Trainees
EC Training Program	279	6,387
Training Delivery	216	-
Total	495	6,387+

IV. Operation of Training Programs

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Tasks of Training Program

Training Program for Energy Manager	General Training Program
Announcement of the Program	Announcement of the Program
Acceptance of Application (including pre-qualification)	Acceptance of Application
Collection of training fee	Collection of training fee
Arrangement of Teachers and Textbooks	Arrangement of Teachers and Textbooks
Making Certification Examination Paper	Implementation of Training Program
Implementation of Training Program and Examination with Marking	
Notice of Qualified Applicants	

Instructor

1. Sourcing:
 - (1) People of academic standing
 - (2) People of practical experience in EC
 - (3) Expert of EC audit
 - (4) Representatives of factories and/or buildings who are to make presentations on best EC practices
 - (5) ECCJ officer in charge of EC related laws & regulations
2. Officials charging the completion exam: Independent of training instructors

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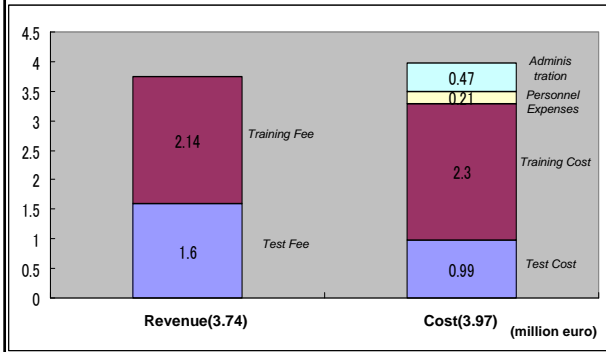
Training Fee

1. Principle: Trainee fee basis
2. Cost Breakdown:
 - (1) Training materials
 - (2) Training guidebook
 - (3) Compensation of instructors
 - (4) Training venue
 - (5) Maintenance of facilities
 - (6) Other direct expenses

Classification	Fee (euro)	Applicant (In 2008)
Energy Manager Qualification Training	518	1911
General Training	148-740	6387

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Examination and Training Revenue and Cost (2008)



V. Introduction of Energy Conservation Center of Japan (ECCJ)

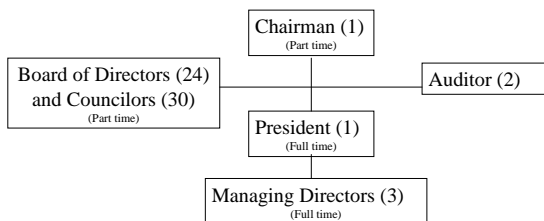
Outline of ECCJ

- Legal status:** An incorporated foundation under the supervision of Ministry of Economy, Trade and Industry (METI)
- Establishment:** 1978 (when the 2nd oil crisis hit Japan)
- Mission:** Core organization responsible for promotion of energy conservation
- Office location:** Head office in Tokyo and 8 branches in Japan
- Supporting member:** 2,719 members (as of May 2009)
- Number of employees:** Full time 131 persons (as of July 2009)
- Annual Budget:** 4375, million yen in FY2009 (48 million US\$: @90¥/US\$)
- Target Sector:** Industrial, Residential / Commercial and Transportation

Main Activities of ECCJ

Industrial	<ol style="list-style-type: none"> 1) Energy conservation audits services for factories 2) Education & training on energy conservation 3) State examination for energy managers (assigned by the government) 4) Good Practice Dissemination (conference for successful cases of energy conservation activities, excellent energy conserving equipment, etc.) 5) Technological development and spillover
Commercial, Residential and Transportation	<ol style="list-style-type: none"> 1) Energy conservation audits services for buildings 2) Ranking catalogue for energy efficient appliances (dissemination of Top Runner Program) 3) Promotion of energy labeling system 4) International Energy Star program implementation 5) Energy efficiency product retailer assessment system 6) Dissemination of energy conservation indicator "E-Co Navigator" 7) Energy education at primary and middle schools 8) ESCO research and development
Cross Sector	<ol style="list-style-type: none"> 1) Energy conservation campaign & exhibition (ENEX) 2) Commendation (grand energy conservation prize) 3) Information & data base, publicity and publishing 4) Survey and monitoring 5) International cooperation & communications

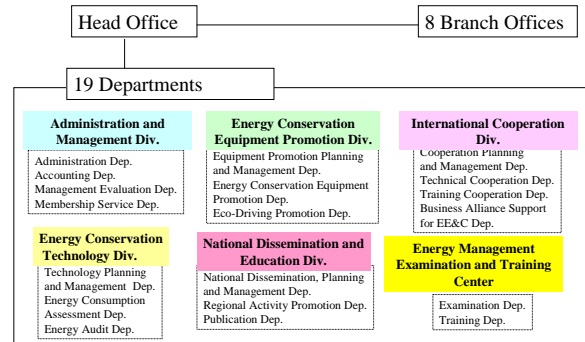
Organization (1): Governance



- (Features)
- No government staff in ECCJ.
 - Chairman and board members are selected from **large energy consuming companies and representatives of academy, association, etc.** (Current chairman is former president of TEPCO).
 - Board meeting is held every 6 month.
 - All management members are assigned every 2 years.

Organization (2): Full Time Staff

Full Time Staff: 131 as of July 2009

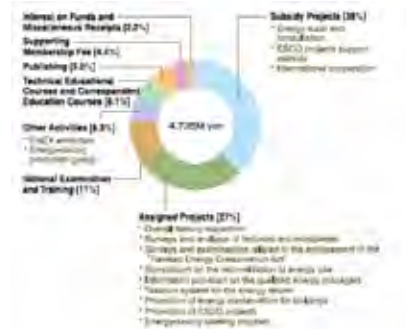


Membership

1. ECCJ is supported by 2,719 members (as of May 2009).
2. Members can receive the following services:
 - Distribution of a magazine "Monthly Energy Conservation"
 - Utilization for consultation regarding legal matter, technology, etc.
 - Discount of seminars, training programs, publication, etc.
 - Other energy related information
3. Membership Fee: 40,000 Yen to 100,000 Yen (400US\$ to 1,000 US\$) /year
4. Share of Membership Fee in Budget: 4.4 %

Membership fee is a small share in the Annual Budget.
 However, the important point is participation into ECCJ membership by many companies.

Annual Budget and Expenditure



Success Key

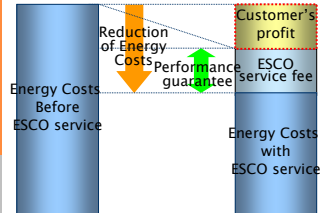
1. Many industries/companies cooperate with the activities of ECCJ.
 - Top companies (TEPCO, Toyota, Mitsubishi, Matsushita, etc.) are assigned as Chairman and Directors.
2. Many industries/companies support ECCJ activities by membership fee.
 - Fee is small. But participation consciousness is very important to maintain the activities of ECCJ.
3. Independent body from any ministries. Neutral stance is better for management of private sector.
 - Substantially Ministry of Economy, Trade and Industry (METI) can affect ECCJ operation because most of budget comes from METI. However, officially ECCJ is an independent body from government.
4. Government budget support
 - Most of activities are supported by Government budget.

Thank You Very Much

ESCO Industry in Japan

Tetsuya MAEKAWA (M.Sc)
 JICA Study Team
 Tokyo Electric Power Company, Inc.

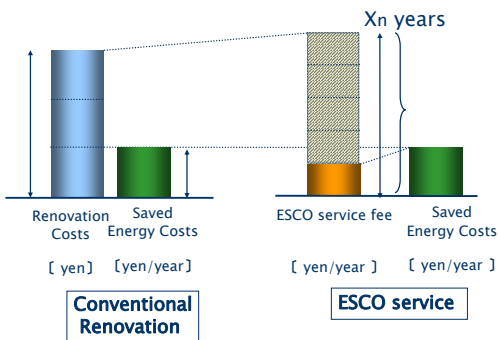
Concept of ESCO (1)



ESCO is a comprehensive service regarding Energy Efficiency, whose advantages are;

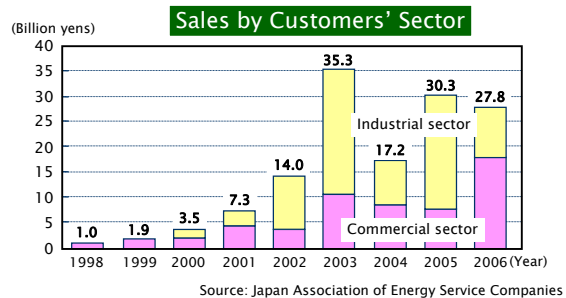
- Guaranteeing Energy Efficiency Performance
- Investment cost is provided by ESCOs and service fee is paid from the savings of Energy Cost

Concept of ESCO (2)



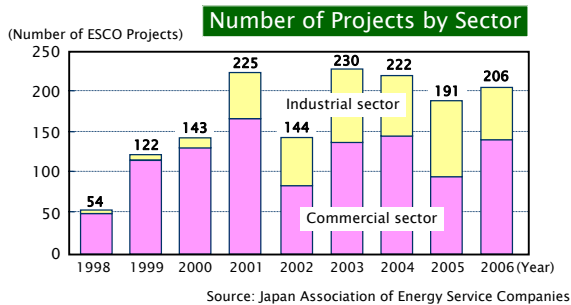
ESCOs in JAPAN (1)

Market Size of ESCO (1)



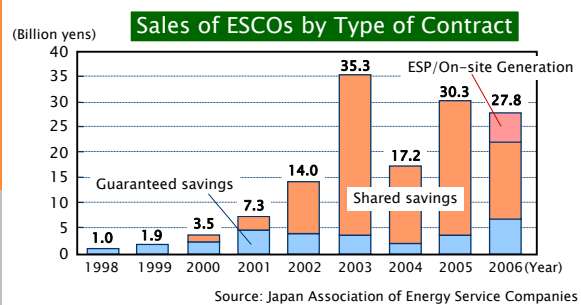
ESCOs in JAPAN (2)

Market Size of ESCO (2)



ESCOs in JAPAN (3)

Market Size of ESCO (3)



ESCOs in JAPAN (4)

Number of Active ESCOs = 10~20 Companies

Utility-based Active ESCOs

Electricity Companies

- Japan Facility Solutions, Inc.
- Kanden Energy Solution Co.,Inc.
- C Energy Co.

Gas Companies

- Energy Advance Co.,Ltd
- Gas and Power Investment Co.,Ltd

ESCOs in JAPAN (5)

Other Active ESCOs' Background

Manufactures

- Yamatake Corp.
- Johnson Controls, Inc.
- Hitachi, Inc.

Constructors

- Sanki Engineering Co.,Ltd
- Takasago Thermal Engineering Co.,Ltd

Others

- The First ESCO, Ltd.
- Mitsubishi UFJ Lease & Finance Company

ESCOs in JAPAN (6)

JAESCO

- Japan Association of Energy Services Companies
- Established in 1999
- Number of Member Companies: 126
- Roles of JAESCO
 - Policy related lobbying activities
 - PR and marketing of the ESCO concept
 - Training the staff of member companies
 - Information exchange between members
 - International cooperation
 - Others including publishing a book of ESCO

ESCOs in JAPAN (7)

History of Japanese ESCO Industry

Background

- Deregulation of Energy Market
- Global Environmental Issue

History of ESCO Industry

- 1996 - Concept was Imported from US
- 1997 - First ESCO Co.Ltd was established
- 1999 - JAESCO was established
- 2000 - TEPCO Established JFS (TEPCO's ESCO Subsidiary)

TEPCO's ESCO Subsidiary (JFS)

Japan Facility Solutions, Inc. (JFS)

- Established : 14 Dec. 2000
- Share Holders: 4 Companies
 - TEPCO (45%)
 - Mitsubishi Corp. (35%)
 - Yamatake Corp. (10%)
 - Kanden Co.,Ltd (10%)
- Capital Fund : 490 million yen
- Employees : 45 persons
- Turnover : 11,540 million yen (2006 FY)
- Profit : 380 million yen (2006 FY)

TEPCO's ESCO Subsidiary (JFS)

Business Line up of JFS (since 2000)

- ESCO Service : 71 projects
- Energy Audit : over 200 projects
- Energy Efficiency Renovation: 27 projects
- Sales of Equipments for All-Electric Houses
- Energy Center Project : 1 project

And so on...

Practice1: ESCO (1)

National Institute for Environmental Studies

Outline of Buildings

- Location: Tsukuba City, Ibaraki Prefecture
- Building Type: Research Center
- Number of Buildings: 54
- Total Floor Space: 78,000 m²
- Completion Year: 1974
- Energy Cost: 640 million yen/year



Outline of ESCO Service

- Type of Contract: Shared Savings
- Service Period: 6 years (Jul/2005-Jun/2011)

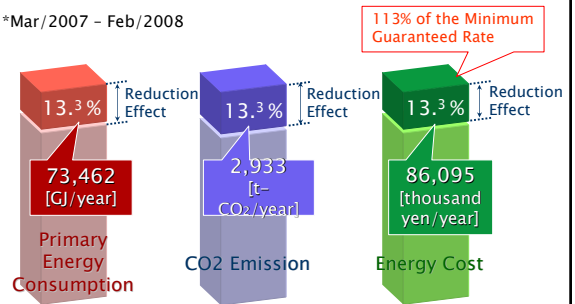
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Practice1: ESCO (1)

Effect of Energy Conservation

*Mar/2007 - Feb/2008



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Practice1: ESCO (2)

Chofu City Office

Outline of Buildings

- Location: Chofu City, Tokyo Metropolis
- Total Floor Space: 14,123 m²
- Number of Floors: 8
- Completion Year: 1971
- Total Floor Space: 31,467 m²
- Number of Floors: 13
- Completion Year: 1995



Outline of ESCO Service

- Type of Contract: Guaranteed Savings
- Service Period: 5 years (Apr/2006-Mar/2011)

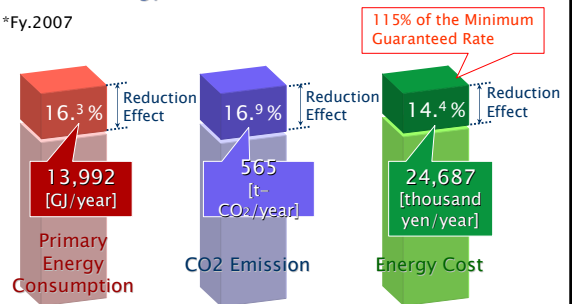
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Practice1: ESCO (2)

Effect of Energy Conservation

*Fy.2007



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Practice1: ESCO (3)

Tokyo Metropolitan Hiroo Hospital

Outline of Building

- Location: Shibuya Ward Tokyo Metropolis
- Building Type: Hospital
- Total Floor Space: 36,511 m²
- Completion Year: 1980
- Energy Cost: 339 million yen/year



Outline of ESCO Service

- Type of Contract: Guaranteed Savings
- Service Period: 6 years (Apr/2006-Mar/2012)

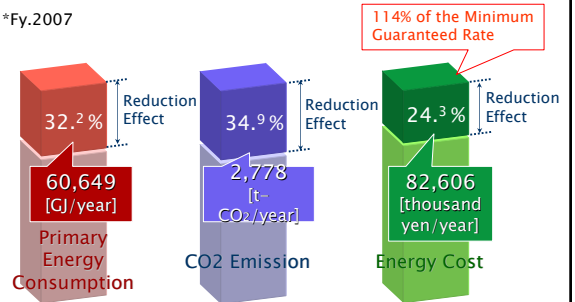
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Practice1: ESCO (3)

Effect of Energy Conservation

*Fy.2007



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Practice1: ESCO (4)

15 Buildings in Edogawa Ward

Outline of Buildings

Facility Name	m ²	Facility Name	m ²
1 General Culture Center	16,496	9 Koiwa Urban Plaza	7,538
2 Hotel Seaside Edogawa	5,564	10 Edogawa Community Center	9,465
3 Edogawa City Office	15,774	11 Komatsugawa Community Facility	5,234
4 Sports Center	10,230	12 Kasai Community Center	4,927
5 Sports Land	6,169	13 Tobu Friend Hall	6,080
6 General Gymnasium	5,257	14 Koiwa Community Center	3,685
7 Central Library	8,452	15 Shinseicho Community Center	2,899
8 Nishi-Kasai Library	2,342	Total	110,112

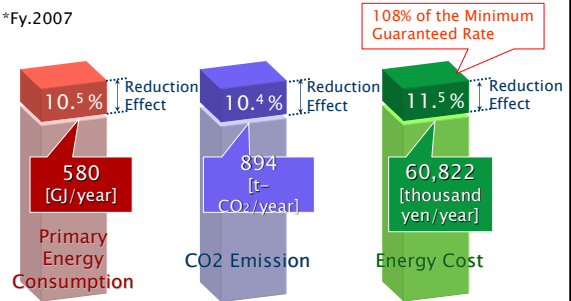
Outline of ESCO Service

- Type of Contract: Guaranteed Savings
- Service Period: 5 years (Apr/2007-Mar/2012)

Practice1: ESCO (4)

Effect of Energy Conservation

*Fy.2007



Practice1: ESCO (5)

Totsuka Regional Center

Outline of Building

- Location: Yokohama City, Kanagawa Prefecture
- Building Type: Regional Center
- Total Floor Space: 7,911 m²
- Number of Floors: 4
- Completion Year: 1978



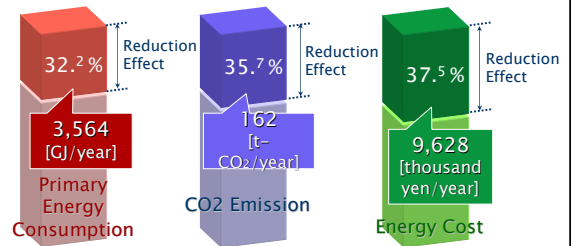
Outline of ESCO Service

- Type of Contract: Guaranteed Savings
- Service Period: 6 years (Jul/2007-Mar/2013)

Practice1: ESCO (5)

Effect of Energy Conservation

*Expectation of Energy Conservation



Thank you very much
for kind attention.

TEPCO's Strategy & Program for the Low Carbon Society

JICA Study Team
Tokyo Electric Power Company (TEPCO)

Principle for Low Carbon Society

2

- Both of Supply Side and Demand Side are important.
- Not a dream but practical technologies are important.

Supply Side

Low Carbon Electricity from the Grid

Nuclear Power
More Efficient thermal
Renewable Energy

Demand Side

Promotion of Efficient Equipments & Appliances

Heat Pump, EV, IH

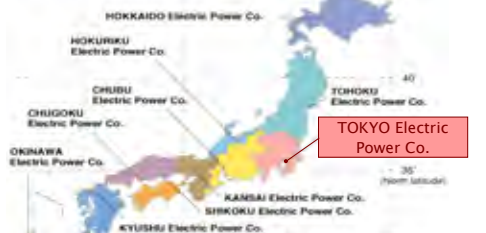


Low Carbon Society

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Service Area of TEPCO

Encompassing All of Japan-The Ten Electric Power Companies by Service Area



System peak load (FY2009): 60,890MW
Electric energy sales (FY2009): 289,000GWh

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Supply Side

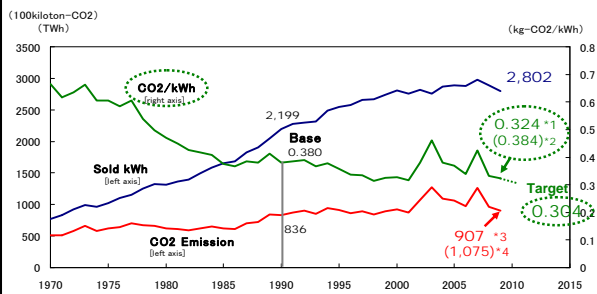
- Diversification of Primary Energy Sources
- Efficiency Improvement in Thermal Power Plants
- Carbon Capture & Storage (CCS)
- Renewable Energy (Solar, Wind....)

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Trend of Carbon Emission from TEPCO

5

- TEPCO will reduce 20% of unit CO2 emission by 2012.



*1 & *3: Values reflecting carbon credit
*2 & *4: Values without carbon credit

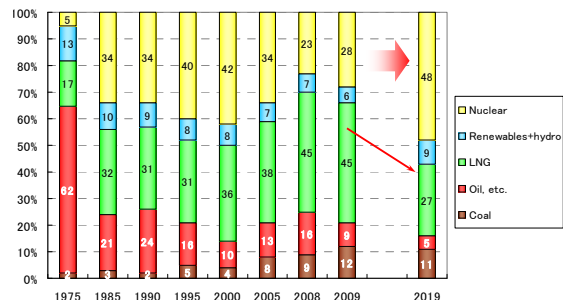
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Diversification of Primary Energy Sources

6

- TEPCO promotes an optimal energy source mix
- After the Oil Shock in 1970s, the effort to reduce the dependence on oil has been successful by Nuclear and LNG.
- Our target is to achieve 50% non-fossil energy ratio by FY 2020.

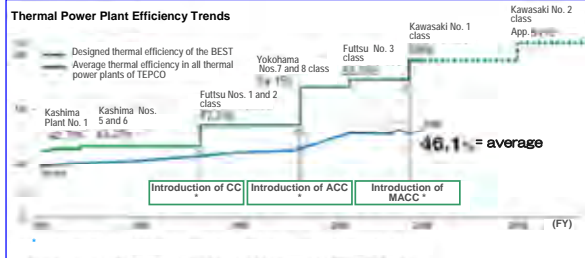
Change of Energy Sources for Electricity (TEPCO)



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Efficiency Improvement in Thermal Power Plants 7

- Generation efficiency has increased mainly by the of LNG combined cycle power generation since 1980s.
- 1,500°C class "MACC" (with thermal efficiency of 59%) was introduced in 2007.
- 1,600°C class "MACC II" (with thermal efficiency of approx. 61%) will be introduced in 2016.
- Average Efficiency is 46.1% in 2008.



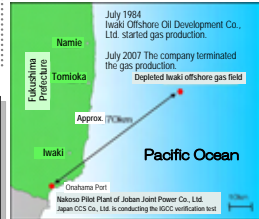
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Carbon Capture & Storage (CCS) 8

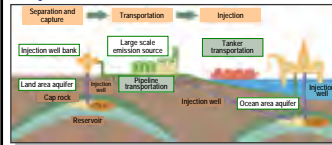
- Separate and capture CO₂ emitted from factories and power plants, and store them in the ground at a depth of approx. 1,000m and more.
- 32 companies including TEPCO along with 10 EPCOs, invested in May 2008 in the new company called "Japan CCS Co., Ltd." which will study the feasibility of the CCS business.

- The company is conducting a feasibility study for storing CO₂ emitted from the IGCC of the Nakoso Pilot Plant in Fukushima Prefecture
- They aim to commence a large scale verification test from FY2009.
- They will deploy CCS to oil and coal producing countries receptive to this technology

[Planned Site]



[Image of CCS]



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Mega-Solar Projects of TEPCO 9

- Generation Capacity : 30MW, Estimated CO₂Reduction) : 14,000 t/year
- Good cooperation with local municipalities is important.

- Ukushima PV Power Station** (Kawasaki City, Kanagawa Pref.)
 - PV Capacity: 7MW
 - Estimated kWh: 7.4 Million kWh
 - CO₂Reduction: 3,100 ton/year
 - Construction starts in 2009FY
 - Launch in 2011FY
- Ohnishi PV Power Station** (Kawasaki City, Kanagawa Pref.)
 - PV Capacity: 13MW
 - Estimated kWh: 13.7 Million kWh
 - CO₂Reduction: 5,800 ton/year
 - Construction starts in 2009FY
 - Launch in 2011FY
- Yonekurayama PV Power Station** (Kofu City, Yamanashi Pref.)
 - PV Capacity: 10MW
 - Estimated kWh: 12.0 Million kWh
 - CO₂Reduction: 5,100 ton/year
 - Construction starts in 2010FY
 - Launch in 2011FY

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Demand Side

1. Conventional Scheme

- Tariff
- Brochure
- Backside of Bill Sheet
- Homepage
- Exhibition
- PR Facility
- Research & Development
- Demonstration

2. Promoted Systems & Equipments

- Heat Pump
- Thermal Storage HVAC
- Ice Storage HVAC
- Eco Cute (hot water supply unit)
- Electric IH Cooking
- NAS Battery

3. Energy Solution

- ESCO Service
- Energy Centre Business
- PV Support Service

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Energy Efficiency by Tariff Incentive 11



Tariff Incentive in Residential Sector = 3 bracket prices (step-up price)

Tariff for Residential Sector

		Price incl. tax
Demand Charge (per month)		273.00 yen/kVA
Energy Charge	1st Step Price (~120kWh)	17.87 yen/kWh
	2nd Step Price (120~300kWh)	22.86 yen/kWh
	3rd Step Price (300kWh~)	24.13 yen/kWh

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Check System for Customers Record 12

◇ Consumption Record can be obtained from Internet

- Indicate customer's electricity consumption record and bill in the past 2 years, comparing with average of same category customers

Comparison of Average of Same Category Customers

Push button to switch screen

Customer's Record

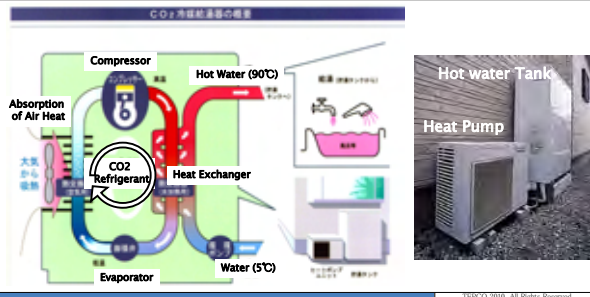
Internet Screen

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Eco-Cute (Heat Pump Hot Water Supply Unit)

13

- 50% of CO2 reduction will be achieved compared to conventional gas hot water unit.
- Installation in Japan: 1.7 Million as of March 2009
- National Target : 5.2 Million by 2010 (Kyoto Action Plan)



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Electric Vehicle for business use

14

- Overview: - Performance test of the lithium ion battery in size & weight per kWh, price and efficiency
- Development of lithium ion battery electric vehicles
- Achievements: Utilization of the three thousand electric vehicles, instead of the use of conventional cars, contributes to reduction of 2,600 ton-CO2 per year



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Thermal Storage HVAC System

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- Night-time electricity is approx. 70% cheaper than that of Day-time.
- Night-time operation of refrigerators will be efficient due to the low outside temperature.

- ◆Ice/Water Storage System
- ◆Ice Storage System (Unit Type)

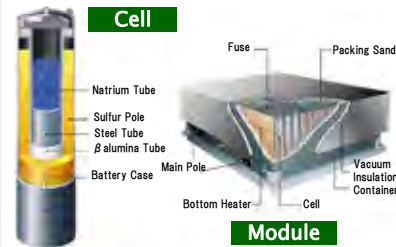


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NAS Battery

16

Installation : 177 MW
by TEPCO at 96 sites of customers



Cell Battery	
Voltage	2V
Capacity	1,220Wh
Size	D: 91 mm LG: 520mm
Efficiency	Over 89%
Weight	5.5kg

50kW Module Battery	
Voltage	116V
Capacity	375kWh
Size	Width: 2.17m Depth: 1.69m Height: 0.64m
Number of cells	320 cells
Weight	3.5t

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TEPCO Electric Factory "I²" (I Square)

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- I² is an exhibition facility that supports process innovations for manufacturers by offering real experience of using electric systems.
- To streamline corporate operations and reduce CO₂ emissions with the latest heat pump and IH (Induction Heating) technologies.

Major systems displayed

IBSS (Induction Heating Super Steam)
Via a single process, uses superheat to generate super-steam from room-temperature water
Compact

Eco Turbo Hot Water Heat Pump
Supplies 80 degree-C hot water from exhaust heat
Reuses exhaust heat at around 40 °C

Super-flex Module Chiller
Applies R410A for high efficiency
Won FY2006 Energy Efficiency Prize

Induction Heating Jacket Roll
Uses induction heating mechanism activated magnetically
Provides high-temperature heat energy

IH Coating Drier
Enhanced coating quality
Reduce drying time
Reduce installation space

Other systems shown: Steamless Air Conditioner, Water Heater, Steamless Air Conditioner, Liquid Sterilizer, Coating Drier.

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To meet the Customer's Needs

18

To provide "4 slim down solutions for customers" is the role of utility companies to meet customers' needs and realize low carbon society.

Save Energy

Decrease energy consumption by introducing efficient devices and operating efficiently

Cut Costs

Cut energy cost by making the most use of economic energy tariffs.

Cut CO₂

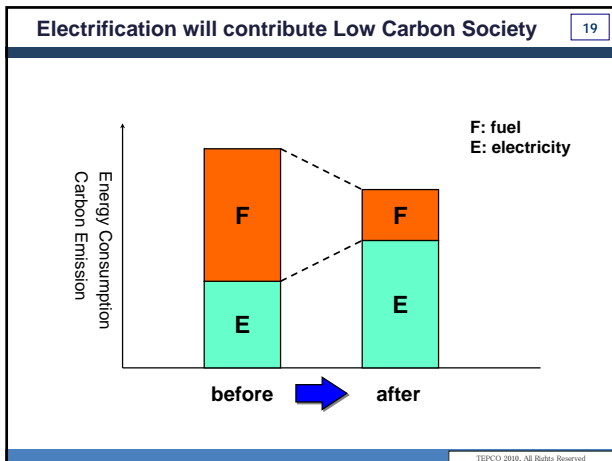
Cut CO₂ by using low carbon electricity which is generated with a good mixture of thermal, hydraulic, and nuclear.

Slim Down Assets

Slim down assets by utilizing various financial services. Help customers to avoid investment.

New chances for revenue & profit = Energy Solution

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TEPCO Group's Energy Solutions

20

Service	TEPCO & Group Companies	Case
ESCO Service	TEPCO Japan Facility Solutions Inc.	(1)Tokyo Metropolitan Hiroo Hospital (2)National Institute for Environmental Studies
Thermal Energy Storage Support	TEPCO Tokyo City Service Co.	Sakakibara Heart Institute (hospital)
Fuel and Steam Supply	TEPCO TEPCO Gas Department Toden Kogyo Co.	Nippon Paper Crecia, Kaisei Mill
NAS Battery Service	TEPCO Tokyo Densetsu Service Co.	Tokyo Dome City 'LaQua'
Energy Centre Business	ISEHARA Energy service Co.	Tokai University Hospital
PV Energy Service	Toden Kogyo Co.	Haneda International Airport New Cargo Terminal

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ESCO (Energy Service Company) Service

21

Reduction of Energy Costs

Customer's Merit

Energy Cost Before ESCO Services

Guaranteed performance

ESCO Service Fee

Energy Costs with ESCO Services

- TEPCO set up a subsidiary company (Japan Facility Solutions, Inc = JFS) for ESCO business in Dec.2000.
- JFS has been very successful to achieve 77 ESCO contracts and more than 200 building audits.
- Japan Association of ESCOs (JAESCO) has 130 member companies and there are approx. 10 active ESCOs in Japan.

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Energy Centre Business

22

ISEHARA campus of Tokai Univ.

Energy Centre

- NAS battery
- Centrifugal refrigerator
- Thermal storage tank
- Boiler
- Emergency generator
- Building Automation System, etc.

Project size : ¥ 4,000 million (26.7 million euro)

Hospital & school

Supplied energy includes electricity, chilled water, and steam, through the trench

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Energy Centre Business

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Installed Facilities at ISEHARA Campus

10,000USRT Ice Storage Tank

Centrifugal Chiller 800USRT x 2

Brine Chiller 740/550USRT x 2

NAS Battery 2,000kW

Smoke Tube Boiler 10/h x 2

Steam Generator 1.6/h x 3

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PV Energy Service by TEPCO Group

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●Tokyo International Airport(Haneda) Terminal 1, Terminal 2, Parking 4

- TEPCO sells electricity to Toden Kogyo CO
- Toden Kogyo Co owns PV and supply electricity to JAT
- Routine maintenance will be checked by JATEC

Japan Airport Terminal CO.Ltd. JAT

Contract of Energy Supply

TEPCO

Contract of Electricity Supply

Energy Supply Service Business Toden Kogyo CO. (100% Subsidiary of TEPCO)

Routine maintenance

Japan Airport Techno co.,Ltd. JATEC

- PV Capacity 1.2 MW(TOTAL)
- Estimated kWh 1.2 Million kWh/year
- CO₂Reduction 440 ton/year
- Construction starts in 2009FY
- Launch in 2010FY

Terminal 1 790kW

Terminal 2 150kW

Parking 4 300kW

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Thank you for your kind attention.

TEPCO is providing various types of Overseas Consultancy Services.

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Corporate Marketing Dept.+ Int'l Affairs Dept.
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EE&C Activities at Refineries in Japan

July, 2010
Sadao Higaki
(JICA Study Team)

Table of Contents

1. Promotion of EE&C at Refineries in Japan
 - 1-1. EE&C Activities
 - 1-2. Consideration Matters on EE&C
 - Reference-2: Change of demand on each petroleum product in Japan
 - Reference-3: Analysis of Energy-Consumed Transition at Refineries in Japan
 - Reference-4: Comparison of Energy Consumption Index at s Refineries of Each Country in 2004FY
2. Examples of EE&C Measures at Refineries in Japan
 - Example-1 : Introduction of Utility Optimization System
 - Example-2 : Utilizing of Thermo-Compressor
 - Example-3 : Energy Conservation by Rising Feed Oil Temperature and Lowering Reaction Temperature at Kerosene Desulfurization Unit
 - Example-4 : Application of O2/CO Control System at Boiler
 - Example-5 : Steam Saving by Management of Steam Traps
 - Example-6 : Introducing IGCC (Integrated Gasification Combined Cycle)

1. Promotion of EE&C at Refineries in Japan

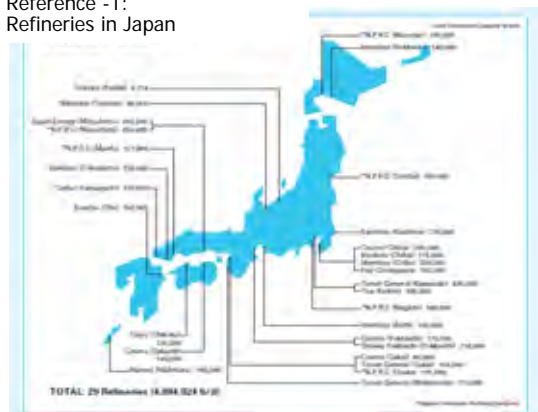
1-1. EE&C Activities

- 1) Organizations for promotion of EE&C
Activities in whole refinery (such as EE&C Committee in refinery)
- 2) EE&C activities by small groups
 - Cooperation of managers, staffs and related departments
 - Improvement proposal system / Quality control system / Awarding system
- 3) Supports from the related government offices and organizations
 - Free audits by Energy Conservation Center of Japan (ECCJ)
 - Subsidies on research and development, and investment
- 4) Publishing results of EE&C activities to inside and outside of the refinery

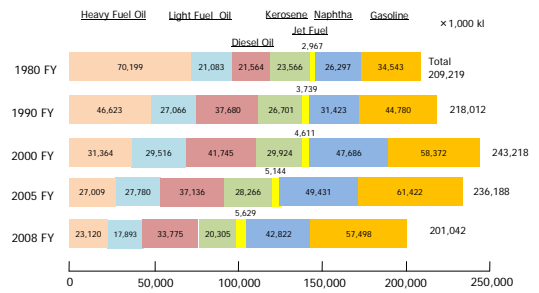
1-2. Consideration Matters on EE&C

- 1) Soaring of oil prices and energy costs
- 2) Change in demand pattern of petroleum products
- 3) Upgrade of oil refining facilities
- 4) Introducing the latest equipments and technologies for energy conservation
- 5) Correspondence to environmental issues

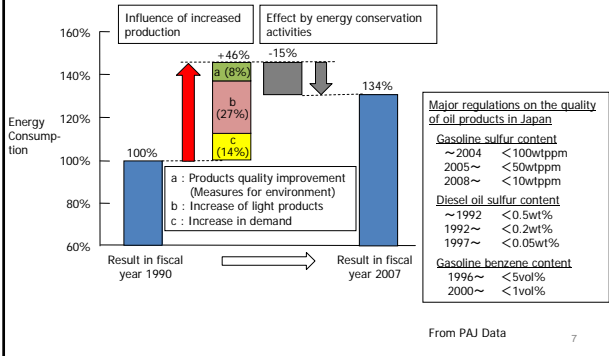
Reference -1:
Refineries in Japan



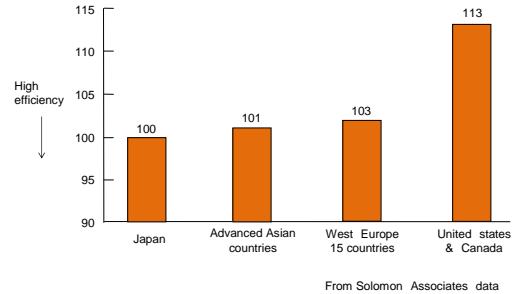
Reference-2 :
Change of demand on each petroleum product in Japan



Reference-3:
Analysis of Energy-Consumed Transition at Refineries in Japan



Reference-4:
Comparison of Energy Consumption Index at Refineries of Each Country in 2004FY



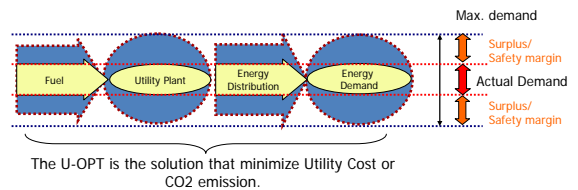
2. Examples of EE&C Measures at Refineries in Japan

Example-1 :
Introduction of Utility Optimization System

1. Merit of Utility Optimization System

- Stable supply of utilities
- Cost saving and CO2 reduction
- Reduction for operator workload

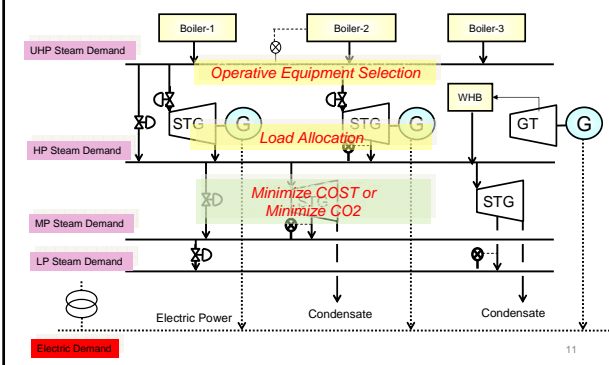
The energy is often over supplied to accommodate the load fluctuation.



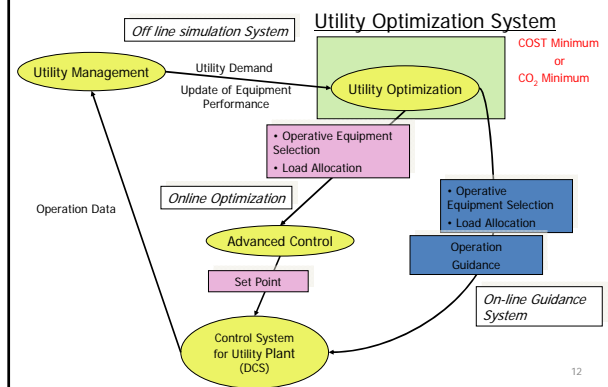
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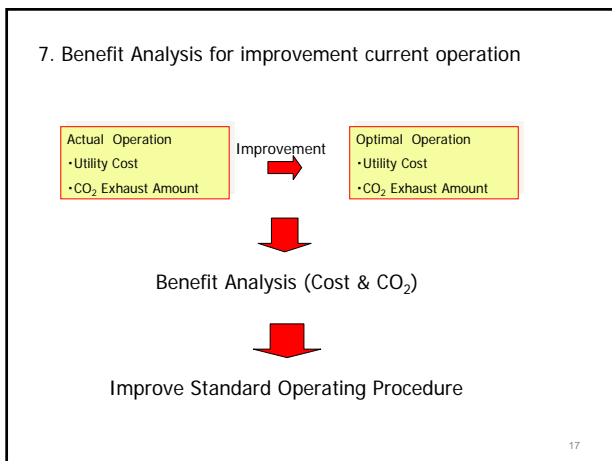
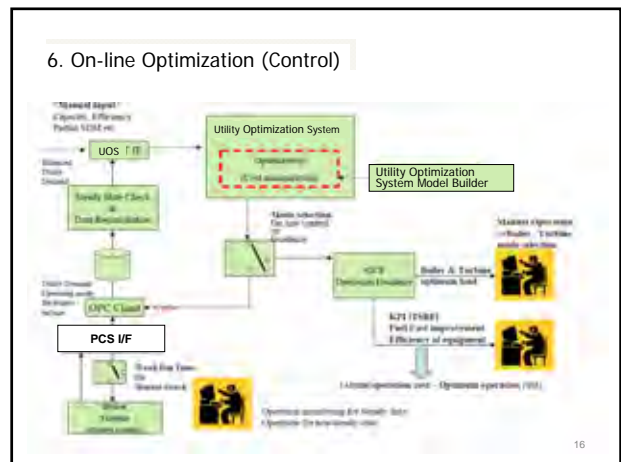
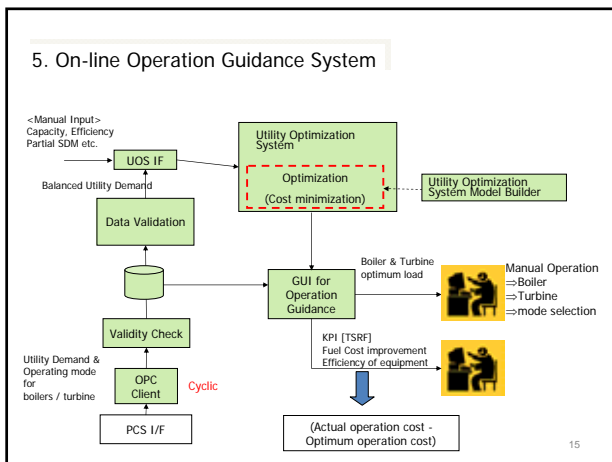
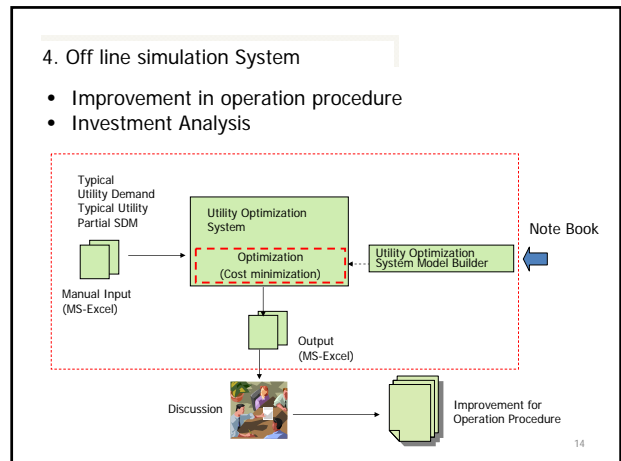
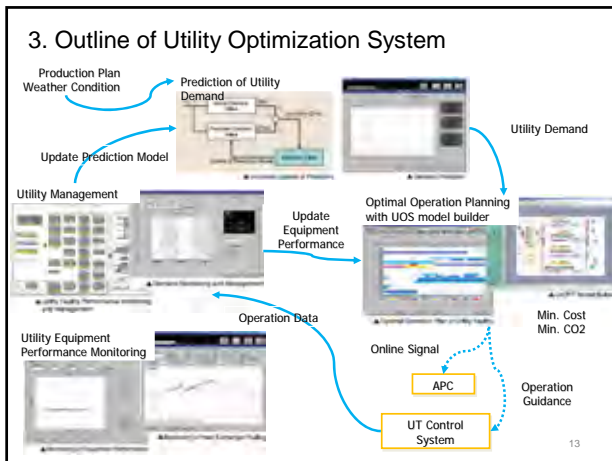
10

2. Concept of Utility Optimization System



3. Major Function of Utility Optimization System





8. Utility Optimization by Utility Optimization System

Company	Annual Energy Cost	Annual CO ₂ emission	Utility Equipment	Annual Reduction of Energy Cost	Annual Reduction of CO ₂ emission
	Mill.US\$	TONS		US\$	TONS
A	40	200,000	Boiler, Generator, Refrigerator, Heat storage	800,000 (▲ 2%)	7,000
B	5	60,000	Boiler, Generator, Refrigerator, Heat storage	175,000 (▲ 3.5%)	2,400
C	10	30,000	Boiler, Generator, Refrigerator, Heat storage	300,000 (▲ 3%)	1,200
D	2	5,000	Boiler, Generator, Refrigerator, Heat storage	96,000 (▲ 4.8%)	200

Reduction of cost is subject to number of Utility Equipments, current operation method, constraints including geographical utility allocation and current annual primary energy cost.

Example-2 :
Utilizing of Thermo-Compressor

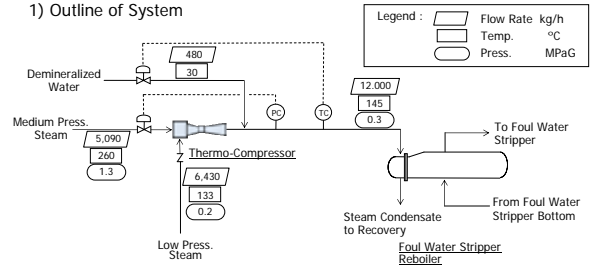
2-1. Utilizing Low Pressure Steam by Raising Pressure at Foul Water Stripper Reboiler

2-2. Flash Steam Recovery from High Temperature Steam Condensate

2-1. Utilizing Low Pressure Steam by Raising Pressure at Foul Water Stripper Reboiler

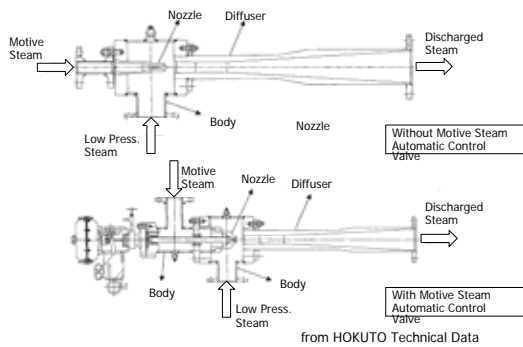
Nippon Oil
Mizushima Refinery

1) Outline of System

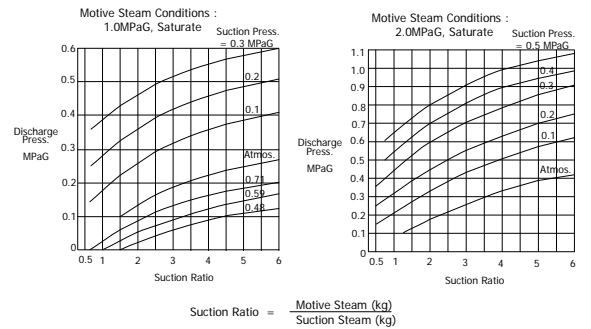


- Notes :
- 1) Heating source for Foul Water Stripper Reboiler
Medium press. steam → Medium press. Steam + Low press. steam
 - 2) Especially in summer season, low press. steam was released to atmosphere in large quantity because of the excessive condition.

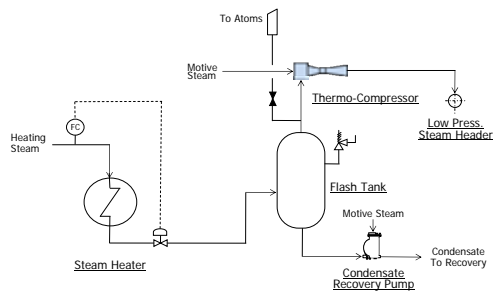
2) Thermo-Compressor



3) Typical Performance of Thermo-Compressor

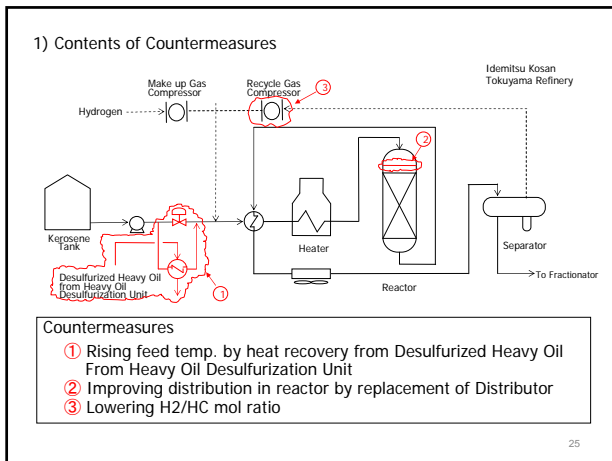


2-2. Flash Steam Recovery from High Temp. Steam Condensate



- Notes :
- 1) Thermo-Compressor is installed for increasing recovered flash steam from hot condensate.
 - 2) Condensate recovery pump has to be installed because of the low pressure in Flash Tank.

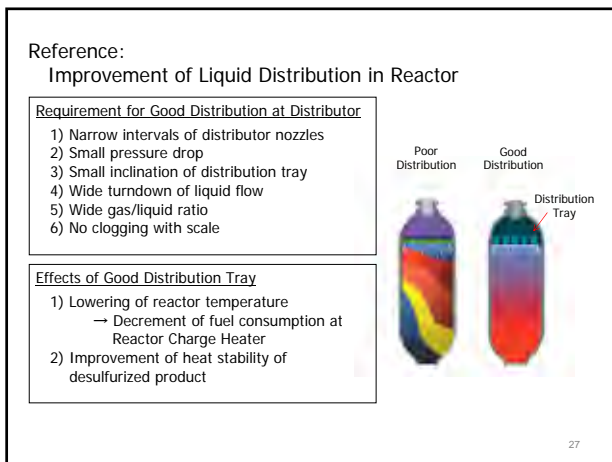
Example-3:
Energy Conservation by Rising Feed Oil Temperature and Lowering Reaction Temperature at Kerosene Desulfization Unit



2) Total Effect

- (1) Temperature change
 - Feed oil temp. : 60°C up
 - Heater ΔT : 6°C down
 - Reactor inlet temp. : 15°C down
- (2) Decrement of fuel consumption at Heater
- (3) Decrement in load at Recycle Gas Compressor (steam driven)
 - Decrement of total energy consumption : about 20%

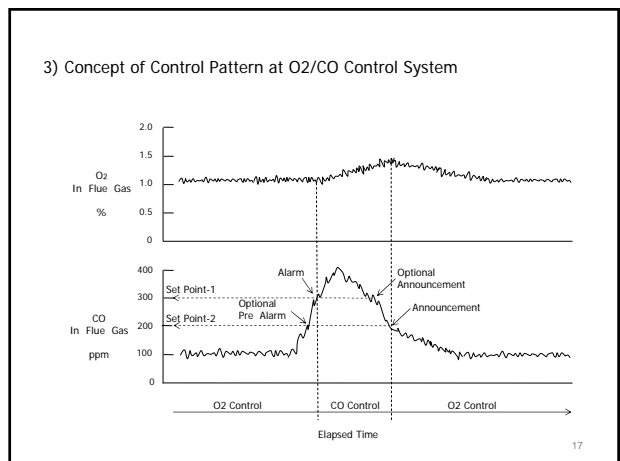
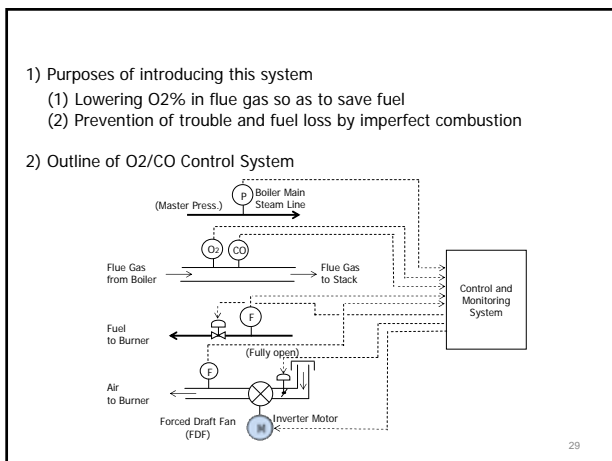
12



Example-4 :
Introducing O₂/CO Control System at Power Boiler

Nippon Oil Mizushima Refinery

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Example-5 : Steam Saving by Management of Steam Traps

Fuji Oil
Sodegaura Refinery

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- 1) Reason of Choosing The Activity Theme
 - (1) Increase in malfunction of steam trap of specific types
 - (2) Increase of steam loss
- 2) Purposes
 - (1) Review of selecting steam traps
 - (2) Review of managing steam traps
 - Decrease of steam loss
- 3) Confirmation of Current Status
 - (1) Confirming the performance of steam traps on each type and manufacturer by actual measurements
 - (2) Analysis of present conditions
 - Leaking steam quantity and the loss amount of money
 - Malfunction rate and the breakdown

32

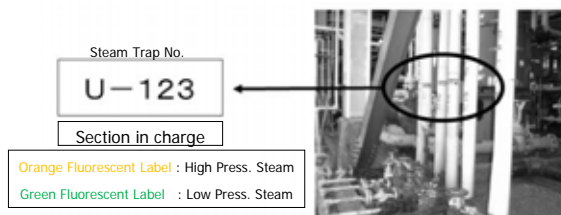
- 4) Contents of Activities
 - (1) System for Activities
 - Cooperation of production section in whole refinery
 - (2) Target
 - Checking all steam traps and replacing malfunctioned and inadequate steam traps
 - Reviewing previous management method of steam traps (checking intervals, criteria of replacement or repair, etc.)
 - Zero emission of loss steam
- 5) Contents of Countermeasures
 - (1) Instruction and training about steam traps to all operators
 - Mechanics of steam traps of each type
 - Training of steam traps checking by using "steam trap checker"
 - (2) Preparing "Standard" for checking and maintenance of steam traps"
 - Checking method
 - Maintenance method of malfunctioned steam traps
 - Checking interval (fundamentally every half year)
 - (3) Adopting high performance steam traps (steam loss and life)
 - (4) Site indications of each steam trap for easy identification

33

- 6) Effects of The Activities
 - (1) Replaced numbers of steam traps in 2005
 - Total number in the refinery : 12,000
 - Replaced steam trap : 1,305 (10.9 %)
 - (2) Steam saving quantity in 2005
 - 28,000 ton/year
 - (Decrease of CO2 emission : 6,000 ton/year)
 - (3) Improvement effect and investment
 - Improvement effect (A) : about 400,000 us\$ / year
 - Investment (B) : about 190,000 us\$
 - Pay back period (B/A) : about 0.5 year
 - (4) Another effect
 - Enhancement of the consciousness for energy conservation in the whole refinery

34

Reference-1 : An Example of Site Indications of Each Steam Trap for Easy Identification



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Reference-2: Malfunction Rate of Steam Traps and Steam Loss of Malfunctioned Steam Traps

Generally, as saying

- 1) Malfunction Rate of Steam Traps
 - In case of
 - insufficient maintenance : 15 ~ 20%
 - sufficient maintenance : under 5%
- 2) Steam Loss of Malfunctioned Steam Trap
 - Averagely 10 ~ 15 kg/h·each

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Example-6 : Introducing IGCC (Integrated Gasification Combined Cycle)

Nippon Oil
Negishi Refinery

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1. Reason of Introducing VR IGCC

- 1) Change of demand pattern on oil products
⇒ Decrement of bitumen consumption
- 2) Promoting IPP (Independent Power Producer) politically
- 3) High power generation efficiency
Note: VR: Vacuum Residue

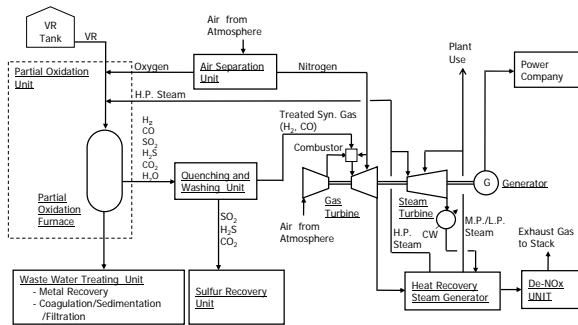
2. Aspect of VR IGCC



from <http://www.jgc.co.jp/>

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3. General Configuration of VR IGCC



39

4. Main Specifications of VR IGCC

Overall Power Plant	Generated Power	43.1 MW (Efficiency 46%)
	Transmitted Power	34.2 MW (Efficiency 36%)
Gasification Section	Gasification Method	Partial Oxidation
	Fuel	Vacuum Residue (Asphalt)
Combined Cycle	Fuel Consumption	50,000 ton/month
	Type	One Shaft Combined Cycle
Gas Turbine	Main Fuel	Synthesis Gas (Main Component : CO, H ₂)
	Combustion Temp.	1,350 °C Class
	Exhaust Gas Temp.	570 °C
	Material for Hot Parts	Nickel Base Alloy
	Cooling Method for Hot Parts	Air Cooling
Steam Turbine	Steam Press.	High Press. 9.8 MPaG
		Medium Press. 2.9 MPaG
	Low Press.	0.7 MPaG

from <http://www.eneos.co.jp/>

40

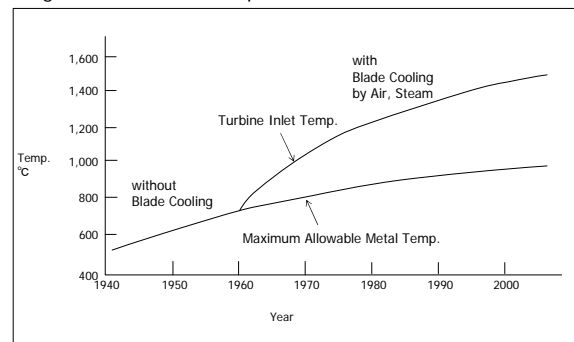
5. Comparison of Thermal Efficiency and CO₂ Emission between VR IGCC and BTG

Items	VR IGCC	Boiler-Turbine Generator (Conventional)
Terminal Efficiency(LHV) %	46	39
CO ₂ Emission g-CO ₂ /kWh	598	706

from <http://www.eneos.co.jp/>

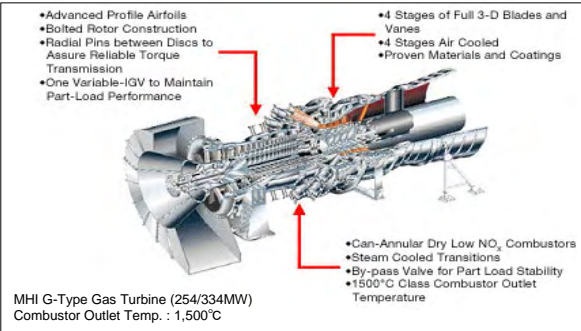
41

Reference-1: Progress of Inlet Gas Temperature of Gas Turbine



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Reference-2:
Advanced Gas Turbine



Thank you very much for
your attention

Steam System EE&C Technology of Japan

July 2010
JICA Study Team

Contents

1. Tuning and Improvement
 1. Combustion Air Ratio Control
 2. Thermal Insulation
 3. Management of Steam Trap
 4. Reduction of Evaporation Steam Pressure
2. High Investment and High Return

2

Combustion Air Ratio Control

1. Excess Combustion Air Causes Energy Loss
2. Excess O₂ Reduction Saves Certain Amount of Fuel
3. Oxygen Content is the Indicator of Proper Air Ratio
4. Periodical Measurement of O₂ Concentration
5. EE&C Law of Japan regulates Adequate Air Ratio

3

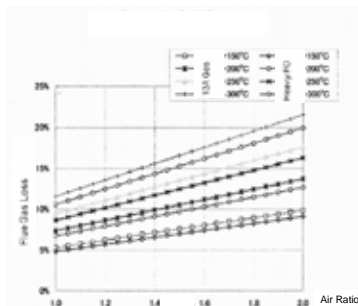
Standard of Air Ratio at Boilers Regulated by the Law in Japan

CLASSIFICATION	Boiler Load %	Standard of Air Ratio (O ₂ concentration)					
		Solid Fuel		Fluid Fuel	Gas Fuel	Blast Furnace Gas and By-product Gas	
		Fixed Bed	Fluid Bed				
Power Boiler	75-100	-	-	1.05-1.2 (1.0-3.8)	1.05-1.1 (1.0-2.0)	1.2 (4.0)	
Others	SG > 30 t/h	50-100	1.3-1.45 (5.0-6.5)	1.2-1.45 (3.5-6.3)	1.1-1.25 (2.0-4.4)	1.1-1.2 (2.0-3.8)	1.2-1.3 (4.0-5.2)
	30t/h ≥ SG > 10t/h	50-100	1.3-1.45 (5.0-6.5)	1.2-1.45 (3.5-6.3)	1.15-1.3 (3.0-5.0)	1.15-1.3 (3.0-5.2)	-
	10t/h ≥ SG > 5t/h	50-100	-	-	1.2-1.3 (3.8-5.0)	1.2-1.3 (4.0-5.2)	-
	5t/h ≥ SG	50-100	-	-	1.2-1.3 (3.8-5.0)	1.2-1.3 (4.0-5.2)	-

Notes: 1) SG : Steam Generation
2) (O₂ concentration) is rough values and for reference.

4

Air - Fuel Ratio and Flue Gas Loss



Air-Fuel Ratio and Flue Gas Loss

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Gas Analyzer Measurement Result of Exhaust Gas at 8t/h New Boiler

Date and Time	Temp. °C	O ₂ (Dry) %	CO ₂ (Dry) %	Boiler Operation Condition
Nov.3 '09 10:31	264.5	5.2	12.4	- Evaporation : 3.8 t/h - Steam Press. : 10.5 bar - Steam Temp. : 185.2 ° C (Saturate)
10:32	271.1	4.6	12.6	
10:33	288.9	3.4	13.4	
10:34	297.3	3.0	13.7	
10:35	289.0	3.6	13.2	
10:36	257.3	5.3	11.9	
10:37	248.2	5.7	11.6	
10:38	251.3	5.0	12.2	
Ave	271.0	4.48	12.6	

6

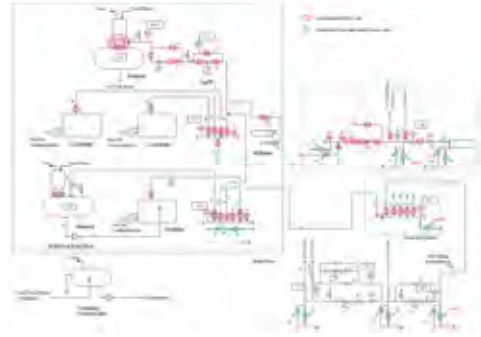
Thermal Insulation for Non-insulated Valves

1. Valves on Steam Line tends to be Non-insulated
2. Heat Loss from Non-insulated Valves is Huge
3. Application of Prefabricated Insulation Jacket

7

Non-insulated Valves in Steam System

- Flow Sheet of Steam System



8

Insulation on Non-Insulated Valves

- Present Condition:
 - No insulation on steam valves, etc.
- Possible Measure for Improvement:
 - Insulation on non-insulated valves, flanges, etc.
- Premises:
 - Number of non-insulated valves : 51
 - Boiler efficiency : 85%
 - Boiler operation hours : 8,760 hours/year
- Effect:
 - Heavy Fuel Oil saving : 51ton/y, 19,200 €/y
 - Investment : 15,000 €
 - Payback period : 0.8 year



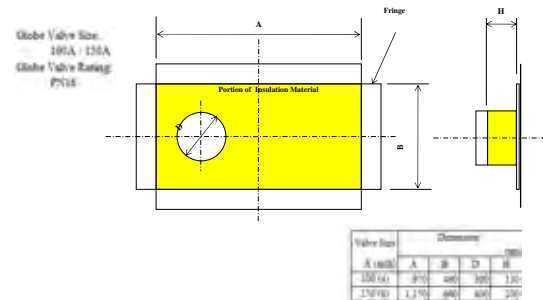
Picture of steam header



Valve insulation by insulation jacket

9

Outline of Prefabricated Insulation Jacket



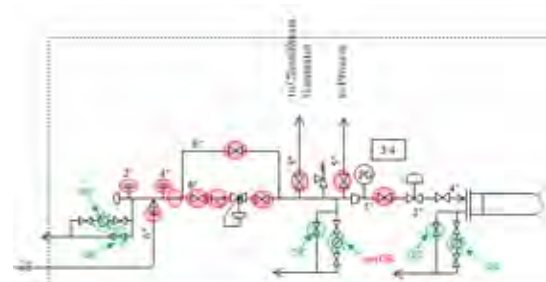
10

Management of Steam Trap

1. Steam Condensate Drain Equipment
2. Steam Leakage from Malfunctioned Steam Traps
3. Importance of Periodical Checking and Maintenance

11

Steam Traps in Production line



12

Management of Steam Traps

- Present Condition:
 - Total steam trap number : about 40
 - No periodical checking and maintenance
 - High malfunction rate (about 30%)
- Possible Measure for Improvement:
 - Periodical checking and maintenance
 - Replacing malfunctioned ones with adequate type and capacity
- Assumption:
 - Boiler efficiency : 85%
 - Boiler operation hours : 8,760 hours/year
 - Steam loss per malfunctioned steam trap : 10 kg/h
- Effect:
 - Heavy fuel oil saving : 67 ton/year, 25,200 €/year
 - Investment : 10,000 € (1st year)
 - Payback period : 0.4 year

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Reduction of Evaporation Steam Pressure

1. Energy Loss from Excessively High Steam Pressure
2. Review of Adequate Steam Pressure at Production Lines

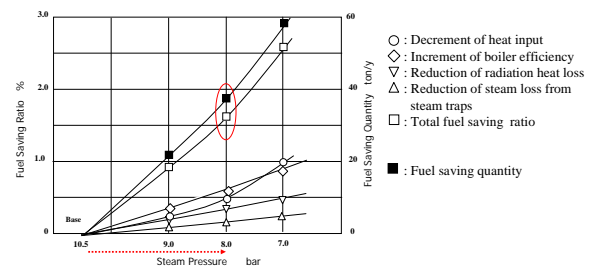
14

Reduction of Evaporation Steam Pressure

- Observation:
 - Evaporation steam pressure : 10.5 bar
 - Required steam pressure at production areas : 7, 6, 3.5, 3 bar
- Possible Measure for Improvement:
 - Decreasing the steam pressure as low as possible
- Premises:
 - Pressure : 10.5 → 8 bar
 - Note : The cases of 9 bar, 7 bar were calculated as well.
- Effect:
 - Heavy Fuel Oil Saving: 37 ton/y, 13,900 €/y
 - Investment : None

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The lower the pressures, the better the fuel saving ratio.



Fuel Saving Ratio and Fuel Saving Quantity

16

High Investment and High Return

1. Steam Condensate Recovery
2. Installation of Economizer at Boiler

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Steam Condensate Recovery

- Present Condition:
 - No steam condensate recovery considering ingress of impurities
- Possible Measure for Improvement:
 - Condensate recovery with the required safety device
- Premises:
 - Condensate recovery rate : 50%
 - Recovered condensate temp. : 90 ° C
- Effect:
 - Heavy fuel oil saving: 118 ton/year, 44,400 €/y
 - Investment : 100,000 €
 - Payback period : 2.3 year

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Installation of Economizer at 8t/h Boiler

- Present Condition:
 - No economizer
 - Exhaust gas temperature : 250 - 300 ° C
- Possible Measure for Improvement:
 - Installing economizer on the exhaust gas duct
- Premises:
 - Preheated boiler feed water temp. : 20 ° C
 - >> Fuel saving ratio : 2.9%
- Effect:
 - Heavy fuel oil saving: 55 ton/year, 20,700 €/y
 - Investment : 70,000 €
 - Payback period : 3.4 year

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**Thank you
for your attention!**

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Compressed Air EE&C Technology of Japan

JICA Study Team TAKAHASHI
14, July, 2010

CONTENT

1. Compressed air system audit of a machinery manufacturing factory in Japan
2. Operation improvement and leakage improvement
3. Estimated power saving of compressed air system = 22%

1

Where are the EE&C potentials

High potential Energy Saving in this Factory

(1) Steam system

Heating

(2) Compressed air system

Pneumatic control and blowing

2

Measurement Audit of Compressed Air System

Target : Compressed Air System

1. Improvement of Air Compressor Operation
2. Reduction of Leakage Loss

Compressor Specification

250kW 4units
Atlas Copco GA250

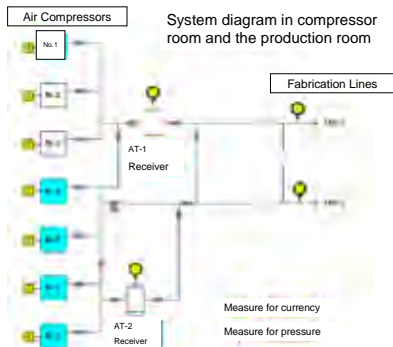
Annual Power Consumption

3 618MWh



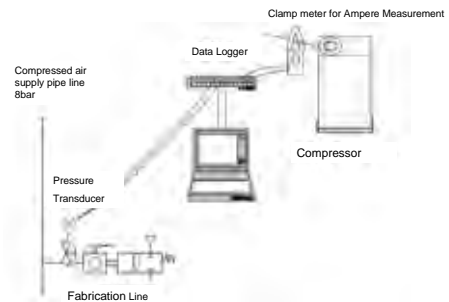
3

Compressors Operation Analysis



4

Measurement



5

Measurement Instrument

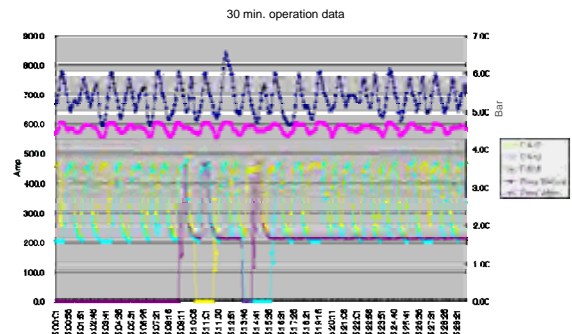


Data Logger for Ampere and Pressure Measurement

HIOKI 8430 MEMORYLOGGER (HIOKI HP)

6

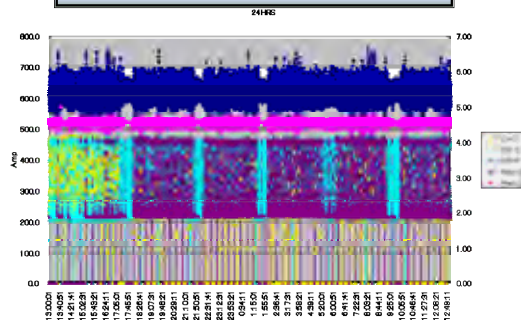
Operation Data of 30 minutes



1. Observing relation between CA Pressure and compressor Ampere
2. Observing on load, unload and idling operation of 3 compressors

7

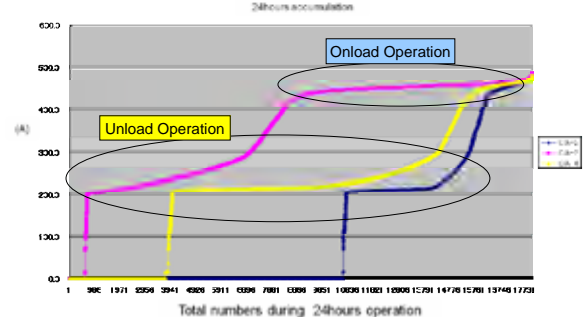
24hrs Measured Data



Observing 24hours operation and pressure of compressed air system

8

Analysis of Measured Data



Total numbers during 24hours operation

		CA-2	CA-3	CA-4	Average
Stop	Below 20A	59%	4%	21%	28%
Unload	Below 300A - 20A	27%	35%	58%	40%
Onload	300A and Above	14%	61%	21%	32%

9

Countermeasure for Power Saving

1. Adequate pressure setting for each air compressor
2. Application of variable speed drive compressor

10

Reduction of Unload Operation

Power Consumption = $\sqrt{3} \times \text{kV} \times \text{A} \times \text{PF} \times \text{Running Hour}$

Voltage 0,38kV
 Unload operation current 210 A
 PF(Power factor) 70%
 Unload operation hours 7 200 hr/y

$$P = \sqrt{3} \times 0,38 \text{ kV} \times 210 \text{ A} \times 0,7 \times 7 200 \text{ hr}$$

$$= 696 616 \text{ kWh/y}$$

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Thank you for your attention

Energy Conservation Measures on Steel Making Plant

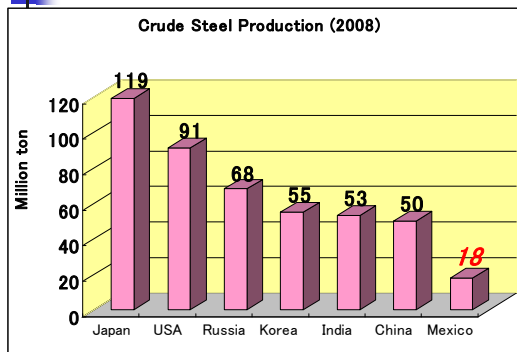
JICA Advisor
Yoshiharu IKEUCHI

Contents

	Slide No.
1. Crude Steel Production in Each Country	3
2. Energy Saving Activity	4
3. Process Flow on Integrated Steel Making Plant	5
4. Coke Oven	6
5. Sintering Machine	8
6. Blast Furnace	11
7. Basic Oxygen Furnace & Continuous Casting Machine	14
8. Reheating Furnace	16
9. Domestic Power Station & Utility Energy Supplying System	32
10. Excellent Specific Energy Unit on Steel Making Plant in Japan	34

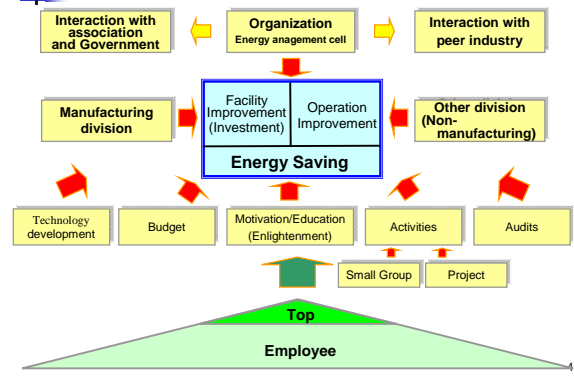
2

1. Crude Steel Production in Each Country

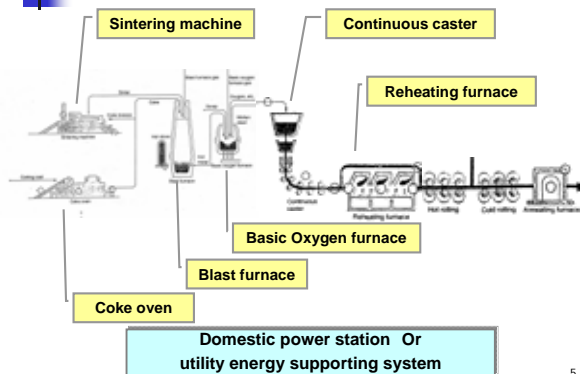


3

2. Energy Saving Activity



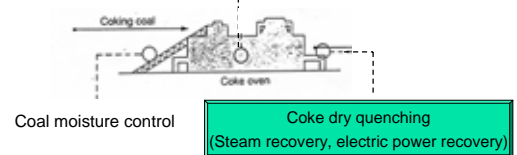
3. Process Flow on Integrated Steel Making Plant



5

4. Coke Oven / Energy Saving Measures

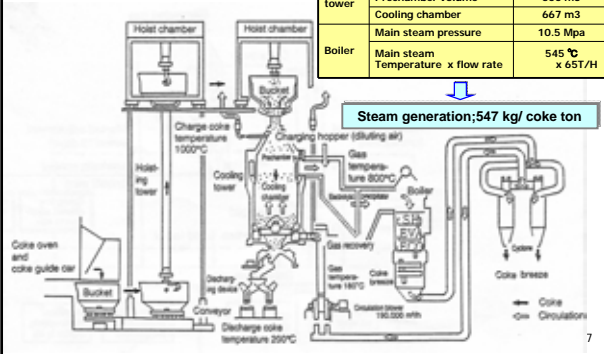
- Automatic combustion control
- Rotation speed control of dust collector fan



6

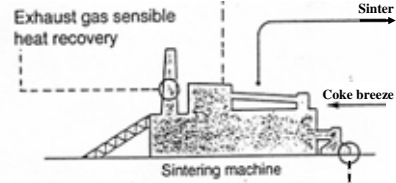
4. Coke Oven / Coke Dry Quenching

Item	Specification
Coke treaty capacity	150 T/H
Prechamber volume	500 m ³
Cooling chamber	667 m ³
Main steam pressure	10.5 Mpa
Main steam Temperature x flow rate	545 °C x 65T/H



5. Sintering Machine / Energy Saving Measures on Sintering Plant

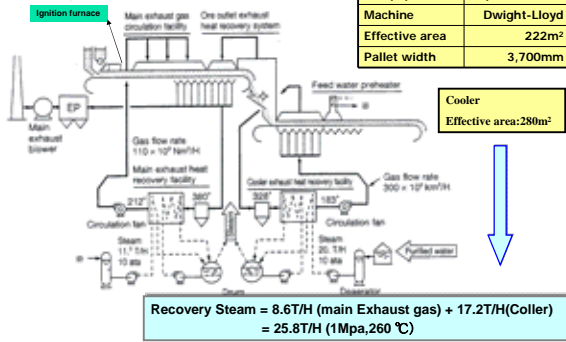
- Fuel saving measure in ignition furnace
- Rotation speed control of main exhaust fan
- Increase of layer thickness of sinter



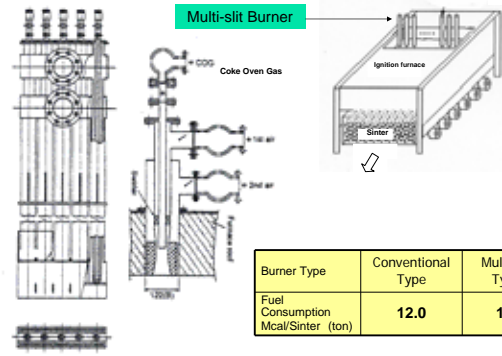
Waste heat recovery from sinter (Steam recovery, electric power recovery)

5. Sintering Machine / Waste Heat Recovery from Sintering Plant

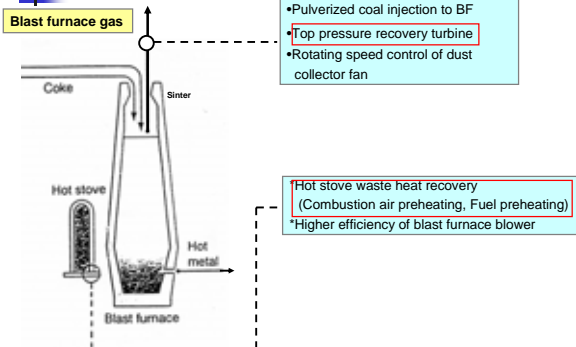
Equipment	Specification
Machine	Dwight-Lloyd
Effective area	222m ²
Pallet width	3,700mm



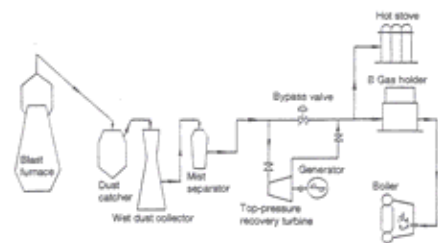
5. Sintering Machine / Effective Burner on Ignition Furnace



6. Blast Furnace / Energy Saving Measures

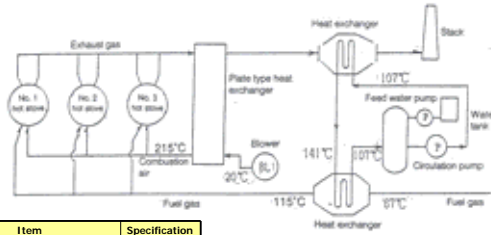


6. Blast Furnace / Top-pressure Recovery Turbine



Item	Specification
Gas pressure	0.162 Mpa
Gas temperature	58 °C
Generation output	7,000 kW
Turbine type	Axial flow three-stage expansion type

6. Blast Furnace / Heat Recovery from Waste Gas of Hot Stove (Preheating for combustion air & Fuel)



Item	Specification
Combustion Air	Air flow rate: 63,200m ³ /H
	HE type: Plate type
	Heating area: 2,131 m ²
Fuel gas	Fuel gas flow rate: 83,600m ³ /H
	HE type: Multi-tube type
	Heating area: 1,575 m ²

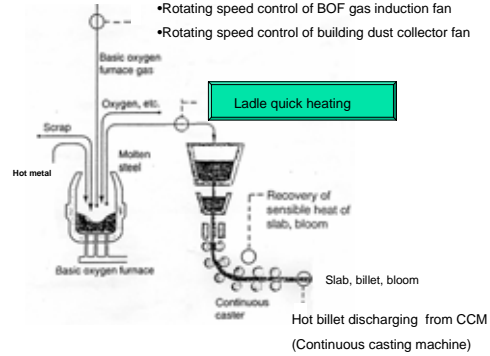
	From	To
Combustion air	20°C	215°C
Fuel gas	67°C	115°C

Recovery energy
28 x 10 ⁹ cal/year
9 x 10 ⁹ kcal/year

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7. Basic Oxygen Furnace & Continuous Casting Machine / Energy Saving Measures on BOF & CCM

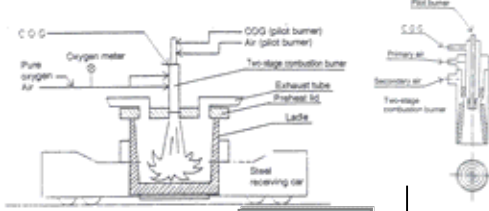
- Improvement of recovery basic oxygen furnace gas (BOF)
- Rotating speed control of BOF gas induction fan
- Rotating speed control of building dust collector fan



Hot billet discharging from CCM (Continuous casting machine)

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7. Basic Oxygen Furnace & Continuous Casting Machine / Effective Burner for Ladle Quick Heating



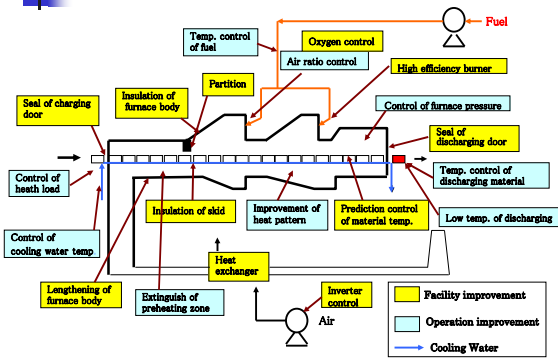
Item	Specification
Type	Ladle preheating
Heating temperature	Max.: 1,600 °C
Fuel	Coke oven gas
Oxygen enrichment	21% to max. 60%
Burner	Capacity: 600 x 104 kcal/h
	Type: Two-stage combustion

Temperature drop of molten steel can be suppressed by 12 °C in average
12°C
3°C

Type	Conventional	New type
COG flow rate Nm ³ /h	400	1,200
O ₂ enrichment	21	60
Heating time (min)	15	15

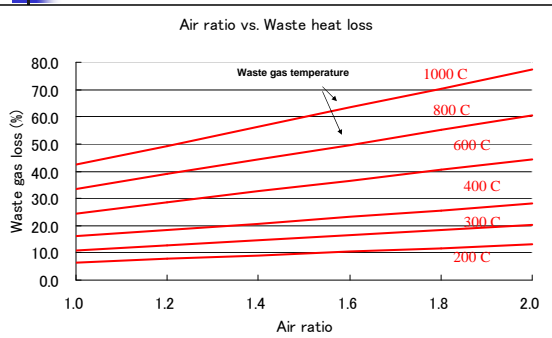
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8. Reheating Furnace / Energy Saving Technology on Reheating Furnace



16

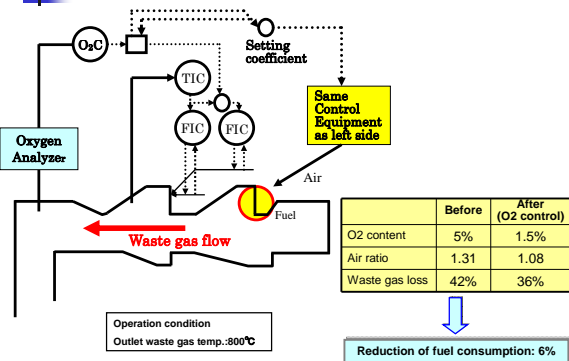
8. Reheating Furnace / Air ratio vs. Waste heat loss



Air ratio (m) = 21% / (21% - O₂ %) O₂ % is oxygen content in waste gas

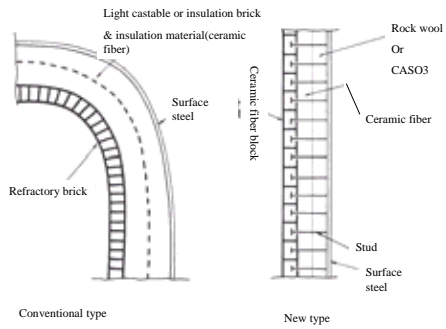
17

8. Reheating Furnace / Oxygen Control in Waste Gas



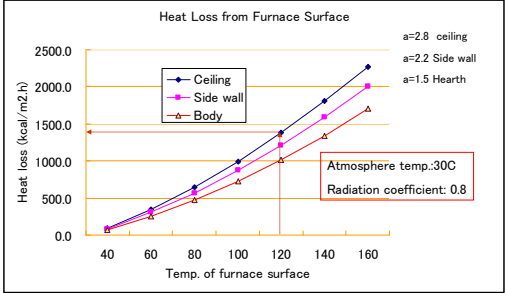
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8. Reheating Furnace / Insulation of Furnace



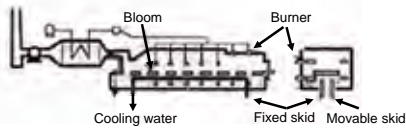
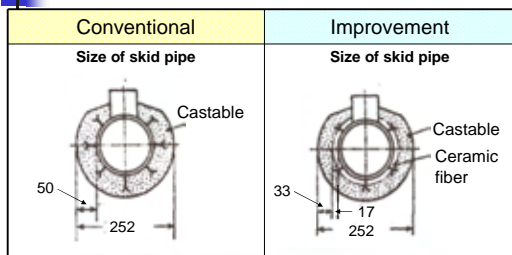
Weight of furnace wall will be 1/10-1/20 of conventional
And heat loss from surface becomes small

8. Reheating Furnace / Heat Loss from Furnace Surface

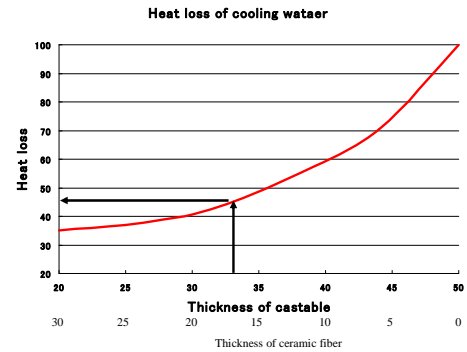


$$Q = a \cdot (t - b)^{(5/4)} + 4.88 \cdot \epsilon \left(\left(\frac{t + 273}{100} \right)^4 - \left(\frac{b + 273}{100} \right)^4 \right)$$

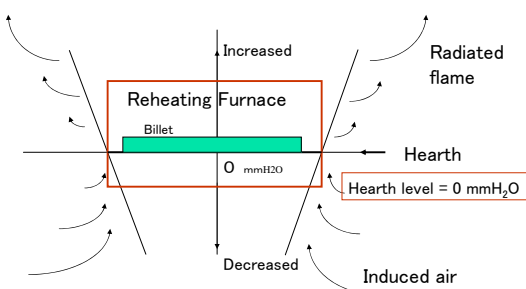
8. Reheating Furnace / Insulation on Skid Pipe



8. Reheating Furnace / Effect of Ceramic Insulation

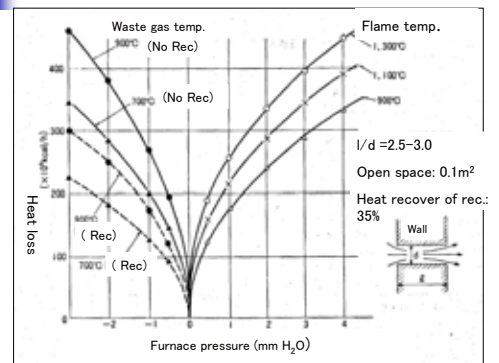


8. Reheating Furnace / Furnace pressure



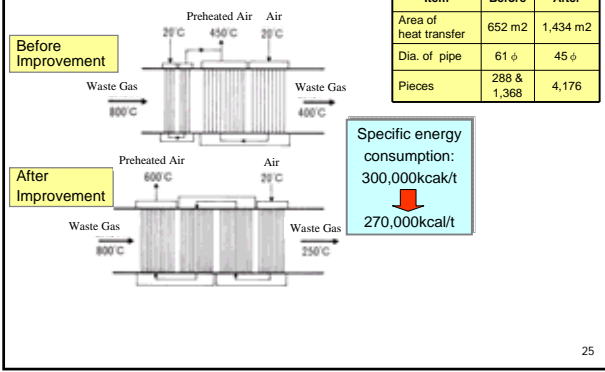
1m ≈ 1mm H₂O in reheating furnace

8. Reheating Furnace / Furnace pressure vs. Heat loss from open space

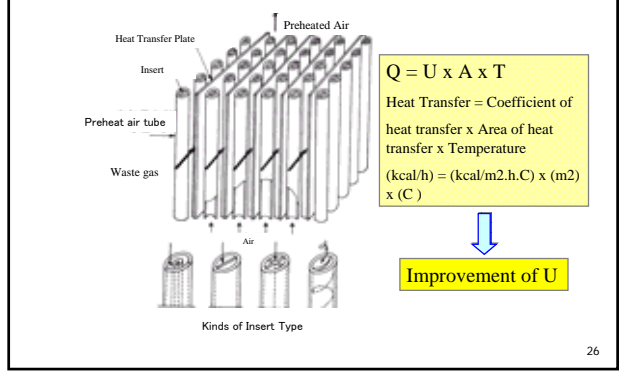


Furnace pressure vs. Heat loss of open space

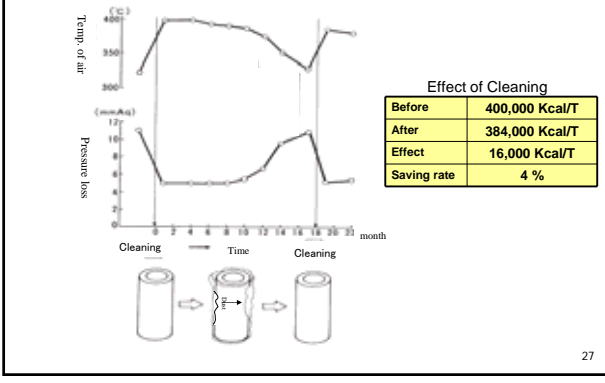
8. Reheating Furnace / Increasing Heat Transfer Area



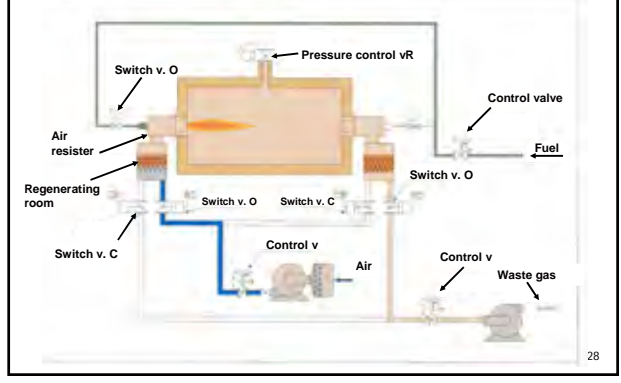
8. Reheating Furnace / Improvement of Heat Exchanger



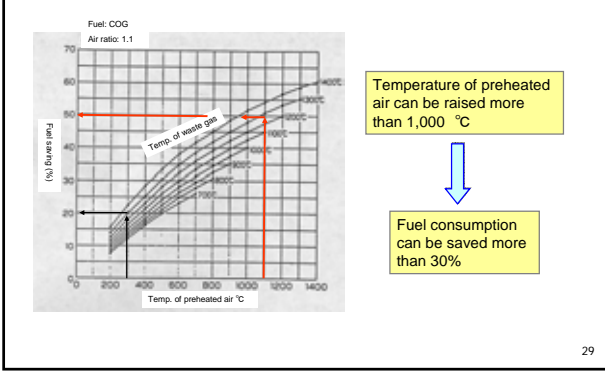
8. Reheating Furnace / Cleaning of Heat Exchanger



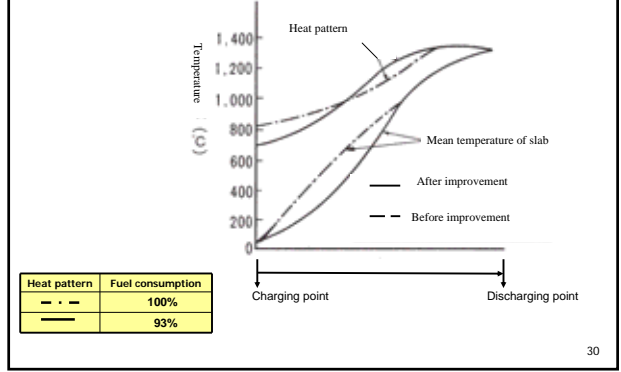
8. Reheating Furnace / Regenerative Burner



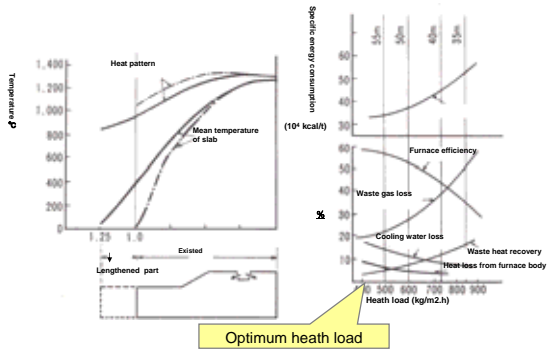
8. Reheating Furnace / Fuel Saving vs Waste Gas Temperature



8. Reheating Furnace / Heat pattern



8. Reheating Furnace / Lengthening Furnace Body

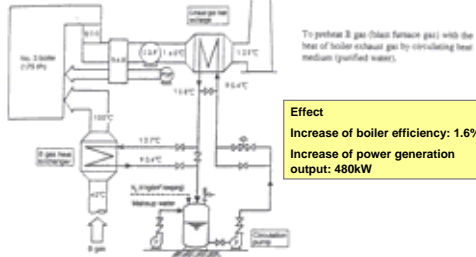


9. Domestic Power Station & Utility Energy Supplying System / Energy Saving Measures

Domestic power station and utility energy supplying system

- Rotating speed control of pump for boiler
- **Preheating fuel gas**
- O₂ control of flue gas of boiler
- Installation of high efficiency air preheater
- Installation of cogeneration facility
- Total energy control system

9. Domestic Power Station & Utility Energy Supplying System / Preheating Fuel Gas



Exhaust gas heat exchanger		
Type: Fin tube type		
Heating area	4,290m ²	
Shell side	Exhaust gas	222,870 Nm ³ /h
	Temperature	Inlet:160C outlet:123C
Tube side	Purified water	60 t/h
	Temperature	Inlet:90.4C Outlet: 138C

BFG gas heat exchanger		
Type: Fin tube type		
Heating area	3,411 m ²	
Shell side	BFG gas	142,000 Nm ³ /h
	Temperature	Inlet:40C outlet:1100C
Tube side	Purified water	60 t/h
	Temperature	Inlet:137C Outlet: 190.4C

10. Excellent Specific Energy Unit on Steel Making Plants in Japan (Similar Bench mark)

	Item	Dimension	Value
Coke Oven	Steam generation	Kg/ton	600
	Energy consumption	MJ/ton	2,100
	COG generation	Nm ³ /ton	340
Sintering Plant	Steam generation	Kg/ton	126
	Energy consumption of ignition furnace	MJ/ton	5
Blast furnace	BFG generation	Nm ³ /ton	2,000
	Electricity generation by TRT	kWh/ton	47
Basic Oxygen Furnace	Energy consumption of HS	MJ/ton	1,600
	BOF gas generation	Nm ³ /ton	270
Energy consumption of Reheating furnace	Hot strip mill	MJ/ton	700
	Plate mill	MJ/ton	1,100
	Structure mill	MJ/ton	1,300
	Bar mill	MJ/ton	1,200
	Wire mill	MJ/ton	1,200
	Seamless pipe	MJ/ton	2,900

A
Big
Thank You !!

Energy Efficiency in Commercial Sector

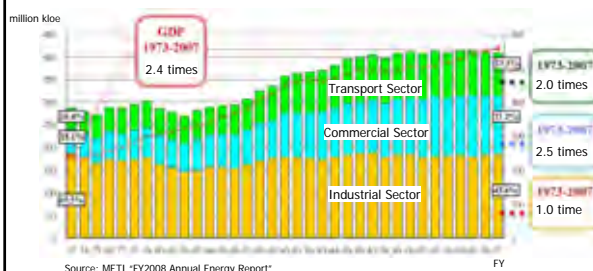
July 2010
JICA Study Team
Madoka Nakashima

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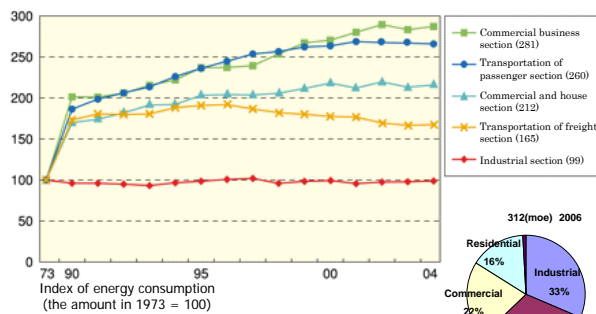
1. Statistics
 - Commercial Sector
2. Measures for Energy Efficiency
 - Regulations etc.
3. Technology for Energy Efficiency

Statistics

Final Energy Consumption by Sector

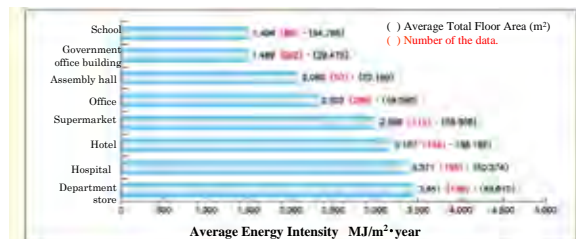


Final Energy Consumption by Sector



Energy Intensity by Building Type of Commercial Sector

■ Energy intensity = energy consumption per floor area



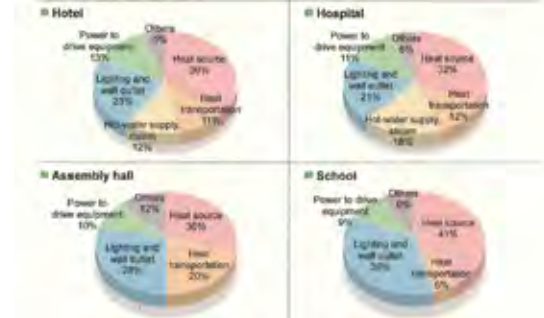
Proportion of Energy Consumption by Usage (1)



Source: ECCJ

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Proportion of Energy Consumption by Usage (2)



Source: ECCJ

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Measures for Energy Efficiency

Overall EE&C measures in Japan

	Industrial Sector	Commercial Sector	Residential Sector	Transport Sector
Regulation	Energy Conservation Law	Building Code for Energy Efficiency The Energy Management Regulation System (EMS)		Regulations for transportation
Incentive	Subsidy	Grants for purchasing energy-efficient (EE) equipment and cars		
	tax reduction, low interest public loan	Special depreciation or tax mitigation for EE equipment		
	Others	Public loan for small & medium companies purchasing EE equipment	Tax reduction for EE houses	
	Awarding scheme, Offering energy efficiency diagnoses tools, Offering information, etc.			

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Building Code for Energy Efficiency

- Energy Efficiency Plan
 - Minimum standards of energy performance of building; Under the Energy Conservation Law
 - Mandatory submission when construction or major retrofit (over 2,000 m² (total floor area))

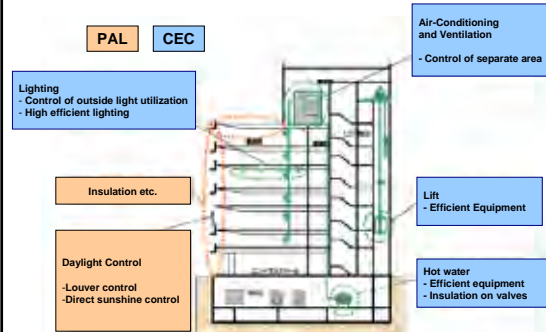
Two Indicators

- PAL (Perimeter Annual Load)**
 - Indicate level of heat loss through envelopes (walls and windows)
 - $PAL = \text{thermal load of inside perimeter area (MJ/year)} / \text{floor area of inside perimeter area (m}^2\text{)}$
- CEC (Coefficient of Energy Consumption)**
 - Indicate energy efficiency of each equipment
 - AC, V, L, HW and EV
 - $CEC = \text{Annual Energy Consumption (MJ/year)} / \text{Annual Standardized Energy Consumption (MJ/year)}$
 - Special software for calculation

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Building Code for Energy Efficiency

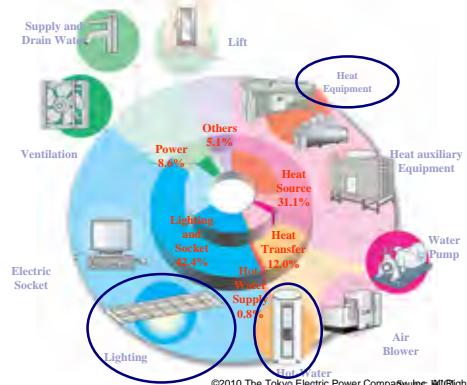


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Technology for Energy Efficiency

Energy Use Structure in Office Building



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Today's Examples

- Heat Pump
 - Efficient Heat Generating Equipment (HP Chiller)
 - HP Water Heater (Eco-Cute)
- Efficient Lamp and Lighting Control System

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Heat Generating Equipment

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ex: Efficient Air-Cooled HP Chiller



2006 Energy Conservation Grand Prize <Gold Medal>

SFMC : SUPER FLEX MODULE CHILLER

※Under Joint Research Project with Toshiba Carrier Air Conditioning Corp.

[Specification : one module]

Capacity (cooling) (heating)	95kW (high efficiency model) 90kW	85kW (standard model)
COP (cooling) (heating)	COP 4.8 (high efficiency model) COP 3.8	COP 3.6 (standard model)
Size	L3.0 × W1.0 × H2.3m	

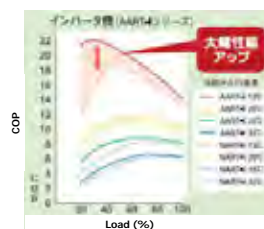
- SFMC can combine the module from 3 to 12.
- Target floor size in office building : about 1,000 – 10,000 m²
- Flexible combination of "heat pump type (both cooling and heating)" and "cooling only type" is also possible to meet heating load.

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ex: An Efficient Centrifugal Chiller

Variable Speed Drive Centrifugal Chiller

- Air conditioning for factories, IT centers, large commercial buildings etc.
- Capacity range: 230 – 4,000 USRT
- Highest partial load efficiency: COP 21.9!



Best Energy Efficient Appliance Award (2007)

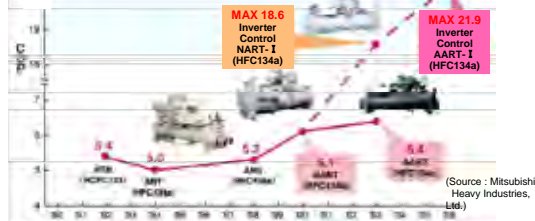


Variable Speed Drive Centrifugal Chiller (Source: Mitsubishi Heavy Industries)

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Changes in Performance of Centrifugal Chillers

- Centrifugal chillers are mainly used for air conditioning in **large facilities such as buildings and factories**.
- Advanced centrifugal chillers, of which the **efficiency is increased to COP=20 or higher by inverter-controlled** variable-speed operation at the time of partial load, are also newly developed.
- These are actively introduced by 24-hour air conditioning semiconductor plants equipped with clean rooms, computer centers, etc.



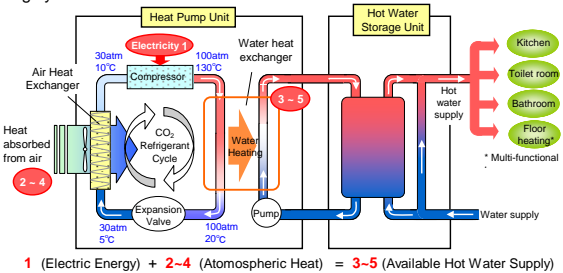
(Source: Mitsubishi Heavy Industries, Ltd.)
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Heat Pump Water Heater

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What is "Eco Cute" ?

The natural refrigerant (CO₂) heat pump water heater, "Eco Cute", is highly efficient.



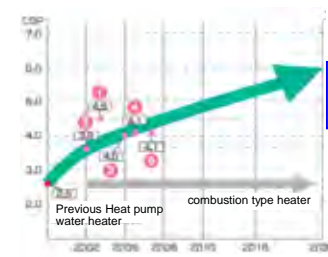
$$1 \text{ (Electric Energy)} + 2-4 \text{ (Atmospheric Heat)} = 3-5 \text{ (Available Hot Water Supply)}$$

※"Eco Cute" is the name used by the electric power companies and water heater manufactures when they call the natural refrigerant (CO₂) heat pump water heaters.

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TEPCO's Development of Heat Pump Water Heater for Business Use

- For hotels, hospitals, sports facilities, stores and restaurants



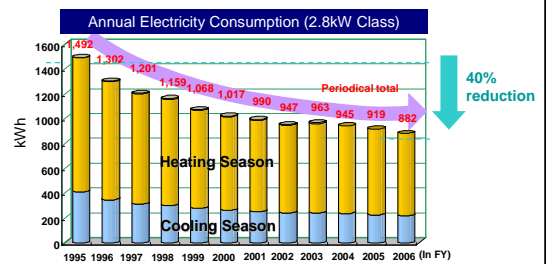
- Hot Power Eco BIG (Toshiba Carrier) (28kW) COP4.5
- "Eco Cute" (Nihon Itoic Co.) (26.3 kW) COP3.8
- "Eco Cute" (Daikin Industries) COP4.1
- "Eco Cute" (Hitachi Appliances) COP4.1
- "Eco Cute" (Mitsubishi Electric Works) (40 - 320 kW) COP4.1

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Efficient Air Conditioner (AC) for Home Use

Efficiency Improvement of House AC

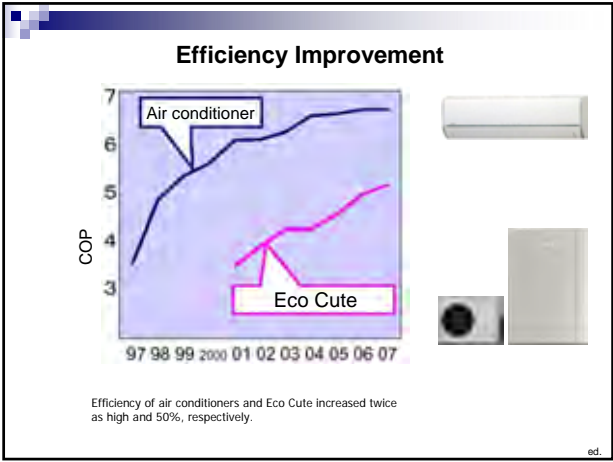
- The annual electricity consumption for heating and cooling **decreased by about 40%** in past ten years.
- Recently, air conditioners with close to **COP 7** have made their debut.



※Cooling and heating AC, 2.8kW cooling capacity, average consumption of high class products.
※Annual electricity consumption is calculated by the standard of "Japan Refrigerator and AC Industry (JRA4046)"
Source: Association of Japan Refrigerator and Industry

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Efficient Lighting System

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High-efficiency lamp and Lighting control system

High-efficiency lamps (HF: high frequency)

- 1.5 times brighter than conventional FLR lamps
- reduce the initial setup cost and running cost (the number of lamps)

Lighting control system

- Control artificial light to maximize daylight use
- Continuous dimming function of the HF lamps

Comparison of lighting equipments

Reduction in lighting power by adjustment of the brightness with an inverter

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A Case of Energy Efficiency in Hospital Japan

July 2010
JICA Study Team
Madoka Nakashima

An ESCO project at Tokyo Metropolitan Hiroo Hospital

- The first ESCO competition by Tokyo Metropolitan Government.
- JFS (Japan Facility Solutions Inc.): an ESCO, one of the TEPCO's subsidiaries
- [The Golden Prize of Best ESCO Projects](#) in Japan

Location	Shibuya ward, Tokyo
Building size	8 stories + 2 stories underground
Total floor space	36,511 m ²
Construction	October 1980 (28 yrs)
Electricity demand	2,168kW
Total energy consumption	188,075 GJ/year
Expenses for utilities	2,700,000 euros/year



- A variety of medical cares including emergency/disaster medical care, cardiac medicine and cerebral vessel medicine.
- 500 beds and 800 outpatients/day.

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Overview of the Results

Energy Consumption and CO2 Emission Reduction

Reduction	Primary Energy	CO2 Emission
	28% (61,166 GJ/yr)	29% (2,795 t-CO2/yr)

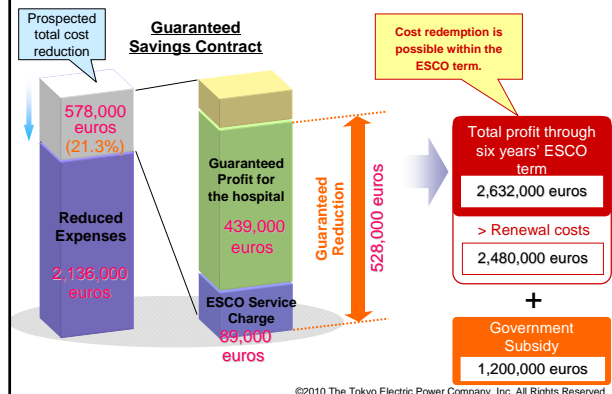
Cost and Profits

Case	Cost for Retrofit	Cost Savings	Payback Period	Remarks
Without Subsidy	€ 2,480,000	€ 439,000/yr	5.65 yrs	ESCO fee, € 89,000, is excluded from Cost Savings
With Subsidy	€ 1,280,000 (Subsidy: 1,200,000)	€ 439,000/yr	2.9 yrs	

Notes:
- Cost savings in the table are the guaranteed amount. Actual savings is 489,000 euros/yr.
- Project hasn't been completed yet. (contract period: 2005-2011)

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Cost and Profits as an ESCO Service



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EE&C Measures and Effects

Applying various energy saving techniques

Reduce Heat Load Itself	1) Reduce the volume of outdoor air intake according to indoor CO2 density	6%
	2) Optimize cool and re-heat process in double coil AHUs by allowing small temperature and humidity fluctuation	
Produce Heat Efficiently	3) Renew refrigerators/ boilers for higher efficiency (Heat generation equipment retrofit)	12%
	4) Produce chilled water only with cooling tower operation under low outdoor air temperature (Free Cooling)	
Heat Transport & Ventilation Efficiently	5) VVW control	10%
	6) VAV control	
	7) Intermittence drive of AHUs and ventilation fans	

Energy Saving Rate About 28%

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Each EE&C Measure

A. Heat Generating Equipment/System

Cogeneration system (CGS) is considered to be **advantageous** as a heat generating equipment, especially for **hospitals** due to the great amount of thermal demand.

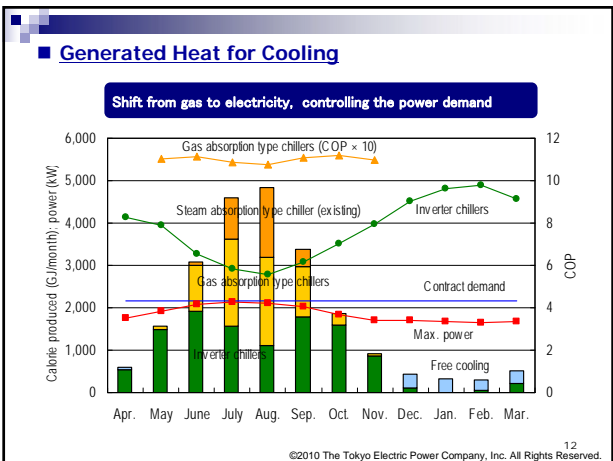
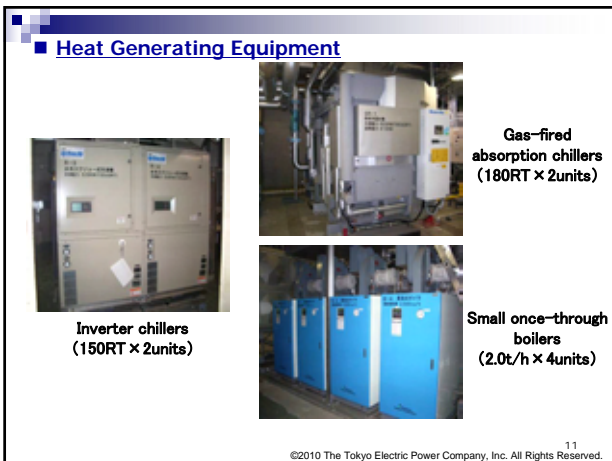
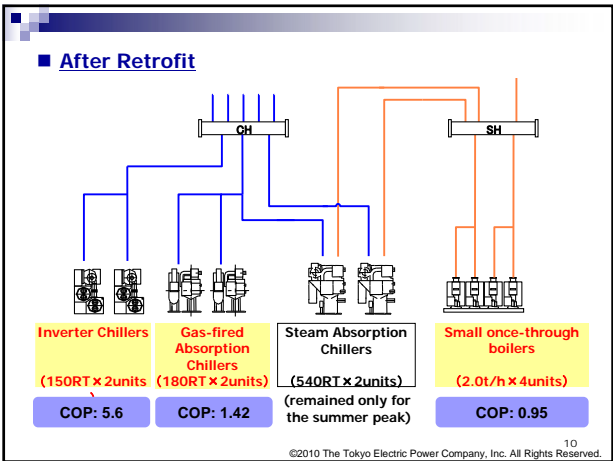
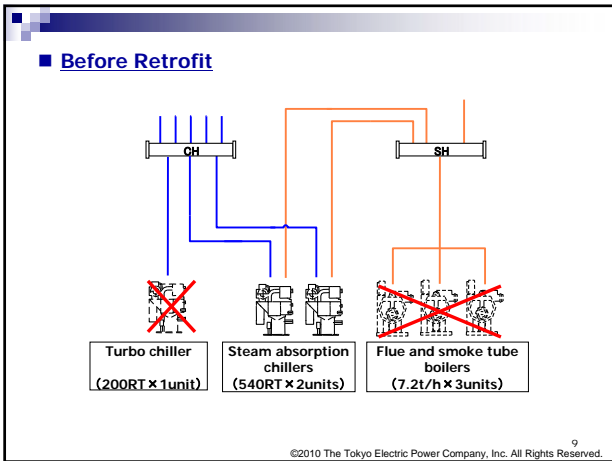
Having examined from various viewpoints such as energy consumption, CO2 emission, cost, administrative and

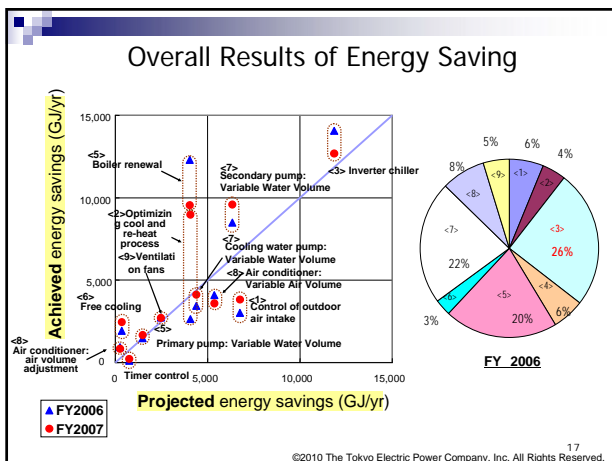
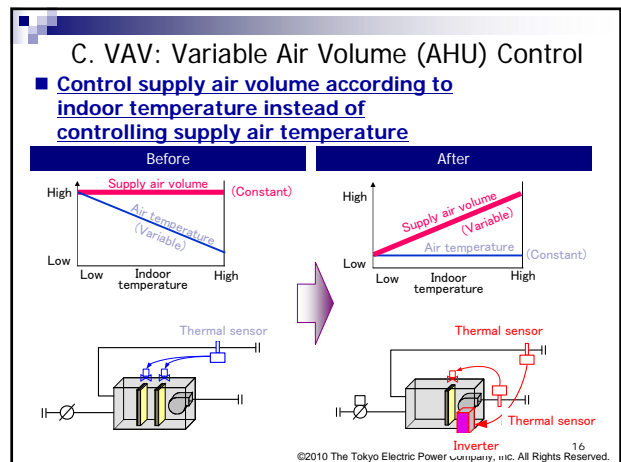
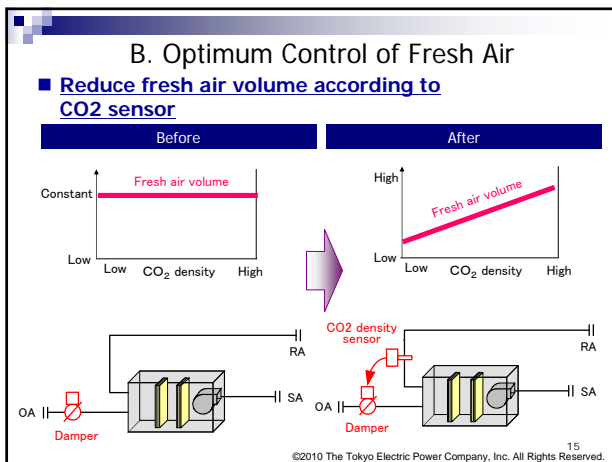
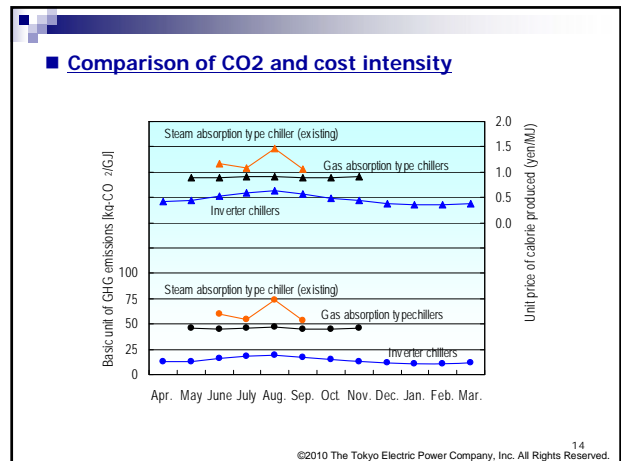
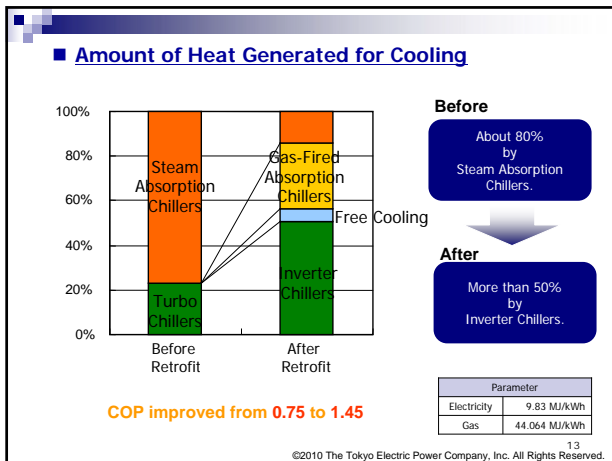
viewpoints such as energy overall cost including construction maintenance cost, etc.

Concluded;

- Most reasonable
- to **optimize the heat generating capacity**
- to shift from **fuel to electricity** in actual operation
- Also important; **power interruption** during construction can be avoided **without CGS**.

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A Case of Office Building:
**Energy Management in
 Tokyo Electric Power Company
 (Head Office Building)**

July 2010

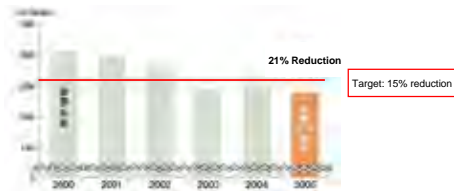
Contents

- Results as a Company
- Results of TEPCO Head Office Building
- Measures Implemented
- Energy Efficient Equipment

TEPCO as a whole

Electricity use has decreased and remained mostly level since 2003.

- Company-wide environmental goal
 The amount of electricity use for five years from 2001 to 2005 should be decreased by 15% compared to 2000.
- Results of measures
 - The reduction rate of 2005 was 20.9% compared to 2000, and the goal was reached.
 - We received 2006's award for global warming prevention activities from the Minister of the Environment (measure and activity implementation category) for our efforts in reducing the use of water, copy/printing paper and gasoline.



* Applicable to the head office, branch offices, power system offices, and East and West Thermal Power Offices



Efforts for Energy Saving
 in Tokyo Electric Power Company Head Office Building



Tokyo Electric Power Company Head Office Building:
 The managerial function of TEPCO, and its central function of power supply are placed in the building.

- Total floor areas: 50,598 m², Year of completion: 1972, Structure: SRC -

- Energy saving measures taken
 at the construction of the building
- Energy saving measures after COP3
- Response to Energy Conservation Law,
 Energy Management System

Energy saving measures taken at the construction of the building

Since 1972

7

Energy saving measures taken when constructing the building

Building completed in 1972 (38 years ago)

- ◆ Adoption of large air conditioners using chilled/hot water:
Highly efficient operation of heat generating equipment through rated and nighttime operation
- ◆ Adoption of turbo refrigerating machines and heat pumps:
Production of heat with one third of energy using heat from the air



As a forerunner of a thermal storage type air conditioner and heat pump, the building contributed to popularizing later models of thermal storage type air conditioners and heat pumps.

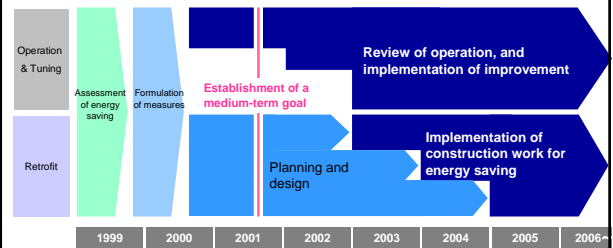
8

Energy saving measures after COP3

Since 1997

9

Implementation of systematic energy saving measures



Company-wide goal of reducing energy: 15% reduction of power consumption (By 2005 in comparison with 2000)

Formulation, planning, and implementation of energy saving measures based on the assessment of energy saving

10

Assessment of energy saving from 1999

- ◆ Establishment of a work group on energy
Establishment of a work group to analyze the current situation and formulate medium- and long-term plans
 - ◆ Implementation of the assessment of energy
 - Examination of drawings
 - Walk-through survey
 - Analysis of operational data
- Formulation of medium- and long-term energy saving measures

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Improved operation of heat generating equipment for AC since 2000

- ◆ Improved operation of a heat generating system for air conditioning
Improved operation for more efficient operation
- ◆ Examination of freezers in the Kitchen
Improvement of energy-consuming facilities based on data analysis

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Response to the Energy Conservation Law

Since 2003

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Assessment of energy saving from 1999

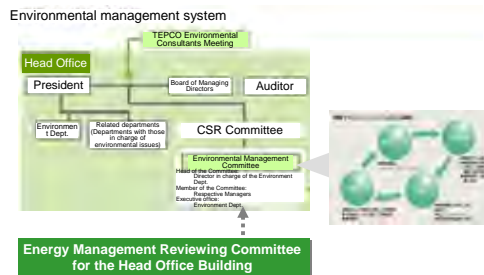
- ◆ **Re-Establishment of Energy Management System**
 - ◆ Clarification of responsibilities
 - ◆ Implementation of PDCA cycle
- ◆ **Promotion**
 - ◆ Management through company wide system (up-stream)
 - ◆ Promotion to building occupants (down-stream)

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Response to the Energy Conservation Law

- ◆ Management through a company-wide environmental management system (upstream side)



- ◆ Promotion to building users, using intranet

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Further Implemented Measures

Since 2005

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Further implemented Measures

Equipment

- Adoption of a floor-by-floor air conditioning system, a VAV air conditioning system, and total heat exchangers
— Reduction: about 2.0%
- Adoption of highly efficient turbo refrigerating chillers
— Reduction: about 1.1%
- Adoption of EcoCute for business use (water heater with a CO2 refrigerant)
— Reduction: about 0.7%

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Further Implemented Measures

Activities

- Improvement of the Energy Management Standards
— Creation of usable standards
in line with the actual conditions of the Head Office Building
- Stabilization of the PDCA cycle
— Creation of a system for autonomous energy saving

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Retrofit of TEPCO Head Office Building



Turbo Refrigerating Chiller

■ Substantial reduction of CO₂ emissions through high efficiency

Energy efficiency (a coefficient of performance (COP)* = 6.4 (*catalogue value))
Efficiency was improved by **28%** in comparison with conventional machines (10-year models of the same manufacturer) through consolidated high performance technology, and improved compressors and heat exchangers.

■ Highly efficient and economic

A reduction of approximately **40%** in electric power expenses in comparison with conventional machines (10-year models from the same manufacturer)



<Cooling tower>



<Turbo refrigerating machine>

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Plate-Type Exchanger

■ Mechanism

A machine to exchange the heat of cold water (or hot water) in a thermal storage tank, and circulated water in an air conditioning machine.

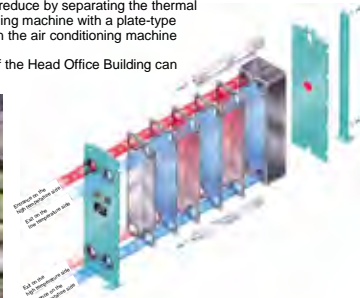
■ Energy saving quality

Power for transmitting water can reduce by separating the thermal storage tank and the air conditioning machine with a plate-type exchanger, and closing circuits on the air conditioning machine side*.

* The total power consumption of the Head Office Building can be reduced by about **5%**.



<Outer appearance of a plate-type exchanger>



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Rotary Total Heat Exchanger (Air Conditioning Machine)

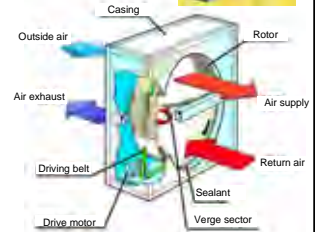
■ Reduction of air conditioning energy

The thermal load of fresh outside air (intake) is reduced by recovering total heat or sensible heat from exhaust air for supply air through the rotation of a rotor*.

* The total power consumption of the Head Office Building was reduced by about **1%**.



<Air conditioning machine>



<Rotary type total heat exchanger>

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EcoCute for business use

■ Environmental conservation

EcoCute use a non-toxic, non-flammable, and idealistic natural refrigerant (CO₂), which has an ozone layer depletion coefficient of zero, a global warming coefficient of one (about one thousand-seven-hundredth of a fluorocarbon refrigerant). EcoCute is excellent in terms of environmental protection.

■ Highly efficient and economic

The energy efficiency (the coefficient of performance (COP)) is high, at 3.0 or more. Furthermore, because inexpensive night-time electricity can be utilized, EcoCute can reduce running costs substantially in comparison with combustion-type water heaters.

■ Hot water dispenser

EcoCute can dispense hot water at 90 degrees centigrade through an instantaneous temperature rising process, utilizing the high thermal capability of a natural refrigerant (CO₂). Its hot water supply capability can minimize the size of a hot water storage tank.



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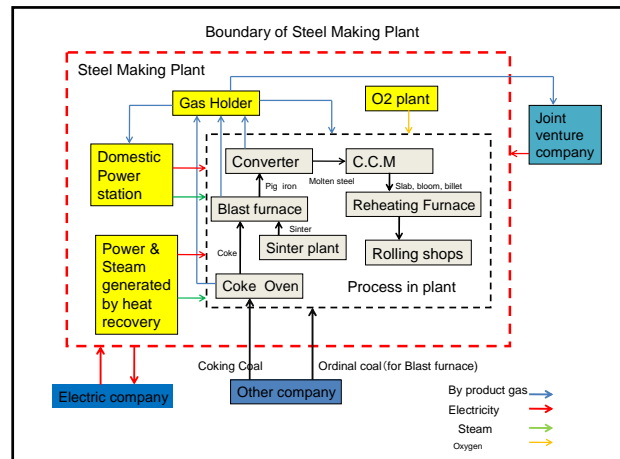
Thank you for
your kind attention!

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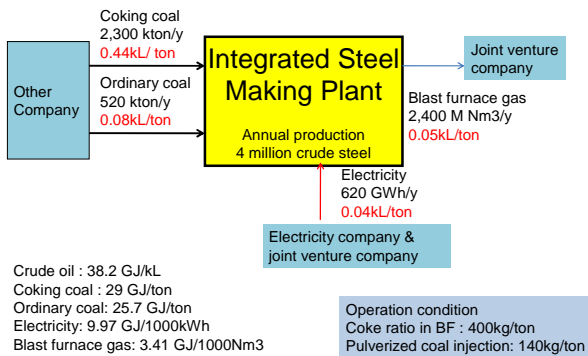
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Example of Benchmark in Integrated Steel Making Plant

JICA STUDY TEAM
Yoshiharu IKEUCHI



Benchmark :
0.51kL/ton



Calculation of Benchmark

$$\text{Benchmark} = \frac{\text{Annual total energy consumption}}{\text{Annual total crude steel production}}$$

$$\begin{aligned} \text{Annual total energy consumption} &= \text{Purchased energy}(\text{Coking coal} + \text{Ordinary coal} + \text{Electricity}) - \text{Sold energy}(\text{Blast furnace gas}) \\ &= 66,700 \text{ TJ} + 13,364 \text{ TJ} + 6,181 \text{ TJ} - 8,184 \text{ TJ} = 78,061 \text{ TJ} \end{aligned}$$

$$\begin{aligned} \text{Benchmark} &= 78,061 \text{ TJ} \div 4,000,000 \text{ ton} = 19.5 \text{ GJ/ton} \\ &= 19.5 \text{ GJ/ton} \div 38.2 \text{ GJ/kL} = 0.51 \text{ kL/ton} \end{aligned}$$

Proposal of Audit Standards

1. Identification of Contents of the this Work
 - a. "Assessment Standards" for find potential and propose EE&C measures → [For Consultant](#)
 - b. "Audit Standards" for evaluate performance of target consumers → [For Accredited Energy Auditor](#)
2. Utilization of the Above Standards
 - a. "Assessment Standards" is [for site](#)
 - b. "Audit Standards" is for [both HQ and site](#)
3. Expected Contents of the Assessment Standards
 - a. Pre-questionnaire sheet
 - b. Methodology
 - c. Reporting format
4. Expected Contents of the Audit Standards
 - a. Pre-questionnaire sheet
 - b. Evaluation methodology
 - c. Rating and final evaluation

Award System for Excellent Energy Management Factories and Buildings

JICA Study Team
Yoshiharu Ikeuchi

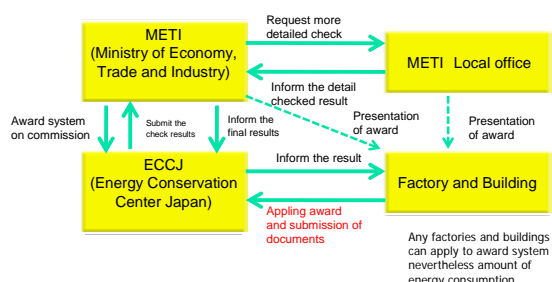
Contents

1. Purpose of Award System	3
2. Players of Award System	4
3. Other Award systems	5
4. Type of Award	7
5. Qualification for application	8
6. Procedure for Taking Award	10
7. Contents of Submission Documents	11
8. Energy Consumption and Energy Intensity for Past Three Years	12
9. Enforcement of Measures for rational Energy Use	13

1. Purpose of Award System

- To award the factories and buildings which make a great effort to improve energy conservation activities in order to develop rational energy use and to sustain the energy resources.
- Awarded factories and buildings will be a good model for other ones.
- Award system causes further improvement of energy conservation.

2. Players of Award System



3. Other Type of Awards

- Excellent Activity by Employees
- Introduction of Excellent EC Implementation Technologies (Product / System)
- ESCO Business
- Contest (Poster / Article / Implementation)
- Excellent Electronics Stores



Type of Awards

Type	Main Objective	Methodology	Implementing Body	Duration	Target Layer
Excellent Activity by Organization	1. Encouraging Continuous EC Activity 2. Dissemination of EC Activity	1. Application 2. Screening 3. Field Visit 4. Interview 5. Selection	1. METI 2. ECCJ 3. Local Government	Once /Year	Factory/Organization/ Employees
Introduction of Excellent EC Implementation Technologies (Product / System)					Energy Consuming Product/System
ESCO Business					ESCO Company
Contest (Poster / Article / Implementation)					School/Pupil
Excellent Electronics Stores					Shop

4. Type of Award

- Section of award
 - Fuel and heat
 - Electricity

But after 2008, two sections were drawn together
- Kinds of award
 - Minister of METI
 - Director general of Agency of Natural Resources and Energy
 - Director general of branch of METI

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5. Qualification for application(1)

Don't correspond to under three articles,

- Acting against Energy Conservation Law (Act on Rational Use of Energy) within past three years
- Happening social problems with own responsibility such as pollution problem within past three years
- Happening serious accidents resulting in injury and death, facility accidents and disasters within past three years

8

5. Qualification for application(2)

Producing distinguished results regarding to following four items

- Energy management organization and its operation status
- Energy improvement status to promote rational energy use
- Educating and training status of energy management engineers
- Energy conservation results concerned with rational energy use

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6. Procedure for Taking Award

Any factories (buildings) begin to apply this award

Award of Director general of branch of METI



In principal, to be selected out of awarded factories (buildings) from Director general of branch of METI. Necessary to pass three years from previous awarded

Award of Director general of Agency of Natural Resources and Energy



In principal, to be selected out of awarded factories (buildings) from Director general of Agency of Natural Resources and Energy Necessary to pass two years from previous awarded

Award of Minister of METI

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7. Contents of Submission Documents

- Energy management organization and its operation status
 - **Diagram of energy management organization**
 - Operation status of holding frequency of steering committee and discussing contents, etc
 - **Conditions of energy consumption for past three years**
- Educating and training status of energy management engineers
 - Numbers of taking an examination of energy manager
 - Numbers of attending the training program with certification examination for candidates of Energy Manager and general training programs for proper implementation of EMS
- **Extinguished results for promoting rational energy use for past three years**
- **Enforcement of measures for rational energy use**
- Others
 - Yes or no of happening accidents and pollution problems for past three years

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8. Energy Consumption and Energy Intensity for Past Three Years

	2007	2008	2009
① Consumption of fuel and heat (GJ)			
② Electricity consumption (1000 kWh) (GJ)			
③ Total (GJ)			
④ In terms of heavy oil (κL)			
⑤ Amount of product			
⑥ Energy intensity			
⑦ Ratio against previous year			

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9. Enforcement of Measures for rational Energy Use

Target items (facilities)	Status of establishing management standards	Status of observing measurement/record	Status of observing maintenance/inspection	Status of measures to be taken on new installation
Rationalization of fuel combustion (Combustion facility)	Status of establishing management standards for air ratio and others <input type="checkbox"/> Already established <input type="checkbox"/> Being established (%) <input type="checkbox"/> To be established	Status of measurement/record defined in management standards <input type="checkbox"/> Regularly done <input type="checkbox"/> Done as needed <input type="checkbox"/> Not done	Status of maintenance/inspection defined in management standards <input type="checkbox"/> Regularly done <input type="checkbox"/> Done as needed <input type="checkbox"/> Not done	Status of measures to be taken on new installation of combustion facilities <input type="checkbox"/> Done <input type="checkbox"/> Not done <input type="checkbox"/> Not applicable
Rationalization of heating, cooling and heat transfer (Heat consumption facility)	Status of establishing management standards for heating equipment and others <input type="checkbox"/> Already established <input type="checkbox"/> Being established (%) <input type="checkbox"/> To be established	Status of measurement/record defined in management standards <input type="checkbox"/> Regularly done <input type="checkbox"/> Done as needed <input type="checkbox"/> Not done	Status of maintenance/inspection defined in management standards <input type="checkbox"/> Regularly done <input type="checkbox"/> Done as needed <input type="checkbox"/> Not done	Status of measures to be taken on new installation of heating equipment and others <input type="checkbox"/> Done <input type="checkbox"/> Not done <input type="checkbox"/> Not applicable

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A
BIG
THANK YOU!!

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Curriculum of Energy Efficiency in Japanese Universities

August, 2010

Mayo Yoneyama
JICA Study Team

Contents

1. Any Faculty of Energy Engineering in Japan?
2. Mechanism of Energy Study in Japan
3. Academic Background of Energy Managers
4. Study Fields and Subjects of National Qualification Examination for Energy Managers
5. Curriculum of Energy Study in Graduate Schools
6. Examples: Energy Programs of 5 Japanese universities
7. Conclusion

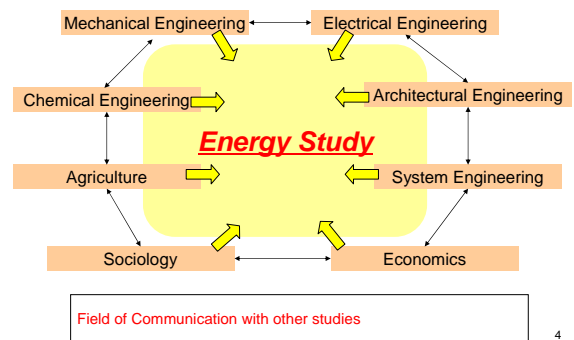
1. Any Faculty of Energy Engineering in Japan?

There's no faculty named "Energy Engineering".

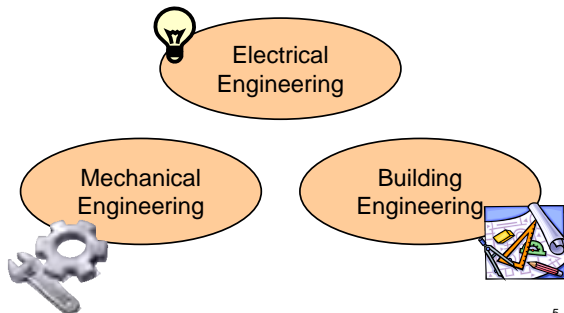


- In Japan, Classes related to Energy are held in a variety of faculties.
- The contents depend on the university.
- Energy is taught not only in Engineering, but also in Social Science.

2. Mechanism of Energy Study in Japan

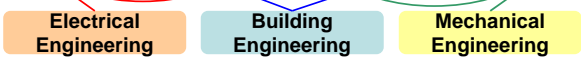


3. Academic background of Energy Managers



4. Study Fields and Subjects of National Qualification Examination for Energy Managers

< Required Subject >	
1. Outline of energy management and Law and Regulations	
< Optional Subject >	
(Electric Course)	(Heat Course)
2. Basic Theory in Electricity	2. Basic Theory in Heat and Fluid
3. Facility and Equipment	3. Fuel and Combustion
4. Application of Electricity	4. Heat Utilization Facility and its Management



5. Curriculum of Energy Study in Graduate Schools of Universities

- 5.1 Kyoto University
- 5.2 The University of Tokyo
- 5.3 Osaka University
- 5.4 Nagoya University
- 5.5 Waseda University



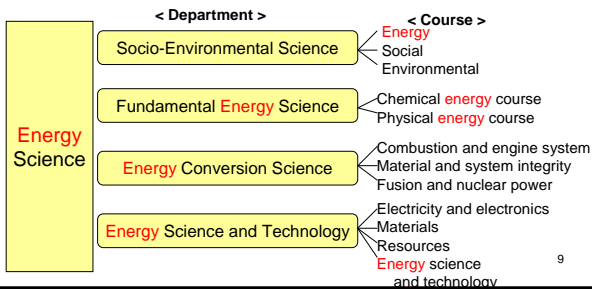
7

5.1 Kyoto University

8

[Kyoto University] Graduate School of Energy Science

<The Aim of Lecture>
To develop a sustainable energy society by establishing theories in **energy science**, an interdisciplinary field that incorporates a humanistic perspective into science and technology, for fostering people who contribute to the harmonious coexistence of a global society, have an international perspective, and high-level abilities in various specialties.



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[Kyoto University] Curriculum of Socio-Environmental Energy Science

<The Aim of Lecture>
Searching for environmentally-friendly **energy** and social systems

*Advanced Study on Socio-Environmental Energy Science	*Energy and Environment Environmental Harmony
*Socio-Environmental Energy Science	*Societal Education for Energy
*Social Engineering of Energy	*Energy Policy
*Advanced Study on Sustainable Society with an Environmentally-sound Material Cycle	*Energy Communication
*Energy Economics	*Environmental Economics
*Economic Analysis	*Energy Politics
*Energy Ecosystems	*International Energy
*Recycling Systems in Earth Ecology	*Field Research Project on Socio-Environmental Energy Science
*Human Interface	*Special Fundamental Study
*System Safety	*Industrial Ethics

10

[Kyoto University] Curriculum of Fundamental Energy Science

<The Aim of Lecture>
New fundamental science for researching **energy**

*Advanced Study on Fundamental Energy Science	*Catalytic Functional Chemistry
*Fundamental Energy Science	*Biological Energy
*Physical Chemistry for Energy Science	*Fundamentals of Fusion Plasma
*Energy Electrochemistry	*High-Temperature Plasma Physics
*X-ray Crystallography	*Plasma Heating
*Introduction to Functional and Solid-State Chemistry	*Energy Transport
*Solid-State Electrochemistry	*Neutron Mediated Systems
*Magnetohydrodynamics	*Introduction to Experiments Nuclear Reactor
*Fundamental Plasma Simulation	*Advanced Energy Creation
*Applied Numerical Physics	*Physics of Superconductivity
*Plasma Physical Kinetics	*Technology for Advanced Energy
*Physics of Non-neutral Plasmas	*Field Research Project on Fundamental Energy Science
*Photo-Related Chemistry	*Special Fundamental Study 1,2
*Sustainable Energy System	*Industrial Ethics
*Molecular Science of Fluids	

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[Kyoto University] Curriculum of Energy Conversion Science

<The Aim of Lecture>
Future **energy** conversion systems and functional design

*Energy Conversion Fundamentals	*Advanced Energy System Technology
*Rate Processes	*Particle Energy Conversion
*Heat Engines	*Electromagnetic Energy Conversion
*Thermal Energy System Design	*Functional Energy Conversion
*Combustion Science and Engineering	*Materials for Energy Conversion
*Pollutant Treatment in Energy Conversion System	*Advanced Energy Conversion Science
*Fracture Mechanics for Energy Systems	*Advanced Numerical Simulation
*Science for System Integrity	*Waste Biomass Utilization
*Theory of Plasticity	*Bio-Energy Waves
*Mechanics of Advanced Materials	*Theory of Elastic Waves
*Continuum Thermodynamics	*Materials Science and Engineering Based on Energy Processing
*Fundamentals of Fusion Energy System	*Field Research Project on Energy Conversion

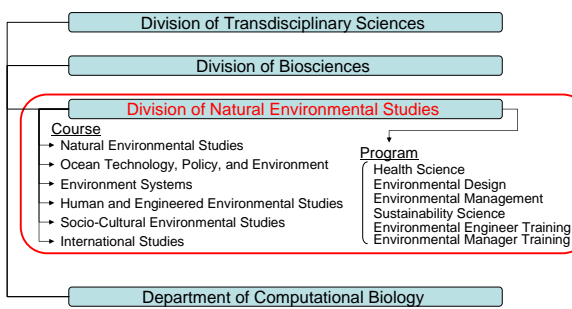
12

[The University of Kyoto]
Curriculum of Energy Science and Technology

<Aim at the Lecture>	
* Striving to develop environmentally-friendly processes	
* Establish energy science and technology supporting these processes for the sustainable development of humanity	
<ul style="list-style-type: none"> *Advanced Study on Energy Science and Technology *Introduction to Energy Science and Technology *Lecture on Advanced Integrated Circuits *Thin Film Nanodevices *Effective Utilization Engineering in Electrical Energy System *Materials Processing *Functional Materials Processing *Thermochemistry *Thermodynamic Strategy for Environmental-Friendly Processes *Resource and Energy System 	<ul style="list-style-type: none"> *Ocean Resources and Energy Technology *Numerical Approach to Working Processes *Computational Physics *Advanced Physical Chemistry *Physics of Energy Conversion Materials *Photon and Quantum Energy *Electromagnetic Energy *Effective Utilization of Energy *Energy Development *Field of Research Project on Energy Science and Technology *Special Fundamental Study *Industrial Ethics

5.2 The University of Tokyo

[The University of Tokyo]
Graduate School of Frontier Sciences



[The University of Tokyo]
Education Program-(1) Sustainability Science

Program	Curriculum
Sustainability Science	*Sustainability perspectives in environmental issues
	*Environmental Economics
	*Fundamentals of Natural Environmental Studies
	*Environmental Information Science
	*Environmental Sustainability
	*Environmental Challenges and Leadership in Asia
	*Biosphere Function
	*Marine Resource and Environment
	*Sustainable Health and Environment
	*Structural Safety of Built Environment
*Agricultural Development, Introduction to Formal Analysis of Conflict and Cooperation	

[The University of Tokyo]
Education Program- (2) Environmental Management

Program	Curriculum
Environmental Management	Sustainability of Ecosystem
	Sustainable Energy Society
	Sustainable Development
	Life Assessment
	Environmental Audit
	Environmental Energy Study
	Intellectual Property Right
	Energy Tax System
	Resources and Energy
	Kyoto Mechanism
Environmental Finance	

5.3 Osaka University

[Osaka University]
Graduate School of Engineering

Division of Sustainable and Environmental Engineering

<Aim at the Lecture>
*Achieve synergy by uniting the academic fields on "Environment" and "Energy."

- Environmental Management
- Sustainable Environmental Design
- Circulatory Material and Resources
- Sustainable Energy
- Quantum Energy

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[Osaka University]
Curriculum of
Environmental Management Program

<Aim in the Lecture >
* Technology for conservation of the environment and resources
* The social systems for their application, diffusion and management

- Environmental Management for Sustainable Energy and Industrial Systems
- Engineering and Risk
- Environmental Dynamics Adv.
- Environmental Modeling Adv.
- Bio-Environmental Conservation Engineering
- Thermal Environment System Adv.

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[Osaka University]
Curriculum of
Sustainable Environmental Design Program

<Aim in the Lecture >
* A Relationship between human beings and environment
* Seek the modality of sustainable cities and living environment

- Principles of Urban Symbiosis
- Design Techniques for Symbiotic Environment
- Spatial Design for Symbiotic Environment
- Information, Media and Communication
- Environmental Communication and Risk Communication
- Engineering System Design for Sustainability

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[Osaka University]
Curriculum of
Circulatory Material and Resources Program

<Aim in the Lecture >
*Material development for zero-waste materials and waste reclamation.
*Environmentally-friendly processes including bio-process, biomaterials, diagnosis and remedy of body tissue, and medical and rehabilitation technologies

- Advanced Environmental Materials and Circulatory Utilizing System of Resources, Adv.
- Quantum Beam Bio-engineering
- Advanced Medical Engineering
- Rehabilitation Engineering
- Bio Resource Engineering
- Green Chemistry
- Nanoscience and Nanotechnology

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[Osaka University]
Curriculum of Sustainable Energy Program

<Aim in the Lecture >
*Technologies and design of energy conversion system such as nuclear power generation, new energy materials, application of renewable energy saving system

- Energy Conversion Material
- Energy and Fluid Engineering
- Energy System Design Engineering
- Applied Plasma Engineering
- Demand-Side Energy System Engineering
- Global Metabolism and Cycles
- Environmental Planning and Management in Global Society

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[Osaka University]
Curriculum of Quantum Energy Program

<Aim in the Lecture >
*Basic Science such as reactor physics, thermal dynamics, fluid dynamics and computing science
*Energy development and application such as safety, renovation reactor, fusion, quantum beam, medical and bio technologies

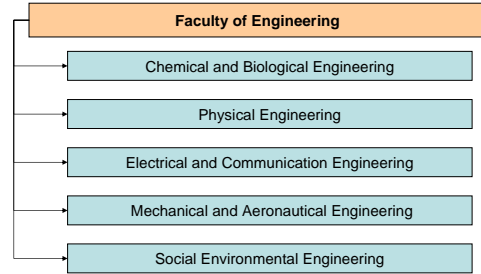
- Reactor Physics
- Nuclear Reactor Control
- Nuclear Fuel and Materials
- Advanced Safety Engineering for Nuclear Reactor
- Nuclear Reactor Fusion Reactor Engineering
- Quantum Beam Chemistry
- Laser Energetics

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5.4 Nagoya University

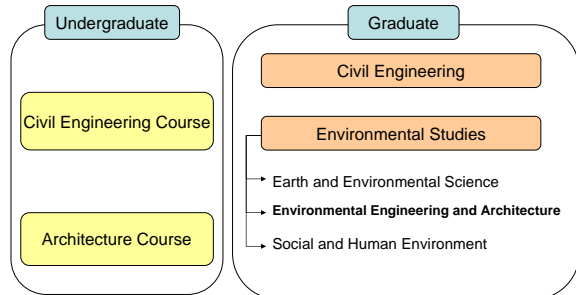
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[Nagoya University] School of Engineering



26

[Nagoya University] Department of Social Environmental Engineering

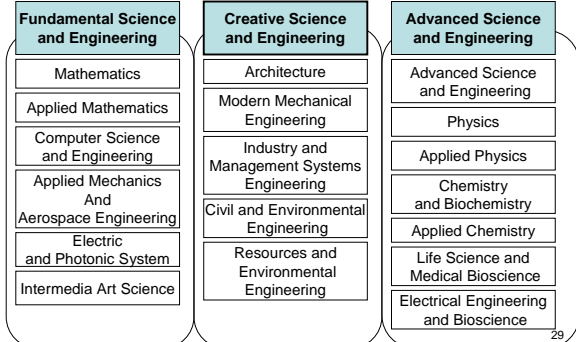


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5.5 Waseda University

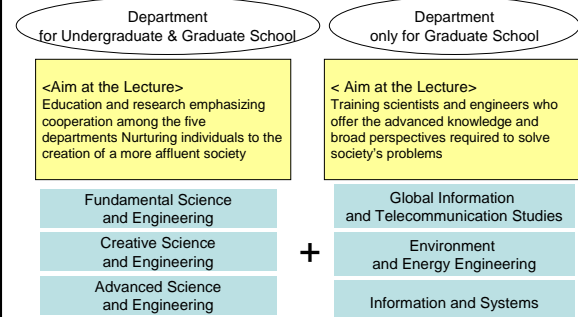
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[Waseda University] Faculty of Science and Engineering



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[Waseda University] Faculty of Science and Engineering



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[Waseda University]
Curriculum of Architecture

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
General, Drawings, Exercises in Architectural Design	Environmental Aspects of Buildings and Cities Architecture and Society Architectural Design and History Architecture and Building Engineering Building Laws Principles of Architectural Planning Mathematics for Engineering Mechanics A Creative Science and Technological Literacy		Structural Design and Planning Exercises for Architecture Building Environment and Services Design Drawings Structural Design Drawings Experiments in Building Materials A-D Architecture and Information		Graduate Seminar (Practice/survey research)	
	Practical Training in Architectural Design Exercise of Architectural History Exercise in City Planning Exercise of Architectural Environment Structural Design Exercises Practice of Construction Process					
Architectural Art			<Architectural Planning> <Architectural History> <City Planning>			
Building Engineering			<Building Production> <Structural Design> <Engineering for building Environment>			

* Data Source from Waseda Uni. Official HP

[Waseda University]
Curriculum of Resources and Environmental Engineering

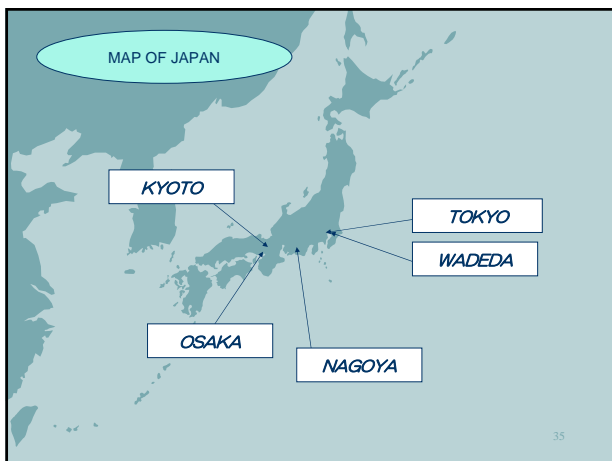
	Graduate	Undergraduate
	Environment and Safety Engineering Environment Study of Ecological System Advanced Aquatic Chemistry Resources Recycling Resource Separation Technology Materials Processing Engineering Formation Fluid and Environmental Engineering Advanced Numerical Production Engineering Applied Geophysics	Rock Mechanics Numerical Rock Mechanics Fundamentals of Reservoir Engineering Reservoir Simulation Environmental Geology Computational Methods for Underground Flow Economics of Resources and Environment Mathematics Electromagnetics Chemical Thermodynamics Strength of Materials Inorganic Chemical Analysis Laboratory Mineralogy and Petrology Introductory C Programming Introduction to Environment and Safety Engineering Introduction to Resource Processing and Recycling Introduction to GeoproductionEngineeringIntroduction to Development and Environmental Engineering Environmental Engineering Materials Processing Engineering Principles Creative Science and Engineering Literacy Development

6. Examples: Energy Programs of 5 Japanese universities

Characteristic	Kyoto	Tokyo	Osaka	Nagoya	Waseda
Energy faculty	x	x	x	x	x
Course of Energy Science	o	x	o	x	o
Special Course of Energy Management	x	o	o	x	o
Lately Reorganized	o April, 2010	x	o April, 2006	x	o April, 2010

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- 7. Conclusion**
- In Japan, Energy Engineering programs are provided at many universities, even in under-graduate school.
 - But, there is no faculty named "Energy Engineering".
 - There is no lecture titled "Energy Efficiency".
 - In graduate schools, there are programs named "Energy + something".
 - Today we introduced 5 major universities as examples. In those universities, Energy Engineering Study is taught on three department :Electrical Engineering, Mechanical Engineering and Building Engineering.
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Thank you for your attention!

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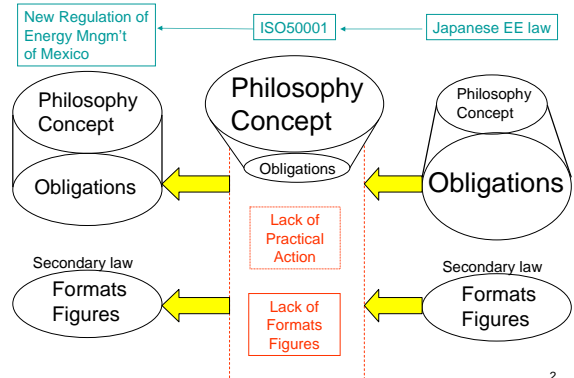
ISO50001 & Energy Management Regulation

August, 2010

JICA Study team
TEPCO

1

Roadmap for the new Regulation in Mexico



2

ISO50001 vs ISO14001

1. Environmental management is achieved by Energy management.
2. So, many companies which was qualified by ISO140001 is well suited for ISO50001.
3. In addition, "Table of Contents" is almost the same in ISO14001 & ISO50001.

ISO50001	ISO14001
1.Scope	1.Scope
2.Normative references	2.Normative references
3.Terms and definitions	3.Terms and definitions
4.Energy management system requirements	4.Environmental management system requirement
4.1 General requirement	4.1 General requirements
4.2 Management responsibility	4.2 Energy policy
4.3 Energy policy	4.3 Planning
4.4 Energy planning	4.4 Implementation and operation
4.5 Implementation and operation	4.5 Checking
4.6 Checking Performance	4.6 Management Review
4.7 Management review	

3

Contribution by the Japanese Government for ISO50001

1. Purpose
 - To input Japanese experience for the process
 - To avoid the overlap in both procedures
- 2.contribution of Japanese opinion
 - the objective of ISO50001 is Energy Efficiency, not cost reduction nor water saving
3. result
 - Japanese companies must obey the Japanese law for energy efficiency, then it is easy for them to get the certificate of ISO50001 with little additional procedures.
 - This means that proposed ISO50001 fit to Japanese law for energy efficiency.

4

Comparison of ISO with Japanese EE Law

	ISO50001	Japanese EE Law
Basic Concept	Support for Independent Activity	Mandatory rules with numeric standards in secondary law
Sites	All applicants	Over threshold
Report	Record internally	Report to the Government
Target	Reduction target individually	1% reduction
Action plan	Necessary to make a plan internally	Long and medium term plan to be submit to the Government.
Operation management	Standard to keep an effective operation and maintenance	Evaluation criteria for operation, measurement, maintenance
Internal inspection	Necessary	Not necessary
Inspection	Non-governmental org.	METI
Necessity of qualified person	No	Energy Manager
Evaluation criteria	Not specified	Specified in detail by secondary law
Evaluation of performance	Observation of significant energy consumption and availability of action plan	Report (energy consumption, specific energy consumption rate, concrete technical index)

5

Same points of ISO50001 & Japanese EE law

item	contents
goal	To make the best effort of energy management and operation
Target figure	necessary
Improvement by PDCA	necessary
Baseline	To be set
Involvement of the Top management	Board member should be involved in the scheme

6

**Main Discussion Points about EMS
In order to make the ISO50001 be a National Regulation**

- 1. Designation of Energy and Consumers
- 2. Implementing Organization
- 3. Qualifications/Licenses of Energy Managers
- 4. EE&C Activities within the Site
- 5. Periodical Reports to the Regulators
- 6. Monitoring and Checking
- 7. Inspection and Penalty
- 8. others

7

1.Designation of Consumers (ISO50001)

All Organization (Open-ended)

1.Designation of Consumers (Japanese Law)

Designated Organization and Category of Business Entities

Annual Energy Consumption (t/year of crude oil equivalent)		3,000 kt/year and above	1,500 kt/year – 3,000 kt/year	Less than 1,500 kt/year
Designated Organizations		Type 1 Energy Management Factory	Type 2 Energy Management Factory	—
Responsibilities of Business Entities	Person to be appointed	Energy Manager Energy Management Officer	Energy Management Officer	—
	Report to be submitted	EE&C Results Report Middle and Long Term Plan Report	EE&C Results Report	—
Responsibility		Responsibility of Evaluation Criteria (Establishment of Management Standards, Implement of measures for EE&C)		
Target number		1 %/year improvement of unit energy consumption in the long and medium term		
Check by government authorities		Guidance and Advise/ collection of the reports of energy consumption Investigation of factories and buildings Investigation of the situation and Observation of Evaluation Criteria		

8

2. Implementing Organization (ISO50001)

International Organization for Standardization (ISO)

<Certifying Organization>:

The Japan Accreditation for Conformity Assessment (JAB)

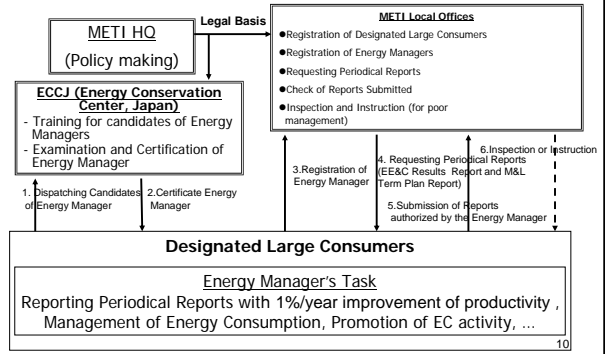
<Certified Company>

- (1) Moody International Certification LTD.
- (2) Bureau Veritas (Japan Branch)
- (3) ISOQAR Japan Co.,Ltd.
- (4) Management System Assessment Center.
- (5) Japan Quality Assurance Organization etc.

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2. Implementing Organization (Japanese Law)

Players of Energy Management Regulation



10

3. Qualifications/Licenses of Energy Managers (ISO50001)

The License is Unnecessary.

The Business Affairs must put into work by a Management Representative appointed The Administration.

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3. Qualifications/Licenses of Energy Managers (Japanese Law)

Function of energy manager

item	Executive Energy Supervisor	Energy Planning Promoter	Energy Manager	Energy Officer
function	(HQ) - Impulsion management standpoint - Make of Mid-and-Long Term Plan - Practical control	(HQ) - Assist a Energy supervisor	(One of factory) - Stationed at Type 1 Energy Management Factory (One of Building) - can be outsourced	(Type 1 Building) - To be stationed (Type 2 Factory +Building) - To be stationed
qualification	(Board member)	Person who finish One day training course	Energy Manager with national license	Person who finish One day training course
quantity of qualified person	—	—	54,154 persons	42,325 person

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7. Inspection and Penalty (ISO50001)

There is no penalty, because ISO is the private standard.

But, when the wrong performance is found in regular survey (twice a year) or renewal review (once every three years), the company has to submit paper of all things to improve.

And then, the company should implement according to the submitted paper. They have to check the result by internal audit.

After internal audit, they have to be checked by certification organization as a whole.

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7. Inspection and Penalty (Japanese Law)

1. When wrong and no report of energy consumption, mid-and-long term plan were submitted,

→ Carry a fine up to five hundred thousand-yen.(62,500MXD)

2. When energy manager were not appointed,

→ Carry a fine up to a million-yen.(125,000MXD)

3. When the renewal of energy manager were not reported,

→ Carry a fine up to two hundred thousand-yen.(25,000MXD)

4. All inadequate performance,

→ announcement of company name, and carry a fine up to a million-yen.

20

8. Others (ISO50001)

1. Energy definition

Electricity, Fuel, Steam, Heat, Compressed air, Renewable

2. Target item of management

To be decided by the organization.

3. Specific energy consumption

Not determined

4. Energy base line

can be decided by the organization.

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8. Others (Japanese law) No.1

1. Energy definition

Electricity, Fuel, Heat

2. Target item of management

Building and factory

3. Specific energy consumption

Divide annual use of energy by anything to get specific energy consumption.

4. Energy base line

(1) previous year and this year.

(2) average of 1% reduction of specific energy consumption per year is required.

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8. Others (Japanese law) No.2

(3) Benchmark standard regulation was started this April.

Schedule of Introduction of SBA

FY	Consultation in the ISCM	Execution
2008	3 sub-sectors (power, iron & steel (3 types furnace) and cement) were selected and authorized as a first stage.	
2009	Next sub-sectors (chemical, paper&pulp, oil refinery) are under consultation.	
2010		From 2010 FY, the first 3 sub-sectors will be executed.
2011		From 2011 FY, the next 3 sub-sectors are planned to be executed.

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**Draft Proposal for
the New Mexican Energy Management Regulation
based on the ISO50001**

Materials for discussion

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1. Designation of Energy and Consumers

(1) Energy

Electricity	Fuel	Heat
-------------	------	------

(2) Management should be carried out not by sites but by **organizations**

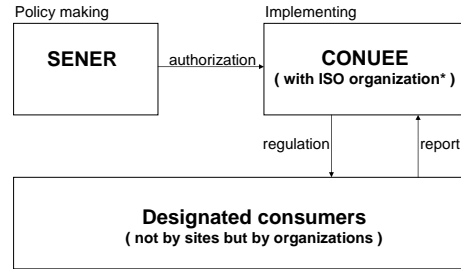
(3) Category & Thresholds*

	1st Class	2nd Class
Manufacturers	●●toely or more	●●toely or more
Non-manufacturers	●●toely or more	●●toely or more
Central Government	●●toely or more	●●toely or more
Local governments	●●toely or more	●●toely or more

* Thresholds can be in CO2 emission.

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2. Implementing Organization



* ISO organization : entrusted companies in ISO certification processes

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3. Qualifications/Licenses of Energy Managers

(1) category

Electric Engineering	Mechanical Engineering
----------------------	------------------------

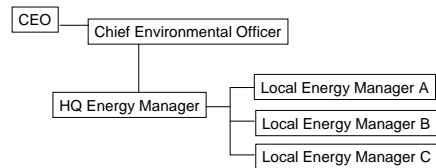
(2) pathway

A	3 year experience + 1 week lecture
B	1 year experience + 1 day examination

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4. Activities within the companies and the sites

(1) Involvement of the Board Members



(2) Operation Management Manuals with numeric criteria for major Equipments

- operators can check the operation data for better performance

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5. Periodical Reports to the Regulators

3 kinds of report shall be submitted once a year.

A	B	C
Energy consumption data	Investment plan	Benchmarking figures
with comparison with the previous years	to reduce energy consumption	for comparison with others

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6. Monitoring and Checking

Based on the procedures of ISO50001, PDCA cycle will be carried out for the better performance of energy efficiency. This is internal procedure.



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7. Inspection and Penalty

1. ISO scheme & organizations can be utilized for regulation scheme with the authorization by the regulators. This will help to minimize the operation cost of the scheme.
2. Penalties and/or fines are not the major purpose. To achieve the improvements of designated consumers is most important.

frequency	Twice a year	Once in 3 years
Contents	- Random check - Check the failure of management mechanism	- Interview with board members - Check the figures - Formal fine with penny

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Thank you for your attention.

Let's discuss in details.

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System of Random check on Site in Japan

JICA Study Team
Yoshiharu Ikeuchi

Contents

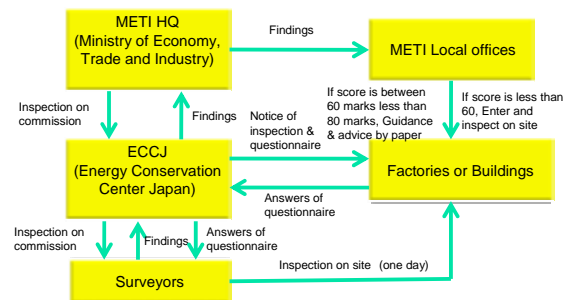
1. Chief Aim of Random Check on Site	3
2. Players of Random Check on Site	4
3. Number of Factories and Buildings Carried Out Random Checks On Site a Year	
4. Factories or Buildings Excepted from Random Selection	5
5. Contents of Questionnaire	7
6. Status of Energy Consumption and Transition of Energy Intensity	8
7. Annual Energy Consumption Table	9
8. Evaluation of Criteria, Management Standard and Self-Check List	11
9. Necessary numbers of Self-Check List	17
10. How to Score Marks	18
11. Penalty depending on evaluation marks	20

1. Chief Aim of Random Check on Site

- >To check the status of energy management (Status of energy intensity for past five years)
- >To check the status of energy conservation activities
- >To check the status of establishing " Management standard" and observing them

3

2. Players of Random Check on Site



4

3. Number of Factories or Buildings Carried Out Random Checks On Site a Year

1. Selection
METI HQ makes a plan and select random check site.
2. Case of FY 2010
 - (1) Designation of Business Type (300-400)
 - 1/3 of Food Industry
 - 30 % of Manufacturer of Transportation Equipment
 - (2) At Random Selection for Site
 - 200 Factories or Buildings (Type-1:100, Type-2:100)
 - (3) At Random Selection for HQ
 - 10 HQ

Number of Surveyors

Surveyors : Approximately 80 persons through 5 blocks in Japan and they are selected among experts of rational energy use in ECCJ

5

4. Following factories or buildings are excepted from selection in this year

- (1) Designation of business type
 - > Factories or buildings which received the document of conforming to the standards of judgment issued from "Registered Investigation Bodies" in previous year
- (2) At random selection for site
 - > Factories or buildings which received the document of conforming to the standards of judgment issued from "Registered Investigation Bodies" in previous year
 - > Factories or buildings selected as the designation business type in previous year
 - > Factories or building selected as the random selection for site in previous year
 - > Factories or buildings got the award of excellent energy management factories or buildings in previous year

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5. Contents of Questionnaire

1. Number of licensed energy managers
2. Observing status for evaluation criteria concerned with rational use of energy
 - Transition of energy intensity for past five years
 - Reasons why couldn't improve 1% reduction of energy intensity, if not achieved
 - Observing status for evaluation criteria concerned with rational use of energy
 - Summary of energy consumption in previous year
 - Management standard of each equipment
3. Energy conservation activities
 - Programs for annual reduction target and medium and long-term activities
 - Status of new installed equipment, improved equipment and strengthening energy management for past 4 – 5 years
 - Energy management activities

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6. Status of Energy Consumption and Transition of Energy Intensity

	2005	2006	2007	2008	2009
① Consumption of fuel and heat (GJ)					
② Electricity consumption	(1000 kWh)				
	(GJ)				
③ Total (GJ)					
④ In terms of heavy oil (kL)					
⑤ Amount of product					
⑥ Energy intensity					
⑦ Rate against previous year					

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7. Annual Energy Consumption Table (1)

Process	Facility and equipment		Energy consumption				Energy consumption rate	MS			
	Kind	Capacity & unit	Fuel and heat	Electricity	Total	None					
			GJ	kL	MWh	kL	kL				
A division	Air-conditioner	18	34,278	884	1,478	372	1,256	10.3	4		
	Absorption chiller	4	47,858	1,227	111	28	1,235	10.3	4		
	Lighting				3,528	889	889	7.3	1		
	Subtotal			81,837	2,111	5,115	1,289	3,409	27.3	4	
	Others			0	0	495	116	116	0.9	1	
B division	Total			81,837	2,111	5,884	1,407	3,518	28.3	4	
	Air-conditioner	16	29,894	774	1,290	330	1,899	15.8	4		
	Lighting			0	431	110	110	0.9	1		
	Subtotal			29,894	774	4,214	1,007	1,861	15.3	4	
	Others			0	431	110	110	0.9	1		
Manufacturing division	Total			29,894	774	4,251	1,197	1,971	16.2	4	
	Inc. furnace	10 ton x2			4,800	1,210	1,210	9.9	1		
	Compressor	10kWx4			254	64	64	0.5	1		
	Air-conditioner	11	21,425	853	920	233	789	6.4	4		
	Lighting				3,654	763	763	6.3	1		
Power service division	Subtotal			21,425	553	9,003	2,269	2,832	23.1	4	
	Others			0	0	131	33	33	0.3	1	
	Total			21,425	553	9,134	2,302	2,865	23.4	4	
	Steam boiler	3	97,984	2,528	187	47	2,575	21.1	2		
	Co-generation	480kW x2			26,124	674	58	15	689	5.6	1
Total	Incinerator	50/day x1			9,457	244	65	16	260	2.1	1
	Lighting						885	223	223	1.8	1
	Transformer & power supply						369	93	93	0.8	1
	Subtotal									0.6	1
	Others				0	0	75	19	19	0.2	1
Full total	Subtotal			133,565	3,446	1,564	394	3,840	31.5	4	
	Others			0	0	75	19	19	0.2	1	
	Total			133,565	3,446	1,639	413	3,859	31.6	4	
	MS: Number of management standard										

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7. Annual Energy Consumption Table (2)

Process	Facility and equipment		Energy consumption				Energy consumption rate	MS	
	Name	capacity & unit	Fuel and heat	Electricity	Total	None			
			GJ	kL	MWh	kL	kL		
Power service division	Steam boiler	3	97,984	2,528	187	47	2,575	21.1	2
	Co-generation	480kW x2	26,124	674	58	15	689	5.6	1
	Incinerator	50/day x1	9,457	244	65	16	260	2.1	1
	Lighting				885	223	223	1.8	1
	Transformer & power supply				369	93	93	0.8	1
Total	Subtotal								0.6
	Others			0	0	75	19	19	0.2
	Total			133,565	3,446	1,639	413	3,859	31.6
	MS: A number of management standard								

* Including estimated value

MS: A number of management standard

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8. Evaluation Criteria, Management Standard and Self-Check List

Evaluation criteria of rational energy use (6 items)

- 4 items to be managed in each facility (equipment) such as (1) Management method
 (2) Measurement & Record
 (3) Maintenance & Inspection
 (4) Measures for new facilities installation

Management Standards

Self-check list with establishing and observing status related with above 4 items

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8. Evaluation criteria of rational energy use (2)

NO	Contents
1.	Rationalization of combustion of Fuels
2.	Rationalization of heating and cooling as well as heat transfer. <ul style="list-style-type: none"> ● Heating units, etc ● Air-conditioning equipment and hot water supply system, etc.
2-1	
2-2	
3.	Recovery and utilization of waste heat.
4.	Rationalization of conversion of heat into power, etc. <ul style="list-style-type: none"> ● Exclusive generation system ● Cogeneration system
4-1	
4-2	
5.	Prevention of Energy loss due to emission, conduction, resistance, etc <ul style="list-style-type: none"> ● Prevention of heat loss due to radiation and conduction, etc ● Prevention of electricity loss due to resistance, etc
5-1	
5-2	
6.	Rationalization of conversion of electricity into power, heat, etc. <ul style="list-style-type: none"> ● Electric motor appliances and electric heating appliances, etc ● Lighting system, elevating machines, office appliances and consumer equipment
6-1	
6-2	

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8. Details of Evaluation Criteria (3)

1. Rationalization of combustion of Fuel

(1) Control of Fuel Combustion

- ① Air ratio shall be controlled according to the type of the combustion equipment and fuel used therein. **"Management Standard"**
- ② For combustion equipment, the air ratio shall be lowered based on the value of the Attachment No.1(A). **"Criteria"**
- ③ In a case of multiple equipment use, overall thermal efficiency shall be controlled by the load adjustment. **"Management Standard"**
- ④ For the purpose of enhancing combustion efficiency, fuel properties shall be controlled.

(2) Measurement and record pertaining to Fuel Combustion

The fuel amount supplied, temperature of an exhaust gas amount of oxygen in an exhaust gas, etc. shall be measured and recorded. **"Management Standard"**

(3) Maintenance and Inspection of Combustion System

For the combustion system, periodic maintenance and inspection shall be performed to keep the good condition. **"Management Standard"**

(4) Measures to be Taken for the New Installation of Combustion Equipment

- ① Combustion equipment shall be introduced which is capable of adjusting the fuel supply and the air ratio to a proper level according to load fluctuations.
- ② A ventilation system shall be introduced after regulating the air flow rate and the combustion chamber pressure.

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8. Sample of Management Standard (4)

Control Field

Name of Equipment

Check Points

Standard Value of the Check Point

How to control

Data Measurement and Recording

Maintenance Schedule (if necessary)

14

8. Sample of Self-Check List and Marking Method (5)

No of MS	Name of equipment	Energy consumption	Energy consumption rate	
2	Steam boiler	2,575 kL	21.10%	
(1) Control or criteria				
NO.	Contents (Management standard items of control or criteria)	Establishing status	Observing status	Evaluation of inspector
	○: Items of evaluation criteria are reflected to management standards. △: partially reflected. ×: not reflected.	○	△	
	○: Facility management is done based on Control of Standard. △: partially done. ×: not done.			
(2) Measurement and record				
NO.	Contents (Management standard, items of measurement and record, frequency)	Establishing status	Observing status	Evaluation of inspector
	○: More than 80% of established frequency. △: more than 50% and less than 80% of established frequency. ×: less than 50% of established frequency.			
(3) Maintenance and inspection				
NO.	Contents (Management standard, items of maintenance & check, frequency)	Establishing status	Observing status	Evaluation of inspector
	○: More than 80% of established frequency. △: more than 50% and less than 80% of established frequency. ×: less than 50% of established frequency.			
(4) Measures for new installation of equipment				
NO.	Content (New installation of equipment in previous year)	Establishing status	Observing status	Evaluation of inspector

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8. Sample of Recorded Self-Check List (5)

No of MS	Name of equipment	Energy consumption	Energy consumption rate	
2	Steam boiler (3t/h x2, 6t/hx1)	2,575 kL	21.10%	
(1) Control or criteria				
NO.	Contents (Control or criteria)	Establishing status	Observing status	Evaluation of inspector
1.(1)①	Air ratio <1.3	○	△	○
1.(1)③	Control of load	○	×	○
2-2(1)②	Control of steam pressure, temp, volume	○	○	○
2-2.(1)③	Setting the operation units	○	○	○
3.(1)①	Flue gas temp. <250 C	○	○	○
3.(1)③	Volume of recovery drain >80%	○	○	○
6-1.(1)①	Stop unit when no necessary	○	○	○
6-1.(1)②	Control of operation units	○	○	○
6.1.(1)③	Rated currency and voltage	○	○	○

30 marks

Contents of NO. are connected with evaluation criteria

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9. Necessity Numbers of of Self-Check Lists

Self-check lists of equipment which cover over 80% out of total energy consumption should be prepared and sent to METI



Surveyor checks the establishing status and observing status for each Self-check List. And score marks.

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10. How to Score Marks (1)

In case of Self-Check List of boiler

(1) Management or standard

- There are 9 items (see the previous sheet)
- 4 marks is perfect for one item (Establishing status: 2marks, Observing status: 2 marks)
- ○: 2 marks, △: 1 mark, ×: 0 mark
- In this case, 36 marks is perfect
- Surveyor score the 30 marks

In the same way

(2) Measurement and record

- If there are 4 items
- Full mark is 16
- Surveyor scores 14 marks

$$\text{Score} = (30 + 14 + 16) / (36 + 16 + 20) \times 0.211 = 17.6$$

(3) Maintenance and inspection

- If there are 5 items
- Full marks is 20
- Surveyor scores 16 marks

Consumption rate

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10. How to Score Marks (2)

In the same way,
Surveyor score marks from another self-check lists
of equipment as same way as previous sheet.



Surveyor scores total marks from all self-check lists.



Finding including total scored marks made by
surveyor is sent to ECCJ

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11. Penalty depending on evaluation marks

Score marks ≥ 80 marks out of 100 : Success
80 marks > Score marks ≥ 60 marks
: Guidance and advice by paper
Score marks < 60 marks : Enter and inspect on the spot



After getting final results of on site inspection, METI local
office sends "Guidance and Advice" by paper or " Enter
and Inspect on the Spot" within one or two weeks.



METI instructs to make the improvement plan based on
above guidance and advice. Announce the name of
company, if not followed.

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A
Big
Thank You!!

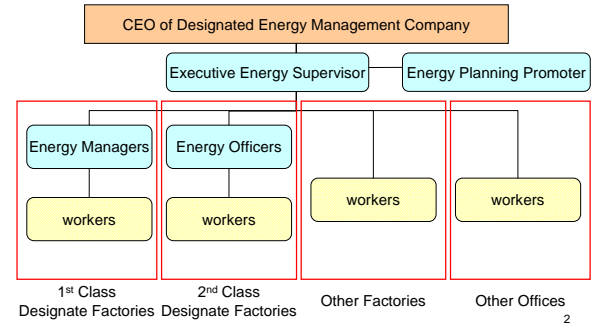
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Details of Training Programs for Energy Managers in Japan

August, 2010

Hiroataka Matsuoka
JICA Study Team

1. Designates Energy Management Company



2. Function of energy manager

item	Executive Energy Supervisor	Energy Planning Promoter	Energy Manager	Energy Officer
function	(HQ) · Impulsion management standpoint · Make of Mid-and-Long Term Plan · Practical control	(HQ) · Assist a Energy supervisor	(One of factory) · Stationed at Type 1 Energy Management Factory (One of Building) · can be outsourced	(Type 1 Building) · To be stationed (Type 2 Factory +Building) · To be stationed
qualification	(Board member)	Person who finish One day training course	Energy Manager with national license	Person who finish One day training course
quantity of qualified person	—	—	54,154 persons	42,325 person

3. Examination and Training of Energy Management

	Energy Manager		Energy Officer		Not eligibility requirements
	Energy Manager Examination	Energy Management Training	Energy Management Course		
			The Course for new applicants	The Course Improving quality of them	EE&C Practice Course
timing of implementation	Annually (August)	Annually (December)	Twice a year	Once a year or more	Many times a year
method	Examination	Training of 6 day and Examination on the last day	Attending a course	Attending a course	Attending a course
applicants per a year ('09)	12,034	1,907	13,925	3,557	4,060
examination pass rate	20~30%	60~70%	All who finished	All who finished	—
Started	1979	1979	1998	1998	1978
see	P5~P7	P8~P11	P12~P13	P14	P15~P25

4. Examination Subjects of Energy Management (No.1)

Possessing more than 1-year experience in the energy management business.

Common Basic and Pick out Optional Area of Specialty

Common Basic

- Outline of Energy Management and Law and Regulations
 - Energy Conservation Law and Regulations
 - Energy Situation, Policy and General Statement
 - Basic of Energy Management Technology

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4. Examination Subjects of Energy Management (No.2)

Heat Field (optional)

- Basic Theory in Heat and Fluid
 - Basic theory in thermodynamics
 - Basic theory in fluid mechanics
 - Basic theory in heat transfer mechanics
- Fuel and Combustion
 - Fuel and combustion management
 - Calculation of combustion
- Heat Utilization Facility and its Management
 - Measurement and control
 - Heat utilization facility

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4. Examination Subjects of Energy Management (No.3)

Electricity Field (optional)

2. Basic Theory in Electricity
 - (1) Basic theory in electricity and electronics
 - (2) Automatic control and information processing
 - (3) Measurement of power
3. Facility and Equipment
 - (1) Distribution in Factory
 - (2) Electric Equipment
4. Application of Electricity
 - (1) Application of Electric Power
 - (2) Electric Heating
 - (3) Electrochemical
 - (4) Lighting
 - (5) Air Conditioning

7

5. Energy Management Training (No.1)

Only persons possessing 3 years or more experience in the energy management business.

Attend The Training of 6 day before The Examination

Common Basic

1. Outline of Energy Management and Law and Regulations
 - (1) Outline of Energy Management
 - (2) Energy Conservation Law and Regulations

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5. Energy Management Training (No.2)

Heat Field (optional)

2. Basic Theory in Heat and Fluid
 - (1) Basic theory in thermodynamics
 - (2) Basic theory in fluid mechanics
 - (3) Basic theory in heat transfer mechanics
3. Fuel and Combustion
 - (1) Fuel and combustion management
 - (2) Calculation of combustion
4. Heat Utilization Facility and its Management
 - (1) Measurement and control
 - (2) Boiler, steam transmission and accumulator, steam mover, internal combustion engine, gas turbine
 - (3) Heat exchanger, heat recovery, chiller, air conditioner
 - (4) Incinerator, material of heat facility
 - (5) Distillation/boiling/condenser facility, drying facility, carbonization and gasification facility

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5. Energy Management Training (No.3)

Electricity Field (optional)

2. Basic Theory in Electricity
 - (1) Basic theory in electricity and electronics
 - (2) Automatic control and information processing
 - (3) Measurement of power
3. Facility and Equipment
 - (1) Distribution in Factory (Planning / Operation / EE&C)
 - (2) Electric Equipment (Outline of electric equipment / Rotating and stationary machine / EE&C in electric equipment)

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5. Energy Management Training (No.4)

Electricity Field (optional)

4. Utilization of Electricity
 - (1) Utilization of Electricity (Outline of utilization of electric power / Facility of utilization of electric power / EE&C in utilization of electric power)
 - (2) Electric Heating (Theory of electric heating and its facility / EE&C in electric heating)
 - (3) Electrochemical (Theory of electrochemical and its facility / EE&C in electrochemical)
 - (4) Lighting (Theory of lighting and its facility / EE&C in lighting)
 - (5) Air Conditioning and Heating (Theory of air conditioning and its facility / EE&C in air conditioning and heating)

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6. Energy Management Course (The course for new applicants)

Energy Management Course is the course to be Energy Officers, Certificate will be given after attending the course.

They can be Energy Planning Promoters or Energy Officers with this certificate.

I . Lecture

1. Basic Knowledge for Outline of Energy Management and Law

- (1) The importance of EE&C
- (2) Energy Policy and Law
- (3) EE&C Plan

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6. Energy Management Course
(The course for new applicants)

2. Energy Management Method
 - (1) Basic of Energy Management
 - (2) Basic of Heat
 - (3) Basic of Electrical Energy
 - (4) Air Conditioning and Lighting
3. Practical Business of Energy Management
 - (1) Evaluation Criteria and Management Standard
 - (2) Notification and Report to regulators
 - (3) Evaluation Criteria in factories and buildings

II . Examination

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6. Energy Management Course
(The Course Improving quality of them)

Energy Planning Assistant or Energy Officer for some company must attend the course every three years.

I . Lecture

Same as the course for new applicants

II . Examination

Same as the course for new applicants

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7.EE&C Practice Course

• This course has nothing to do with qualification and license. These are training programs conducted by the ECCJ for improving the capacity of the operators.

• These programs can be applied depending on each request.

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7.EE&C Practice Course

Training Program of Electricity Course (1)

First Term (EE&C of Building)

- **EE&C of Building**
 - Outline of law and regulation, and energy management
 - Outline of EE&C of building
 - EE&C of lighting
 - EE&C of AC
 - EE&C of transformer
 - Cogeneration
- **Measurement of Electricity**
 - Measurement of voltage and current
 - Measurement of electric power
 - Measurement of pressure, flow volume and temperature
 - Measurement method of each facility
- **Hands on Practice of Electricity Measurement**
 - Practice of measurement of pump
 - Practice of measurement of fan
 - Practice of measurement of lighting
 - Practice of measurement of high efficiency transformer
 - Practice of measurement of AC
 - Data arrangement and observation

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7.EE&C Practice Course

Training Program of Electricity Course(2)

Second Term (EE&C of Compressor)

EE&C of Compressor

- Type of compressors and their characteristics
- Axis power of compressor
- Protection of leakage and its effect
- Pressure loss of pipe
- Measurement tool and how to use
- EE&C of compressor equipment
- EE&C by control method
- EE&C of compressor

Hands on Practice of Compressor

- Hands on practice of compressor
- Data arrangement

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7.EE&C Practice Course

Training Program of Electricity Course (3)

Third Term (EE&C of Pump and Fan)

EE&C of Pump and Fan

- Type of pumps
- Characteristics of pump
- Operation and control of pump
- EE&C of pump
- Consideration points on installation and maintenance
- Type of fans and blowers
- Performance of fan
- Parallel operation and series operation
- EE&C of fan
- Diagnosis of faults

Hands on Practice of Pump and Fan

- Measurement of performance of pump
- Measurement of performance of fan
- Data arrangement

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7.EE&C Practice Course

Training Program of Electricity Course (4)

Fourth Term (Good Practice of EE&C of Electricity)

Introduction of Good Practice of EE&C in Electricity

Good practice of AC
Good practice of lighting
Good practice of compressor
Good practice of pump and fan
Good practice of transformer

Site Visit of EE&C Technology Application

Site visit
Introduction of EE&C sample in building
Q&A

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7.EE&C Practice Course

Training Program of Heat Course (1)

First Term (EE&C Technology of Heat and Combustion Management)

EE&C Technology of Heat

- 1.Outline of law and regulation, and energy management
- 2.EE&C technology and its application to site
- 3.Practical calculation method of heat

Fuel

Fuel

Combustion Calculation

Calculation method of combustion

Hands on Practice of Combustion

- 1.Combustion and hands on practice of explosion
- 2.Hands on practice of combustion

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7.EE&C Practice Course

Training Program of Heat Course (2)

Second Term (Steam Management and Steam Trap)

EE&C of Steam

Necessity of EE&C
Improvement of steam system in Energy Conservation Law
EE&C by utilization of steam
EE&C measures in steam utilization field

Hands on Practice of Steam

Measure of drain recovery
Practice of engineering software

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7.EE&C Practice Course

Training Program of Heat Course (3)

Third Term (Energy Assessment of Heat Facility)

Heat Balance Calculation and Assessment

Introduction of heat balance calculation
Practical assessment method
Case study of heat balance calculation
Answer of heat balance calculation

Practice of Finding Potential of EE&C

Introduction of good practice factory
Finding potential of EE&C (group discussion)

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7.EE&C Practice Course

Training Program of Heat Course (4)

Fourth Term (Good Practice of EE&C of Heat)

Introduction of Good Practice of EE&C in Heat

Improvement of combustion
Improvement of heat transmission
Improvement of heat radiation
Improvement of heat recovery

Site Visit of EE&C Technology Application

Site visit
Introduction of EE&C sample in building
Q&A

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7.EE&C Practice Course

Other Training Programs

(1) How to Find EE&C Potential in factories (Practice to Find EE&C Potential in Electricity and Fuel Consumption)

- 1.Issues and countermeasures for promoting EE&C
- 2.Methods to find EE&C potential and its application
- 3.Practice

(2) Energy Audit of Buildings (EE&C in Building Facility and Operation)

- 1.Law and regulations
- 2.EE&C of lighting
- 3.EE&C of AC
- 4.EE&C of pump and fan
- 5.Good practice of building EE&C
- 6.Practice of energy audit of buildings

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7.EE&C Practice Course

Other Training Programs

- (3) How to Make Management Standards
 - 1.Law and regulations
 - 2.Practice of making Management Standards
 - (1)Resource mapping and grasping current situation
 - (2)Selection of targeted equipments
 - (3)How to make the standards
 - (4)Drafting a sample standard
- (4) Site Visits of Good Practice Factory and Building
 - 1.Lecture
 - (1)Law and regulations
 - (2)Points of EE&C in factory and building
 - 2.Practice
 - (1)Introduction of overview of facilities
 - (2)Introduction of safety code
 - (3)Site visit and practice of energy assessment
 - (4)Presentation of the energy assessment by trainees

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Thank you for your attention!