付属資料

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【参考資料】

参考資料 1-1　判断基準

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	(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.	(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"**	(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 (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.
2 Rationalization of Heating, Cooling, and Heat Transfer	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) Intermittent 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"**	(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"**	(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"**	(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.
	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"**	(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"**	(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"**	(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 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.

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	(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"** (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"**			6) Newly-installed air-conditioners shall have a better efficiency than the standard energy consumption efficiency. (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. 1) Air-conditioners 2) Stoves 3) Gas Water Heaters 4) Oil Water Heaters 5) Gas Cooking Appliance
3 Recovery and Utilization of Waste Heat	(1) Standards of Recovery and Utilization of Waste Heat (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"** (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"** (c) For steam drains, the temperature, steam amount, properties shall be controlled. **"Management Standard"** (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"** (e) Waste heat shall be properly utilized.	(2) Measurement and Recording pertaining to Waste Heat The temperature, heat quantity, components shall be measured and recorded to understand the actual waste heat conditions and to facilitate the utilization. **"Management Standard"**	(3) Maintenance and Inspection of Waste Heat Recovery System 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"**	(4) Measures to be Taken for the New Installation of Waste Heat Recovery System (a)For the flue gas ducts and/or tubes, measures for maintaining the waste heat temperature shall be taken. (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.
4 Rationalization of the Conversion of Heat into Mechanical Power, etc.	4-1 Exclusive Generation System (1) Control of Exclusive Generation System (a) The operation of exclusive generation system shall be controlled to maintain the high-efficiency operation **"Management Standard"**. (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"**	(2) Measurement and Recording pertaining to Exclusive Generation System For the exclusive generation system, measurement and recording of matters pertaining to thermal efficiency shall be periodically performed. **"Management Standard"**	(3) Maintenance and Inspection of Exclusive Generation System For the exclusive generation system, maintenance and inspection shall be performed to keep the thermal efficiency at a higher level. **"Management Standard"**	(4) Measures to be Taken for the New Installation of Exclusive Generation System (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. (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.
	4-2 Cogeneration System (1) Control of the Cogeneration System (a) The operation of a plurality of boilers, etc. for a cogeneration system shall be controlled. **"Management Standard"** (b) When extractor/back-pressure turbines are used for a cogeneration system, allowable minimum value of extraction pressure/backpressure shall be controlled. **"Management Standard"**	(2) Measurement and Recording pertaining to Cogeneration System (a)Thermal efficiency of the system shall be measured and recorded. **"Management Standard"** (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"**	(3) Maintenance and Inspection of Cogeneration System For cogeneration system, maintenance and inspection shall be performed to keep the thermal efficiency at a higher level. **"Management Standard"**	(4) Measures to be Taken for the New Installation of Cogeneration System Cogeneration system shall have a proper level capacity determined after full consideration of the actual demand and the future trend in electrical power demand.

Category	Control	Measurement and Recording	Maintenance and Inspection	Measures to be Taken for the New Installation of Equipment

5 Prevention of Energy Loss due to Radiation, Conduction, Resistance, etc.	5-1 Prevention of Heat Loss Due to Radiation, Conduction, etc. (1) Standards of Thermal Insulation (a) Insulation work for heat utilizing equipment shall be performed in compliance with the JIS standard and other appropriate standards. (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"** In a case where such insulation measures are available to existing furnaces, the same measures shall be taken. **"Criteria"**	(2) Measurement and Recording pertaining to Heat Loss 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"**	(3) Maintenance and Inspection of Heat Utilizing Equipment (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"** (b)The maintenance and inspection of the equipment shall be performed to prevent steam leakage from the steam trap. **"Management Standard"**	(4) Measures to be Taken for the New Installation of Heat Utilizing Equipment (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. (b)Openings of the equipment shall be minimized or sealed up in order to prevent the heat loss due to radiation. (c)The path of heat medium conveying pipes shall be rationalized to reduce the radiating area.
	5-2 Prevention of Electricity Loss due to Resistance, etc. (1) Control of Power Receiving/Transformation System and Distribution facility (a) For transformers, etc., the proper demand factor shall be maintained. **"Management Standard"** (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"** (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. (d) Phase-advance capacitors shall be controlled by an on and off operation in response to the type of the installed equipment. **"Management Standard"** (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"** (f) When electric using appliances are in service, the maximum current shall have to be reduced by leveling the electric power load. **"Management Standard"** (g) In addition, electrical power loss in the receiving/transformation system and in the distribution facility shall be reduced. **"Management Standard"**	(2) Measurement and Recording pertaining to Power Receiving/Transformation System and Distribution Facility 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"**	(3) Maintenance and Inspection of Power Receiving/Transformation System and Distribution Facility Power receiving/transformation system and distribution facility shall be maintained and inspected in order to keep their good condition. **"Management Standard"**	(4) Measures to be Taken for the New Installation of Power Receiving/Transformation System and Distribution Facility (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. (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."
6 Rationalization of the Conversion of Electricity into Mechanical Power, and Heat, etc.	6-1 Electric Motor Appliances and Electric Heating Appliances, etc. (1) Control of Electric Motor Appliances and Electric Heating Appliances, etc. (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"** (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"** (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"** (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"** (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"** (f) Voltages and currents, etc. shall be controlled on the basis of electric equipment in order to reduce the electrical power loss. **"Management Standard"**	(2) Measurement and Recording pertaining to Electric Motor Appliances and Electric Heating Appliances, etc. For the electric motor appliances and electrical heating appliances, etc., measurement and recording of the voltages/ currents, etc. shall be performed. **"Management Standard"**	(3) Maintenance and Inspection of Electric Motor Appliances and Electric Heating Appliances, etc. (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"** (b)The maintenance and inspection of fluid machinery shall be performed to prevent the fluid leakage and to reduce the pipe resistance. **"Management Standard"** (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"**	(4) Measures to be Taken for the New Installation of Electric Motor Appliances 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.

Category	Control	Measurement and Recording	Maintenance and Inspection	Measures to be Taken for the New Installation of Equipment
6 Rationalization of the Conversion of Electricity into Mechanical Power, and Heat, etc.	6-2 Lighting System, Elevating Machines, Office Appliances, and Consumer Equipment (1) Control of Lighting System, Elevating Machine, and Office Appliances (a) Lighting system shall be controlled in compliance with the JIS standard and other standards. **"Management Standard"** (b) For elevating machines, the number of the machines in operation shall be coordinated. (c) Office appliances shall turn power-off when not in use. Also, a low power mode shall have to be available for such appliances.	(2) Measurement and Recording of Lighting Systems For a lighting system, the illuminance shall be measured and recorded. **"Management Standard"**	(3) Maintenance and Inspection of Lighting System, Elevating Machines, and Office Appliances (a)The lighting system shall be maintained and inspected by, for example, cleaning and replacement. **"Management Standard"** (b)Elevating machines shall be maintained and inspected in order to reduce the mechanical loss. **"Management Standard"** (c)Office appliances shall be periodically maintained and inspected.	(4) Measures to be Taken for the New Installation of Lighting System, Office Appliances, and Consumer Equipment (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: 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 (b)The following equipment shall have a better efficiency than the standard energy-consumption- efficiency (Top Runner Program). 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

エネルギーの効率的使用のための国家委員会

連邦政府
エネルギー省
CONUEE

サービス部門・生産部門・製品における
認証促進プログラム

2010 年 9 月

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1. 経緯

1.1 法的枠組み

1.1.1 エネルギーの持続的利用のための法律

2008 年 11 月 28 日付官報に発表された「エネルギーの持続的利用のための法律（LASE)」の第 26 条は、私人（particular）が任意で、その工程、製品、サービスの認証を通じ、自己の作業方法にどの程度エネルギー効率が組み入れられているか、を体系的に検査することができ、更に　これらのオペレーションに関する規則の履行や国際的パラメーター、オペレーションの実践や適用可能なエンジニアリングをどの程度満足させているか、を検討し、エネルギー効率を最大にするために必要な予防的・矯正的手段を決定することができる、としている。　又、エネルギーの効率的利用のための国家委員会（CONUEE）（以後「委員会」）が、プロセス・製品・サービスの認証の実施を促進するプログラムを策定し、その実施を監督することができる、ともしている。　従って委員会は、次の活動を実施することになっている。

- 検査人・監査人承認システムを設定し、必要な場合には「度量衡・基準化連邦法」の規定に準じて、その手順及びシステムに参加を希望する関係者が満たすべき最低の要件を決定する。

- エネルギー関連の検査・オーディットに関する研修プログラムを策定する。

- 自己のプロセスや製品、サービスに関して認証を受けている工場がそれと分かるような識別システムを実施する。

- 中小企業支援地域センターの設立を促進し、中小企業セクターに於けるプロセス、製品、サービス認証を容易にする。

- 公共・民間の個人・法人と合意の上、プロセス、製品、サービスの認証を実施する。

1.1.2 エネルギーの持続的利用のための法律　施行規則

2009 年 9 月 11 日に発表された LASE 施工規則はその第 VI 章「認証と任意プロセスについて」の第 31 条と 32 条で下記のように規定している。

第 31 条　　委員会は、法第 26 条の規定に従い、認証を受けた製品に表示することができる標章を私人に与える。　このために、この標章を獲得するためのガイドラインを作成し、委員会のウェッブサイトに発表する。　委員会は当条の規定に従い、標章を獲得した製品の記録を維持する。

第 32 条　委員会は、法の第 26 条の規定に従ってそのプロセスやサービスについて認証を受けた私人に対し、あるいは同条の第 IV 項の規定している識別システムのために設定されるガイドラインに従って任意のプロセスを実施してエネルギー効率を高度に組み込んで著しい成果を上げた場合、「エネルギーに責任を持つ個人あるいは機関」と言う証明を与える。　エネルギー面で高い責任を果たした個人や機関の記録は委員会のウェッブページに記載されて一般に公開され、3 か月ごとに更新される。

1.1.3　エネルギーの持続的利用のための国家計画

2009 年 11 月 27 日付官報に記載されたエネルギーの持続的利用のための国家計画 2009－2012（PRONASE）は、その目的 3 に「新製品の効率を高め、最終ユーザーが高能率の製品を購入するよう、促進する」と規定し、目的 5 は「建造物内の温度調整によるエネルギー消費を減少させる」としている。　又、これらの目的についてそれぞれ、下記のような活動ラインを特定している。

- **活動ライン 3.1.1.**　設備の認証・標章プログラム・キャンペーンを実施する。
  効率的な設備の購入により、家庭や建物に於ける設備のエネルギー消費を減少させる。活動としては 2011 年に効率的な機材の認証・標章プログラムのキャンペーンを実施することがあげられる。　エネルギーの持続的利用のための法律の施行規則（RLASE）の第 31 条によれば、委員会は LASE 第 26 条に従って委員会が設定する方法に従って効率的と認証された製品に標章（distintivo）を与える。

- **活動ライン 5.2.3.**　新築建造物の推定エネルギー消費量に関する認証を策定する。
  建物のエネルギー効率を上げる手段の実施により得られるエネルギー消費の低減と経済的節約とに対する国民の関心を高める。　このため、エネルギー的にもっとも効率の高い建物を検証するための認証を開発するものとする。　この識別（reconocimiento）は LASE 第 26 条と RLASE 第 31 条の規定に従う。

1.2　プログラムの適用範囲

プロセス・製品・サービス認証促進プログラム（プログラム）は、「製品のエネルギー効率

に関するメキシコ公式基準」の履行義務を負っている製品で、国内で流通・販売されるもの、及び国内の新設住宅用建造物（新築住宅）・非住宅用建造物（商業用建物、公共行政用建物）、及び工場に適用される。

2.　スコープと目的

2.1　スコープ

当プログラムは任意的な性格のもので、私人や公共行政部門の機関・部署が製品（その機能を発揮するためにエネルギーを消費する設備や機械）や新築住宅用建造物、非住宅用建造物、工場に於けるプロセスやサービスについて、エネルギー効率面で行う努力を表彰するためのものである。

2.2　目的

- ユーザーがプログラムに参加するためのガイドライン、条件、メカニズムを設定する。

- 製品については標章を、住宅用新築建造物、非住宅用建造物、工場については識別を獲得するためのガイドライン、条件、メカニズムを設定する。

3.　製品に授与する標章

3.1　標章の定義

製品に授与される標章は連邦政府が支援するエネルギー効率の象徴であり、エネルギー消費を減少させ、お金を節約し、エネルギー効率の高い製品を通じて環境保護に貢献しようとするものである。

製品に授与される標章は、エネルギーの非効率的使用によって発生する温暖化ガスやその他の汚染物質の排出とエネルギーの消費を減少させるとともに、性能や特色、便宜性などを犠牲にすることなく、金銭的には節約となるエネルギー消費の少ない製品を消費者が容易に識別し、購入できるようにするものである。

3.2　標章獲得のためのガイドライン

製品に授与される標章は、エネルギー効率に関するメキシコ公式基準（NOM-ENER）のいずれかの適用分野に含まれている設備・機械に対して与えられる。

私人は、エネルギー効率に関するメキシコ公式基準に設定されている技術仕様を満足させる製品で、同じカテゴリーに属する製品群の中でより高い効率を持つものに、この標章を表示することができる。

標章を取得するためには、下記のエネルギー効率メキシコ公式基準 NOM-ENER が規定する以上の効率、あるいはこれ以下の消費を示す製品でなければならない。

より高い効率の割合、あるいはより低い消費割合を決定するためは、認証組織が認証製品について提供する情報を分析する。　委員会は、少なくとも 1 年の間に、エネルギー効率メキシコ公式基準 NOM-ENER が規定する効率、あるいは消費をどれだけ上回らなければならないか、に関する指数をそのウェッブページに発表する。

この期日以降、私人は任意にこの標章の取得を申請することができる。　取得申請についてはシステムに従う。

3.3　標章を獲得するため、仕様の見直しが必要な場合

一定のカテゴリーに属する製品市場の一部に標章が与えられ、その部分の割合が 50%以上となった場合には、満足させるべき最低エネルギー効率あるいは最大消費量に関する仕様の見直しを行う。　これに加え、下記の要素を考慮する。

- エネルギー効率メキシコ公式基準の更新あるいは発行
- エネルギーの更なる節約を意味するエネルギー効率の進歩を示す技術革新
- 製品の入手可能性

3.4　標章獲得のためのシステム

製品は度量衡基準化連邦法の規定に従った認証過程を通じ、試験ラボに於けるテストを経て認証組織によって認証されなければならない。　試験ラボ、認証組織はいずれも認定機関による認定を受け、委員会に承認されていなければならない。

製造者あるいは販売者は委員会に対し、ラボテストの結果報告書の認証付コピー、及び製品が当該の NOM-ENER を満足させていることを証明する証明書のコピーを提出する。

委員会は上記書類を検査の上、当事者に対し、いくつかの側面について当該の製品に標章の使用を許可する。

標章使用許可の有効期限は認証期間と同じとし、認証形態によって 1 年又は 3 年とする。

委員会は何時でも、認証組織を通じ、それぞれの NOM-ENER に該当する当プログラムの表に示されている仕様を製品が満足させていることを検証するよう要請することができる。

有効期限が切れた場合、あるいは製品が NOM-ENER やそれぞれの NOM-ENER に相当する当プログラムの表が設定する仕様を満足させていない場合には、標章使用の許可を撤回する理由となる。

3.5　クレームと告発

3.2.に言及されるガイドラインに設定されている仕様を製品が満足させていない場合には、委員会は当事者の要請があった場合には、度量衡・規格化連邦法第 93 条の規定に従い、検証の再度実施を許可することができる。　第 93 条の規定は下記の通りである。

「製品やサービスが仕様を十分に満足させていない場合には、省あるいは当該の部局は当事者の要請を受け、当法の規定に従った検証の再度実施を許可することができる。

この検証は、当該部署の判断により、同じ認定ラボ、あるいは別の認定ラボで実施できる。この場合、これにより発生する経費は生産者、製造者、輸入業者、販売者、あるいはサービス提供者がこれを負担する。　この第 2 回目の検証により、製品やサービスが仕様を満足させていることが立証された場合には、最初の結果の反証が成立したものとされる。　仕様が満足されていない場合には、最初の結果が確認されたものとされる。」

3.6　標章を獲得した製品の登録

委員会は標章を獲得した製品の記録を保持し、そのリストを委員会のウェブページに発表する。　製品の認証が有効期限切れとなった場合、あるいは製品が NOM-ENER や、NOM-ENER に相当するプログラムの表に記載されている仕様を満足させない場合には、当該製品をウェブページのリストから排除する。

４． 建物の識別

4.1　商業用建物及び公共建物の識別

4.1.1　識別の描写

委員会が、商業用建物、公共行政用建物でエネルギー効率に関するメキシコ公式基準を満足させ、加えて効率的テクノロジーを使用しているものを識別する行為である。

4.1.2　識別獲得のためのガイドライン

商業用建物、公共行政用建物で、現行のエネルギー効率に関するメキシコ公式基準を満足させ、全国ベースよりも高い点数を獲得するものは識別を申請できる。

このためには、商業用建物・公共行政用建物は、度量衡・基準化連邦法が規定するところに従い、認定機関からしかるべき認定を受け、更に委員会の承認を得た検査ユニット（Unidad de Verificación- UV）によるエネルギー・オーディットと検査プロセスを通らなければならない。　建造物の所有者は委員会に対し、照明の電力密度に関する基準 NOM-007-ENER-2004、外面（envolvente）に関する基準 NOM-008-ENER-2001、断熱材に関する基準 NOM-018-ENER-1997 を建造物が満足させていることを示す検査鑑定書を提出する。

設備の効率を決定するため、委員会は当該建造物のエネルギー消費量を同じタイプの建造物の消費量の中で 1 から 100 のスケールで比較する。

識別を取得するためには、建造物はエネルギー効率分類システムの平均エネルギー効率（50 点）を 25 点以上上回る得点を得なければならない。　つまり、75 点以上の得点を得た建造物が識別を取得する資格を得ることとなる。　委員会は運転条件の差、地域による気候条件、その他の重要な点を考慮して分類システムを用意する。

エネルギー効率点数は、ひとつの建造物を類似の建造物と比較してエネルギー効率を評価するための参考となる。　点数システムは 1－100 のスケールとし、50 点が平均エネルギー効率を示し、75 以上の点数は最高の効率を示す。

エネルギーの平均効率を決定するために、大きさ、位置、居住者数、エネルギーを消費す

る設備・機械台数などの建造物に関する情報を分析する。　上記により建造物の効率が最も良い状態で消費するであろうエネルギー量と効率が最も悪い状況で消費するであろうエネルギー量及びその中間段階の全てを計算する。

このためには、INEGI が実施する調査やセンサスなど適切な手法で情報を収集し、情報ベースを構築し、このシステムを使って建造物のエネルギー消費に関する実際のデータを比較し、同等の建造物と比較した建物の効率を決定する。

遅くとも 2 年のうちに、委員会はエネルギー効率分類システムを設定する。　設定日以降、私人は任意で識別（Reconocimiento）　を申請できるものとする。　申請はシステムに従って行う。

4.1.3　識別入手のためのシステム

（建造物）所有者は、商業用建物の場合には NOM-007-ENER-2004 及び NOM-008-ENER-2001 の基準の履行評価に関する認証を持ち、委員会の承認を受けた検証ユニットにより発行された建物の照明と外面に関する検査鑑定書を入手しなければならない。　公共行政用建物の場合には、上記の履行に加え、効率的なテクノロジーを使用していることを明記した検査人によるエネルギー診断の結果を提示しなければならない。

建造物所有者は委員会に対し、NOM-007-ENER-2004 及び NOM-008-ENER-2001 の履行を立証する鑑定書の証明付きコピーと実施されたエネルギー診断、委員会の必要とするその他の情報を提出する。

委員会は、上記の文書を検討し、当該建造物のエネルギー効率に関する評価が 75 点以上である場合には、識別を与える。　システムや製品に関する NOM-ENER が履行されていない場合や、エネルギー効率が 75 点に満たない場合には、任意の改善プロセスを実施し、再度オーディットあるいはエネルギー診断を行って再度識別を申請することができる。

識別の有効期間は 3 年とし、同じ期間について 1 度だけ更新できる。　委員会は検証ユニットを通じ、無作為で、あるいはそのように決定した場合には、NOM-ENER の履行や実施されたエネルギー診断を検証することができる。

識別の有効期限が切れたり、検証の結果、NOM-ENER の規定の未履行　及び／又は　建造物のエネルギー効率が 75 点以下であることが認識されたりした場合には識別は撤回される。

4.1.4　識別を獲得した商業用建物及び公共行政用建物の登録

委員会は識別を獲得した商業用建物、公共行政用建物のリストの記録を保持し、これを委員会のウェブサイトに発表する。

委員会は、識別の有効期間が終了したり、そのエネルギー効率が 75 点以下であったり、あるいはシステムに関する NOM-ENER の規定を満足させていない建造物をそのウェブサイトのリストから削除する。

4.2　新築住宅の識別

4.2.1　識別の描写

委員会がエネルギー効率に関するメキシコ公式基準の規定を満足させ、かつ効率的なテクノロジーを使用している新しい住宅を識別する行為である。

4.2.2　識別獲得のためのガイドライン

集合住宅用・一戸建て住宅用新築建造物は基準案 NOM-PROY-NOM-O2O-ENER の規定を満足させなければならない。　このためには、サービスを提供する検査人と契約を結び、この検査人に住宅用建造物の建築プロジェクトを提出しなければならない。　これには少なくとも下記の情報が含まれていなければならない。

- 建造物の位置（都市、区又は市町村）

- 外面 4 面及び屋上の平面図。　床面積と方角が読み取れるもの。

- 外面と屋上に使用されている資材（厚さ及び熱伝導率）。　複数の資材が使われている外面が存在する場合には、それぞれの資材がどれだけの面積を占めているかが分かることが必要である。

- 窓ガラスについては、一枚ガラスであるか二枚ガラスであるかを明記し、更にその厚さ、遮蔽係数（coeficiente de sombreado: CS）、使用面積を記載する。

検査人は住宅用建造物の外面を評価し、建設者に対し、基準案を満たしているか否かを通

知する。

- 新しい住宅が基準案を満足させている場合には、検査人は建設者に履行リポートを提出する。

- 新しい住宅が基準案を満足させていない場合には、建設者は建築プロジェクトに必要な修正を加え、再度検査人に提出する。　この活動は、建設プロジェクトが基準案 NOM-PROY-NOM-O2O-ENER を満足させるまで継続される。

新しい住宅の所有者は、住宅用建造物の外面が基準案 NOM-PROY-NOM-O2O-ENER に合致していることを示す履行リポートを委員会に提出する。

4.2.2.1　製品の NOM-ENER 履行

製品に関するエネルギー効率メキシコ公式基準の対象になっている設備で、新築住宅に使用されるものは、該当する NOM-ENER に合致していることを示す認定書コピーを持たなければならない。

新しい住宅は、基準案 NOM-PROY-NOM-O2O-ENER の規定を満足さるだけではなく、製品に関する NOM-ENER が適用される場合には、適用可能な NOM-ENER に関してもこれを履行しなければならない。

4.2.2.2　断熱材

断熱材は NOM-018-ENER-1997 の規定を満足させていることを示す認定書コピーを所持していなければならない。

4.2.3　識別獲得のためのシステム

建設者は基準案 NOM-PROY-NOM-O2O-ENER に従い、住宅用建造物の外面の基準履行レポートを取得しなければならない。

建設者は住宅用建造物外面の基準案 NOM-PROY-NOM-O2O-ENER の履行レポート、及び適用される製品がある場合には、その NOM-ENER 履行レポートの認証付きコピーを委員会に提出する。

委員会は上記書類を検討した後、識別を与える。　基準案 NOM-PROY-NOM-O2O-ENER 及び／又は　適用可能な製品に関する NOM-ENER を満足させていない場合には、任意の改善プロセスを実施し、再度オーディット又は診断を申請することができる。

識別の有効期限は 3 年間とし、同じ期間について、一度更新できる。

委員会は検証ユニットを通じ、無作為に、あるいは一定の決定に基づいて、基準案 NOM-PROY-NOM-O2O-ENER　及び／又は　適用可能な製品に関する NOM-ENER の履行の確認を要請できる。

識別の有効期間が終了した場合、あるいは検証の結果、基準案 NOM-PROY-NOM-O2O–ENER　及び／又は　適用可能な製品に関する NOM-ENER の規定が満足されていないことが判明した場合には、識別撤回の理由となる。

4.2.4　識別を獲得した新築住宅の登録

委員会は識別を得た住宅のリストを記録し、これを委員会のウェブサイトに記載する。

委員会は、識別の有効期間が終了したり、基準案 NOM-PROY-NOM-O2O–ENER　及び／又は　適用可能な製品に関する NOM-ENER の規定が満足されていないことが判明した場合には、当該建造物をそのウェブサイトのリストから削除する。

5.　　工場の識別

5.1　　識別の定義

国産製品の競争力効果はエネルギー効率と、更に言えばエネルギー消費指標と直接関連している。　開発途上国が先進工業諸国に比較してエネルギー消費指数がかなり高いことはよく知られており、グローバル化した世界に於いて、このことは一つのデメリットである。

エネルギー管理プログラムに含まれる主要要素の中、エネルギー使用の比較評価は最も重要な要素の一つであり、工場が改善目標を設定し、その進捗をフォローすることを可能にする。

工場の識別は、そのエネルギー消費指数が報告されている平均以下である工場を委員会が識別する行為である。

5.2　識別獲得のためのガイドライン

この意味に於いて、工場経営陣が工場のエネルギー効率をその他の工場に比較して評価することを可能にするため、委員会は工業に対するエネルギー消費指数を設定する。

エネルギー消費指数を通じ、オペレーションのエネルギー効率を決定するとともに省エネの可能性を明確にする。　更に、指数は工場における径時的なエネルギー消費傾向をフォローする上で貴重な手段となり、同じ業種の他の工場との比較要素となる。

分類にはエネルギー効率に関するメキシコ公式基準の履行や、各工業分野のエネルギー集約度指数などが考慮される。

工場のエネルギー効率分類は 1 から 100 までのスケールで行われ、国内の他工場と比較して、当該工場のエネルギー使用の効率性を評価するものである。

工業に点数をつけるのに役立つとともに、この指標は全国レベルで平均的な指数と効率が高い場合の指数がどの程度であるか、に関する情報を提供する。　高効率指数とは全ての工場の 100 分位中 75 番目とする。

ある工場のエネルギー効率の平均の分類を決定するため、一定の業種を選定する。　これにより、当該業種で最も効率の高い工場が使うであろうエネルギー量と最も効率の低い工場が使うであろうエネルギー量、その間に位置する全ての水準を推定する。

このためには、INEGI が情報ベースを構築するために適用する調査やセンサスのような適切な手段を使って情報を収集し、システムがエネルギー消費の実際のデータを比較して、一つの工場とこれと同等の工場のエネルギー効率を決定することが必要である。

遅くとも 2 年の中に委員会はエネルギー効率分類システムを策定し、その期日以降、私人は任意で識別を申請することが可能となる。　識別獲得のためには当該システムに従うこと必要とする。

5.3　識別獲得のためのシステム

工場所有者は、委員会が承認したエンジニアリング会社、又はコンサルティング企業が工場に対して実施したエネルギー診断の報告書で提示した結果に従って発行したエネルギー

消費指数の確認鑑定書を入手しなければならない。

エネルギー診断及びその他の必要な情報は、当事者が委員会に提出する。

委員会はエネルギー診断を検討した後、当該工場が全ての工場の 100 分位の第 75 位以上であると分類された場合には、識別を与える。　工場が上記の分類指数を満足させない場合には、任意の継続的改善プロセスを適応し、再度エネルギー診断を受けて新たな評価を要請することができる。

識別の有効期間は 3 年とし、同期間について更新できる。

委員会はエンジニアリング会社あるいはコンサルティング企業を通じて無作為に、あるいは一定の決定に基づいて、エネルギー消費指数の履行を確認することができる。

5.4　　識別を獲得した工場の登録

委員会は識別を受けた工場の記録し、識別を受けた工場のリストをそのウェブサイトに記載する。

委員会は、識別の有効期間が終了したり、報告されたエネルギー消費指数が満足されていない場合には、当該工場をそのウェブサイトのリストから削除する。

6.　承認システム

6.1　認証組織の承認

6.1.1　認証組織の承認の定義

基準化のプロセスは 2 つの段階に大別される。　基準の発行によって終了する基準策定の段階と製品が基準に合致していることの認証や、システムが基準を履行していることの確認鑑定をもって終了する基準の適用段階である。

製品の認証やシステムの確認鑑定書を得るために、認定機構が存在する。　認定機構は認証組織や試験ラボ、及び検証ユニット（UV）の技術能力を以下の MNX に従って認める機能を持つ。

- NMX-EC-065-INMC-2000 認証組織
- NMX-EC-17025-INMC-2005 試験ラボ
- NMX-EC-17020-INMC-2000　検証ユニット

6.1.2　認証組織の承認のためのガイドライン

認証組織、試験ラボ、検証ユニットの承認プロセスは非常に類似している。　メキシコ認定機構（Entidad Mexicana de Acreditación: EMA）は認定申請を受けると次の活動を実施する。

- EMA は下記の訪問を計画する。
  - 初期評価
  - フォロー又は監視評価
  - 更新評価

- 下記から成る評価チームを編成する。
  - 評価チームリーダー
  - 評価員
  - 見習い評価員
  - 当該部署（委員会）代表技術員

- 書類評価
  - 品質保証システム
  - 手順書

- 技術評価
  - 人員評価
  - 設備評価

評価結果により、認証組織、試験ラボ、検証ユニットが認定を受けられるか否かが決定される。　結果は下記の通り。

- 組織が評価を満足させる場合には、認定され、承認を受ける。

- 評価チームが意見を提出し、これに対する改善措置が認定機構及び担当機関に提出され、これらの措置が満足できるものである場合には、認定され、承認を受ける。

・　まだ準備が十分と言えない。　新たに申請すれば再度評価を受けることができる。

6.1.3　認証組織の承認獲得システム

認証組織、試験ラボ、検証ユニットは EMA の認定を受けた後、委員会に対し当該の承認を申請することができる。

認証組織は委員会に対し、EMA による認定の認証付きコピーを提出しなければならない。

書類を検討した後、委員会は当該認証組織に承認を与える。

6.1.4　承認された認証組織の登録

委員会は承認を受けた認証組織の記録を維持し、このリストを委員会のウェブサイトに記載する。

委員会は、承認期間が終了したり、委員会のガイドラインや承認を満足させない場合、当該の認証組織をそのウェブサイトのリストから削除する。

6.2　検査人、監査人の承認

6.2.1　検査人の定義

エネルギー診断を実施する能力を持った個人・法人で委員会の承認を得た者を意味する。任意認証プロセスに於いては、「検査人」とはエネルギー管理システムを改善するために、組織を指導する専門家を指す。

6.2.1.1　　検査人のプロファイル

エネルギー管理検査人は工学士、又は大学卒の上級技術専門家で、エネルギー分野のプロジェクトで、少なくとも最近 5 年働いた経験を持ち、その専門分野の最新の知識を持つ者とする。　又、下記についての知識を持っていなければならない。

・　エネルギー技術：　エネルギー効率、電気・熱エネルギー、燃料、自動化と制御、計測機器の操作、生産プロセス、効率的テクノロジー、（場合によっては）再生可能エネ

ルギー。　エネルギー保全と省エネに関する総合プログラムの設計。

- エネルギー管理システム。

- コンサルティング：　分析能力、戦略的計画、人事管理とチームワーク、コミュニケーション、団結と研修／支援グループの士気向上、二次的活動の立案、管理部門のグッドプラクティス。

- 財務分析：　プロジェクトの経済・技術評価、経済、財務、料金体系、投資プロジェクトなど。

- 規制・基準枠組み：　適用可能な規範と手続き（NOM、NMX／ISO）及び委員会のガイドライン

6.2.2　監査人（Auditor）の定義

プロセスやサービスにおけるエネルギー効率の改善プログラムの履行を検証する能力を持った個人・法人で委員会の承認を得た者。

任意認証プロセスの目的からすると、監査人とは、ある組織がエネルギー管理について実施している一連の基準やクライテリア、ガイドラインの履行を検証する専門家である。

6.2.2.1　監査人のプロファイル

エネルギー管理監査人は、大卒（学士レベル）で、エネルギー管理システム　及び／又はエネルギー効率プロジェクトに関して最近、少なくとも 5 年の実地の経験を持ち、その専門分野について新しい知識を持つ者とする。　又、下記の知識を持っていなければならない。

- エネルギー技術：　エネルギー効率、電気・熱エネルギー、計測機器

- エネルギー管理システム

- 適用可能なエネルギー基準：NOM、NMX/ISO 及び委員会のガイドライン

- エネルギー効率分析方法、比較分析、成果評価

監査人は、MNX-CC-10019-IMNC-2008「品質管理システムコンサルタントの選択とその役務使用に関する指針」、NMX-CC-SAA-19011-IMNC-2002「品質管理　及び／又は　環境管理システムのオーディットに関する指針」、及び MNX-EC-17002-IMNC-2000「検証（検査）を実施する様々なタイプのユニット（組織）運営のための一般的クライテリア」の規定を満足させることが望ましい。

6.2.3　検査人・監査人としての承認を得るためのガイドライン

申請者は工学士、又は大学卒の上級技術専門家で、エネルギー効率に関する職業経験を少なくとも５年持ち、上記のプロファイルを満足させなければならない。

6.2.4　検査人・監査人としての承認獲得システム

承認を受けようとする者は委員会に申請書を提出する。　又、その専門と職業経験、及びその他の承認、認証、称号などを立証する履歴書を提出する。

当事者が個人である場合には、委員会あるいは委員会が指定する機関に出頭して試験を受け、少なくとも 80 点の成績を納めなければならない。　当事者が法人である場合には、受験する者を指定し、その者が少なくとも 80 点の成績を納めなければならない。

委員会は申請者が提出した情報と試験で得た結果を検討した後、検査人（Perito）あるいは監査人（Auditor）としての承認を与える。

6.2.5　検査人・監査人の登録

委員会は承認を得た検査人、監査人の記録を維持し、そのウェブサイトに承認を受けた検査人、監査人のリストを記載する。

委員会は、承認期間が終了したり、委員会のガイドラインや承認を満足させない検査人・監査人をそのウェブサイトのリストから削除する。

7.　プログラムの奨励と普及

7.1　経緯

エネルギーの持続的利用のための法律はその第 5 条に、エネルギーの持続的な利用に関するプログラムの設計と適用に於いては社会参加と合意を促進し、同法の適用範囲にある活動を調整して、公共セクターの諸機関と市民組織や民間セクター、学術機関、一般市民との連携を強めることを規定している。　又、同法の第 11 条 X 項には、連邦行政府の各部門や組織、あるいは州政府や市町村当局から、その旨の要請がある場合には、協定を結んでエネルギーの効率的利用に関する指導を行わねばならないことが定められている。　更に、同法の第 26 条Ⅴ項は、中小企業セクターのプロセス・製品・サービスの認証を促進するため、中小企業支援地域センターを設立することが規定されている。

このような背景から、委員会は認証支援地域センターの特徴について下記の通りの設計を行った。

7.2 中小企業支援地域センター

7.2.1　地域センターの定義

中小企業支援地域センターはエネルギー効率に関する促進・技術援助、及び研究・テクノロジー開発ユニットで、委員会と協力協定を締結することによって、高等技術教育機関その他、委員会が適切と考える機関に設置される。

7.2.2　地域センターのビジョン

センターの影響地域内で、エネルギーの効率的使用、再生可能なエネルギー源の持続的な利用、応用研究・技術開発の必要性とチャンスについて、効率的で有効なカバレッジを持つ。

7.2.3　地域センターのミッション

エネルギーに関する技術革新と技術開発に支援を与えてこれを促進し、我が国の持続的な成長に貢献する再現可能エネルギー源の効率的な使用・利用文化を醸成する。

7.2.4　地域センターの目的

- その管轄地域内で技術サービスを宣伝する。

- 民間・公共の組織・機関を指導し、委員会の要請がある場合には、様々な場に於いて

委員会を代表する。

- それぞれの専門分野でリファレンス・ラボとなる。

- 科学技術普及、教育、場合によっては技術移転などの分野で、自己の活動から派生する活動を促進する。

- その他の国立センター、技術援助・研究開発センターあるいは大学、企業などと協力する。

- 政府間組織、他国の技術援助・研究開発センター、特にラテンアメリカと北米のこうした組織と協力する。

- エネルギー、環境、テクノロジーの分野で研究・技術開発活動を促進し、実施する。

7.2.5　地域センターのサービス

- 技術指導と技術援助

- エネルギー面に於いて効率的な企業の認証の推進

- テクノロジー普及

- 情報

- 人材養成

- 国内・国際研修

7.2.6　地域センターの貢献

- 企業その他のエネルギー使用者に近い所にあるインフラであること。

- メキシコ産業に関する知識、及びそのサービスを受けている企業や、技術的問題の解決を支援している企業の具体的な必要性についての知識。

- 先端技術を紹介することにより、企業を最新のテクトロジーに接近させ、企業による先端テクノロジーの応用を支援し、研究・技術開発プロジェクトの実施を推進。

- エネルギーの効率的使用に関する企業方針の概念と実施を支援する経験、知見。

7.2.7　地域センター設立のためのシステム

こうしたセンターを設立するために、センター設置戦略を展開する。　センターには技術研究所、工科大学などが含まれる。　これらの機関を選択するのは、その施設に加え、教授陣や最終年度の学生の持つ技術的知識を利用することが考えられているからであり、彼らを通じてエネルギーの持続可能な使用の宣伝・普及活動が可能となるとともに、当プログラムの促進も可能となる。

様々なユーザー、主として工業とサービス業に従事するユーザー、及びその他の民間企業や地方政府は、地域センターに依頼してそれぞれの分野の情報を入手したりエネルギーの持続的使用に関する活動実施の支援を受けたりすることができる。

7.3　プログラム奨励・普及戦略

LASE 第 26 条に従って、エネルギー効率の高い製品、プロセス、サービスを奨励し、これを普及させる戦略がメキシコで実施される。　この戦略は委員会の与える標章と識別を通じ、認証・推奨努力を統一する目的を持つ。　このプログラム宣伝・普及戦略は毎年更新される。

7.3.1　プログラム普及の目的

コミュニケーション・メディアを通じてエネルギーの効率的使用に努力する委員会の活動と任意認証のメリットを宣伝するとともに、標章を受けた製品を消費し、エネルギーについて責任ある態度を取っている個人や機関のサービスを利用することのメリットを指摘し、現在・将来の社会的・環境的・経済的利点を強調する。

7.3.2　プログラム促進の目的

それぞれのセクターに個別の活動、戦略、目標、目的を掲げて、生産セクターや社会セクター、学術界や一般国民の間にエネルギー効率とエネルギーの持続可能な利用、及びこの分野の革新に関する文化を醸成する。

7.3.3　奨励対象の基軸

- 一般国民（電気エネルギーの使用を必要とする設備機械に関する情報、エネルギーの持続可能な利用のためのプログラム、及び意識付けキャンペーン）
- 地域センターを通じた中小企業
- 製造業大企業
- 製品へのエネルギー効率標章
- エネルギーに関して責任ある態度を取る個人・工場の識別
- 教育と研究
- 協定と合意
- 出版物

8. 語彙表

- **認定（Acreditación）** 認定機構が認証組織、試験ラボ、校正ラボ、規則・基準の履行を評価する検証ユニットの技術的能力と信頼性を確認する行為。

- **監査人（Auditor）** あるプロセスあるいはサービスのエネルギー効率改善プログラムの履行を検証する能力を持った個人又は法人で、委員会が承認したもの。

- **認証（Certificación）** 製品、プロセス、システムあるいはサービスが、国内・海外の規範制定組織の基準、ガイドライン、提案などに合致していることを保証する手順。

- **委員会（Comisión）** エネルギーの効率的使用のための国家委員会

- **検証鑑定書（Dictamen de verificación）** 検証ユニットがその責任の下に発行・署名する文書で、建造物が適用可能な規則を満たしていることを立証するもの。

- **建造物（Edificio）** 屋根、壁、床、下部面積などにより空間を限定する構造物で、その建設には市町村又は区の許可が必要である。 住宅用又は非住宅用のものがある。

- **設計建造物（Edificio proyectado）** 建設予定の建造物

- **参考建造物（Edificio de referencia）** 建設予定建造物と同じ方角、同じ隣接条件、同じ平面図面積と高さの建物で、最高エネルギー予算を決定する際に使用されるもの。

- **適合度評価 （Evaluación de conformidad）** 適用可能な基準に対する建造物の適合度を検証を通じて決定すること。

- **建造物外面（Envolvente del edificio）** 屋根、壁、開口部、床、下部表面などで構成され、建物の内部空間を作り出す。

- **認定組織（Organismo de certificación）** 認定機能を実施する目的を持った法人。

- **検査人（Perito）** エネルギー診断を実施する能力を持った個人・法人で委員会が承認した者。

- **所有者（Propietario）** 自己が所有する建物が認証を得ることに関心を持つ個人又は

法人。

- **建造物の認証システム（Sistema de certificación de edificaciones）**　委員会が作成・実施するプログラムで当事者に対してその建造物に認証を与える。

- **検証ユニット（Unidad de Verificación: UV）**　LFMN の規定に基づいて検証行為を行う個人又は法人。　基準 NOM-007-ENER-2004 と NOM-008 -ENER-2001 の履行を検証するため、しかるべき認証と承認を得た者。

- **検証（Verificación）**　一定の時点での適合性を評価するため、目視、サンプリング、測定、ラボ試験、あるいは書類審査により実施される確認。

- **現場検証（Visita de verificación）**　建造物への立ち入りで、建物がエネルギー効率に関する適用可能なメキシコ公式基準に合致していることを検証する目的で行われる。

【プレゼンテーション資料】

Energy Efficiency Policy & Measures in Japan

July, 2010

JICA Study Team

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

"Low-carbon economy and society" = Non-fossilization of energy supply × Energy Efficiency Improvement × Economic growth

CO2 emissions = CO2 emissions / Energy supply × Energy supply / GDP × 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

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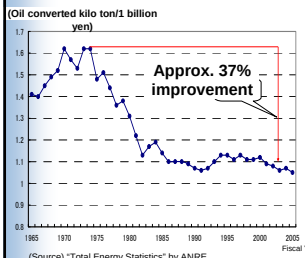
Energy Conservation Efforts of Japan after Oil Crises

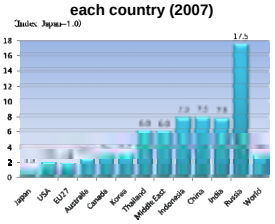
- Japan improved the energy efficiency by 37% in last 30 years after the oil crises in the 1970s, as a result of activities made by both public and private sectors.
- Japanese primary energy consumption per GDP is the lowest in the world owing to various energy conservation measures taken by the respective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

Energy use per real GDP of Japan



(Source) "Total Energy Statistics" by ANRE

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



* Calculated according to IEA Energy Balances of OECD/Non-OECD Countries(2008edition)
Index of each country making Japan 1, based on the value dividing primary energy consumption by GDP.

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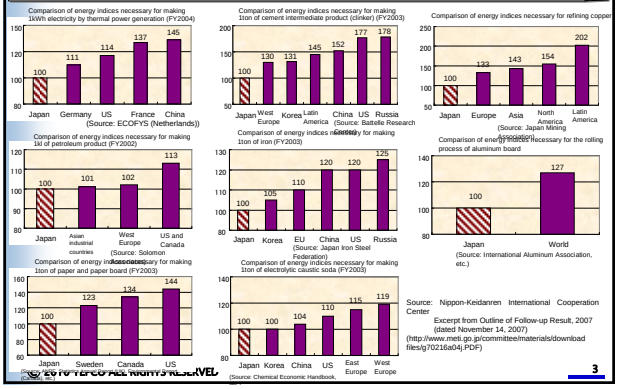
Energy Consumption Efficiency of Each Sector

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



Source: Nippon-Keidanren International Cooperation Center
Excerpt from Outline of Follow-up Result, 2007 (dated November 14, 2007)
(http://www.meti.go.jp/committee/materials/downloadfiles/g70216a04j.PDF)

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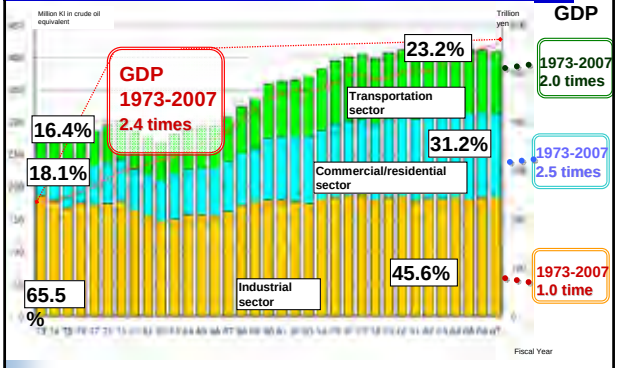
Transition of Final Energy Consumption by sectors



(Source) Total Energy Statistics, Annual Report on National Economy.
(Note) It must be noted that the values after 1990 were calculated differently from those of the years before that, because the calculation method for totaling the total energy statistics was changed in that year.

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Overall Picture of Energy Efficiency Policy

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

Industrial | Buildings (commercial) | Buildings (Residential) | Transport

(1)Regulations based on Energy Conservation Law

- Obligations to report energy consumption & CO2 emission annually
- Obligations (Appointment of Energy Managers etc.)
- Building Code for Energy Efficiency in building sector
- Top Runner Standard (for appliances, automobiles, etc.)

(2) Supportive measures (subsidy, taxation, policy-based financing)

- Promotion of energy-efficient equipments and lifestyle
- Development of energy conservation technologies

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(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**

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Energy Conservation Law (1)

Existing Large Factories and Buildings

Large-scale Factories	Large-scale Buildings	Midium-size Factories and Buildings
Annual energy use: 3,000kl in crude oil equivalent or larger	Annual energy use: 3,000kl in crude oil equivalent or larger	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

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Energy Conservation Law (2)

Construction of New Buildings & Retrofitting

Total floor space of 2,000㎡ 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

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Building Codes for Energy Efficiency in Buildings

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

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

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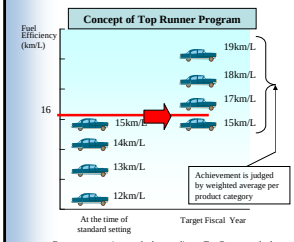
Top Runner Program

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 conservation standards according to Top Runner method

Target products (23 products)

1. Passenger vehicles
2. Freight vehicles
3. Air-conditioners
4. TV sets
5. Video-cassette recorders
6. Fluorescent lights
7. Copiers
8. Computers
9. Magnetic disc units
10. Electric refrigerators
11. Electric freezers
12. Space heaters
13. Gas cooking appliances
14. Gas water heaters
15. Oil water heaters
16. Electric toilet seats

etc.

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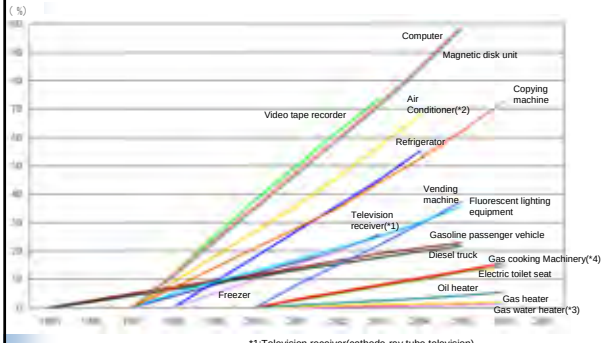
Energy Efficiency Improvement by Top Runner Program



*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)

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(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℃ in Office in Summer
    - Business without neckties from June to September

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Financial Support

Subsidy	For promotion + pilot projects + demonstration +international cooperation + R&D - 1/3 to 1/2 of the EE investments are subsidized by the Government etc.
Taxation	For 88 Energy Efficient equipments - 7% of price of EE equipments are deducted from the income tax of the company etc.
Policy-based Financing	For Equipments of 25% Energy Efficient or more - Loan from the Development Bank of Japan (DBJ) for big companies - Loan from Japan Finance Corporation (JFC) for smaller companies etc.

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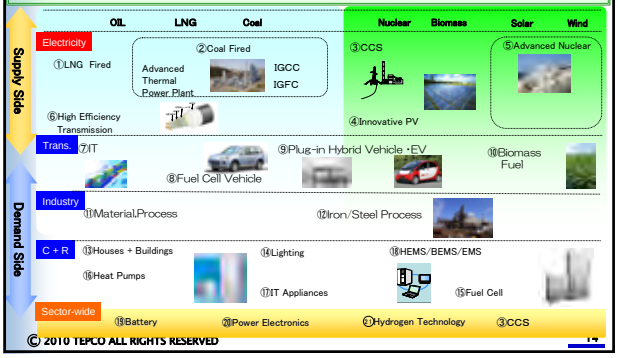
Cool Earth – Innovative Energy Technology Plan

■ **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.**



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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.

CO2 Refrigerant Heat-Pump Boiler (ECO CUTE)

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.

Latent-heat Recovery Boiler (ECO JOZU)

Recovers the latent heat of exhausted gas, which is usually wasted. Energy saving of approximately 15% compared to a conventional combustion-type boiler is realized.

Gas Engine Boiler (ECO WILL)

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.

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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.

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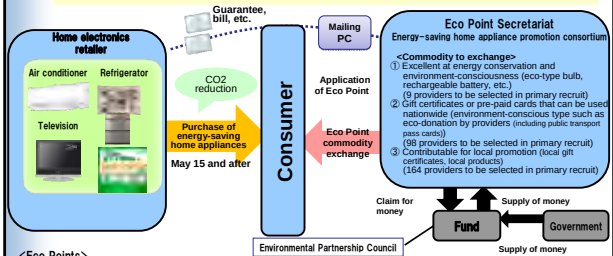
"Eco Point" for energy-saving home appliances

[Purpose] ① CO2 reduction, ② Economic activation, ③ Spread of ground-wave digital television



<Eco Points>

	Air conditioner	Refrigerator	Television
Purchase of product with energy-saving label equivalent to 4 stars	6,000 to 9,000 (3 steps according to cooling capacity)	3,000 to 10,000 (4 steps according to capacity)	7,000 to 36,000 (5 steps according to screen size)
Further recycling point	3,000	5,000	3,000

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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

(1) Promotion of energy efficient equipment to consumers

(2)Provision of energy-saving information to consumers

(3) Publication of brochures

Consumer Electronics Retailers

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

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Thank you for your kind attention !

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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

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.

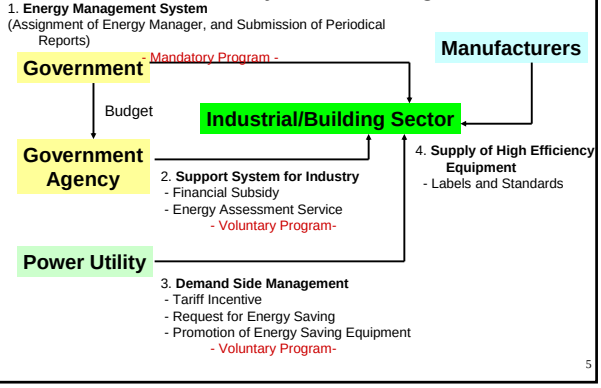
Objective:

- 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:

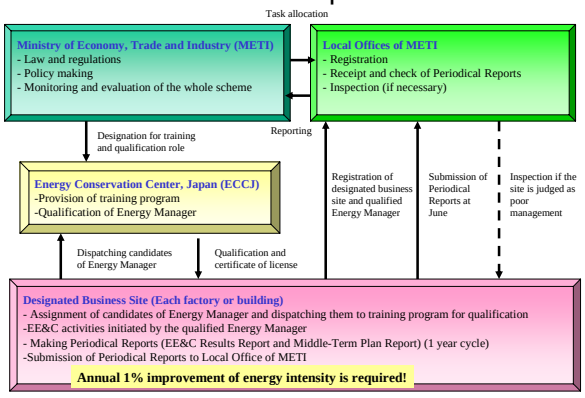
- To promote EE&C activities within a designated unit by mandatory reporting and assignment of energy manager
- Energy manager is assigned by the top of the designated unit, as a responsible person of EE&C activities. Qualified energy manager should have a high level status to strongly promote EE&C.

Overview of EE&C Scheme surrounding Industry and Building

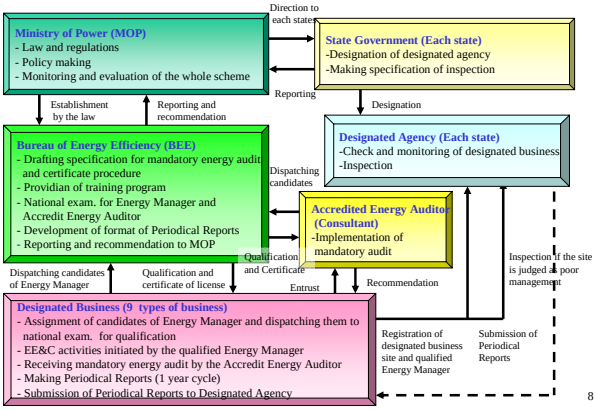


2. Other Countries Experience (Japan, India, Australia and European Standard)

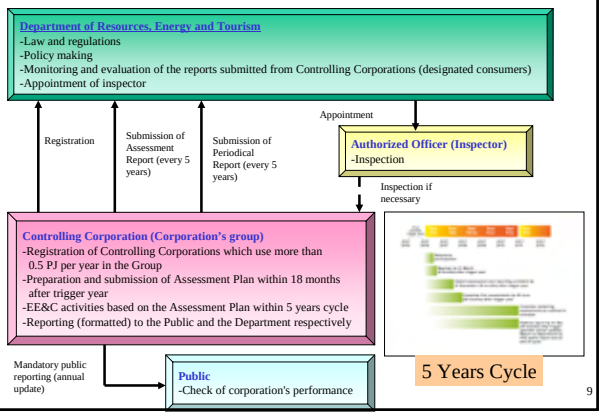
Case of Japan



Case of India



Case of Australia



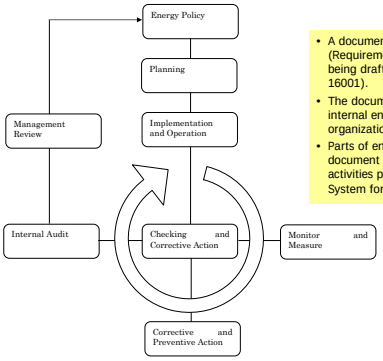
Comparison among Other Countries

	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.

European Standard (Draft: prEN 16001)



- A document for “Energy Management Systems (Requirements with Guidance for Use)” is being drafted by European Standard (prEN 16001).
- The document indicates a standard way for internal energy management within an organization (like ISO 14001).
- Parts of energy management way in the document can be commonly used for EE&C activities proposed in Energy Management System for Serbia.

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	(Fiscal year) Quantity of use		Quantity of energy sold or by-product			
				Quantity of energy sold		Quantity not contributing to sale and others	
		Quantity	Calorie GJ	Quantity	Calorie GJ	Quantity	Calorie GJ
Fuel and heat: Crude oil (excluding condensate)	kl						
Condensate included in crude oil (NGL)	kl						
Gasoline	kl						
Naphtha	kl						
Kerosene	kl						
Diesel oil	kl						
Fuel oil A	kl						
Fuel oils B/C	kl						
Asphalt	t						
Other fuels: City gas	1000m3						
Industrial steam	GJ						
Non-industrial gas	GJ						
Hot water	GJ						
Cool water	GJ						
Sub-total	GJ						
Electricity: Ordinary electric power supplier: Daytime purchased power	1000kWh						
Nighttime purchased power	1000kWh						
Others: Purchased power other than the above	1000kWh						
Private power generation	1000kWh						
Sub-total	1000kWh GJ						
Total GJ							
Crude oil equivalent kl		(a)		(b)		(c)	
Comparison vs. previous fiscal year (%)							

- 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
Facilities related to rational use of energy				
Major facilities consuming energy other than the above				

- 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

	(Fiscal year)	Comparison vs. previous fiscal year (%)
Values closely related to energy consumption such as production quantity, gross floor space or others	(d)	

Table 4: Unit energy consumption

	(Fiscal year)	Comparison vs. previous fiscal year (%)
Unit energy consumption: Quantity of energy used (crude oil equivalent kl) (a) — (b)+(c) / Values closely related to energy consumption such as production quantity, gross floor space or others (d)		

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

	(Fiscal year)	(Fiscal year)	(Fiscal year)	(Fiscal year)	(Fiscal year)	Change in average unit energy consumption for past five years
Unit energy consumption						
Comparison vs. previous fiscal year (%)						

Table 6: Reasons for (A) a case where unit energy consumption for past five years was not improved by 1% or more or (B) a 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
Process	Additional plan	Reason

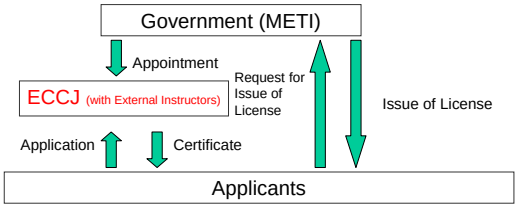
- M plan targets at 3 years in Japan.
- Planning program/project and expected effects are estimated.
- Comparison of last year's plan is also shown.

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. - 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.

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).



License of Energy Manager (Case of Japan)

1. National examination

< in 2005 >

- **Once a year**
- **1 day, 4 subjects**
- **Requirement: At least 1 years experience**

Applicant 8,950
Succeeded 2,290
(22.5%)

2. Training program with certificate examination

- **Once a year**
- **6 days training & 1 day examination**
- **Requirement: At least 3 years experience**

Applicant 2,765
Succeeded 1,800
(65.1%)

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

Annual Schedule (Japanese Case)

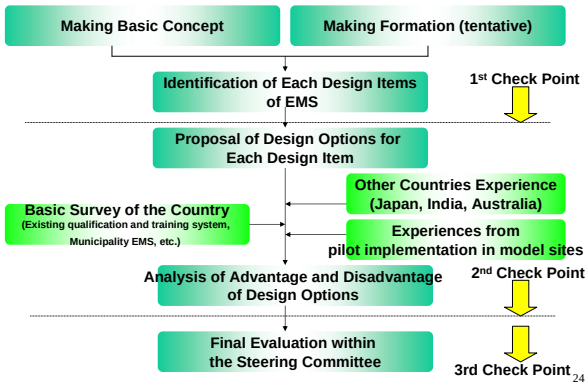
PR: Periodical Reports

	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		

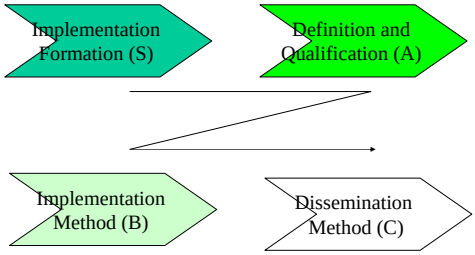
Even after instruction from Control Agency, if EE&C activities of the site is not improved, penalty (Fine 4,000 Euro and Public Announcement of the Name) is levied for the company.

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

Scheme Design Schedule



Prioritization of Design Item



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 Accredit Energy Auditor

3. Status of Energy Manager and Accredit Energy Auditor
- Certification Methods for Energy Manager, Accredited Energy Auditor (and Inspector)
- Procedure of Issue of Energy Manager's License — Priority (A)
- 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

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.)

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

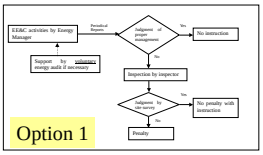
Option 2

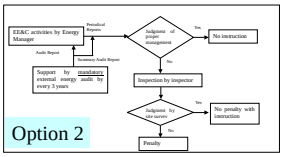
Ministry:
-Law and Regulation

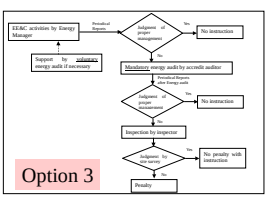
Agency:
-Registration of designated consumers and Energy Manager
-Check and monitoring of designated consumers
-Inspection
-Training and Qualification Authority
-Arranging Training Program and Examination

	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.

Judgment Flow of Poor Management







	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 audit (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 complains 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.

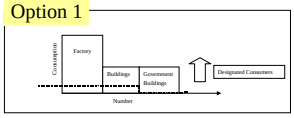
Target Sector

1. Category of Target Sector

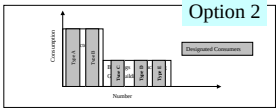
- Category A: Factories and buildings, and central Gov. buildings
- Category B: Transformation sector consisting of power utility, oil refinery, coal transformation, district heating system, etc.

2. Designation (Case of the Category A)

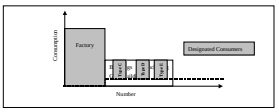
Option 1



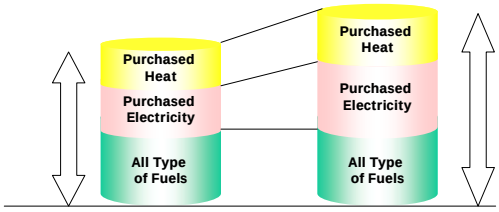
Option 2



Option 3



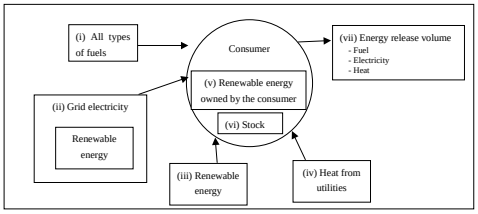
Target Energy (Final Consumption or Primary Energy)



Final Consumption 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.

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:

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:

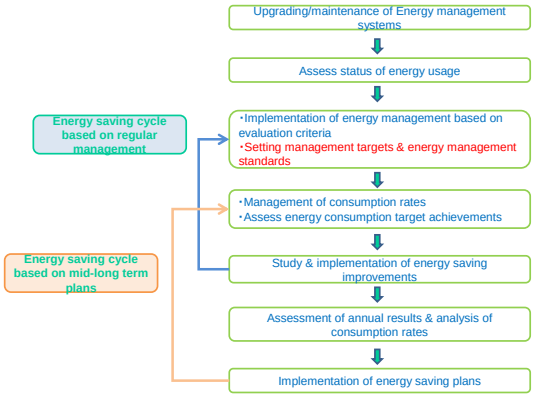
Target Energy = (i) + (ii) +(iii) + (iv) + (v) – (vi) – (vii)

Evaluation Criteria &
Utilization of Evaluation Criteria
in Random Check of Designated Consumers

Contents

1. Evaluation Criteria and Management Standards

Energy Management flow

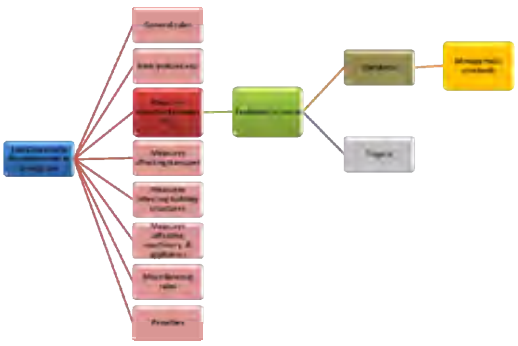


Evaluation Criteria

- Determined by the Minister of Economy, Trade & Industry
- These are the standards required to enable factories & offices to appropriately & efficiently implement increases in energy efficiency
- Comprises 2 parts – “Standards” & “Targets”

*Factory or premises with similar energy consumption

Evaluation criteria & management standards system



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...

Evaluation Criteria
Sample: Rationalization of fuel burning

		Control	Metering and recording	Maintenance / Inspection	Measures to be implemented prior to new installation
1	**Reductions in combustible fuel consumption** Combustion equipment	**(1) Control of fuel combustion** ①Control of combustion air ratio for combustion equipment and type of fuel ● Control standards 1 ②Rationalization of combustion air ration for combustion equipment based on attachment 1 (A) Standards ① ③ Various systems for load regulation and total control of fuel efficiency ● Control standards 2 ④Control 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 extant 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 ration for combustion equipment ② Ventilator arrangement for ventilation volume and combustion chamber pressure regulation

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.

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]

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.

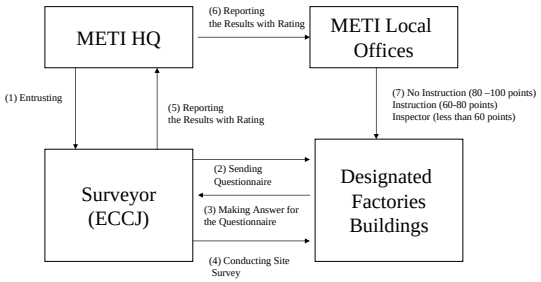
3. Methods
- 1 or 2 surveyors are dispatched to the selected site. They are entrusted by METI as an legal basis surveyor.
- Before the site survey, a questionnaire sheet is sent to the site and the site must return the sheet filled by themselves.

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.

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)

Treatment after Evaluation

1. The Surveyor team evaluates the compliance according to the check list.
2. The evaluation is made by check list which can calculate evaluation points (Full: 100 points).
3. 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.
4. 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”.
5. 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.

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

Survey Methods

(1) The Surveyor (ECCJ) sends a Questionnaire Sheet with “Self-Check List for Complaisance 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.

Composition of Questionnaire Sheet

Repeat of the Contents of PR

1. Basic Information of the Factory/Building and Energy Manager
2. Historical Energy Consumption and Energy Intensity Data
3. Reasons when 1 % improvement has not been achieved.

Information to Grasp Background

4. Questions for EE&C target, past EE&C projects and activities, organizational activities, etc.

Evaluation Sheet For Rating

5. Self-Check List (1): List of Energy Consuming Equipment
6. Self-Check List (2): Compliance Evaluation Sheets with Evaluation Criteria for Individual Equipment

⇩

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

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

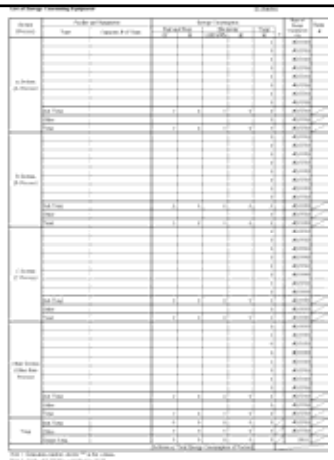
3. Equipment List of C Section
- Capacity, Number of Units
- Annual energy consumption

Compliance Evaluation Sheets for Individual Equipment

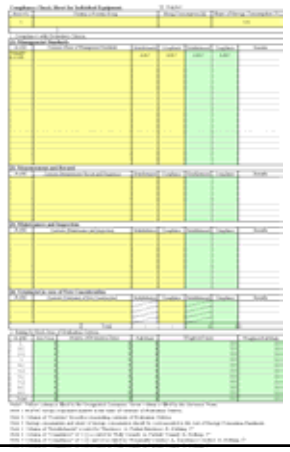
1. Check of Compliance with Evaluation Criteria
- Establishment of Management Standards and its Compliance
- Establishment of Measurement and Record Standards and its Compliance
- Establishment of Maintenance and Inspection Standards and its Compliance

2. Rating Sheet for Individual Equipment

Format (1)

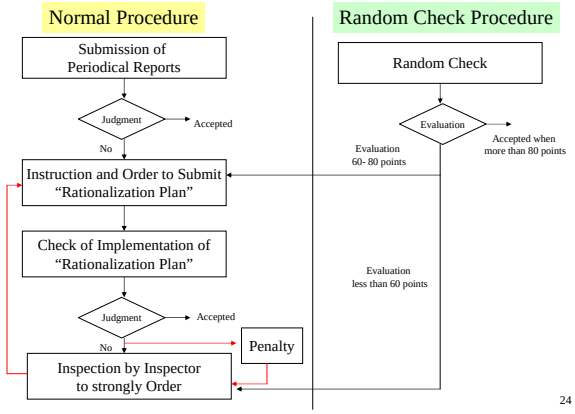


Format (2)



4. Treatment after Random Check

Instruction and Inspection



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

Sector-wise Benchmark Plan of Japan

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.

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.

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)

Benchmark of the Sub-Sectors

Sub-sector	Benchmark	Boundary
Paper	8,532 MJ/ton	BY company (summation of all factories)
Board Paper	4,944 Ml/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)

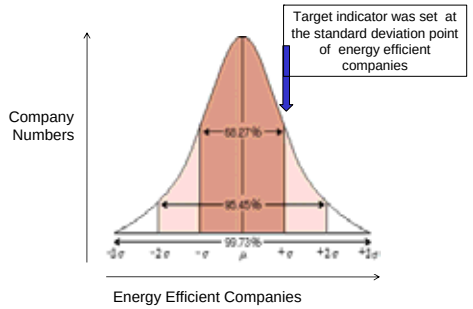
Evaluation Criteria Committee

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

How to set The Target Indicators of Benchmark



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

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

Calculation of Benchmark

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

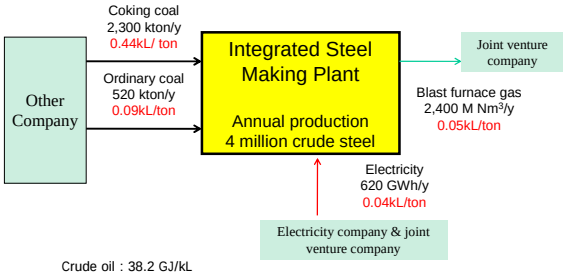
Annual total energy consumption = Purchased energy(Coking coal + Ordinary coal + Electricity – Sold energy(Blast furnace gas)

= 66,700 TJ + 13,364 TJ + 6,181 TJ –8,184TJ = 78,061 TJ

Benchmark = 78,061 TJ ÷ 4,000,000 ton = 19.5GJ/ton

= 19.5GJ/ton ÷ 38.2 GJ/kL =0.51 kL/ton

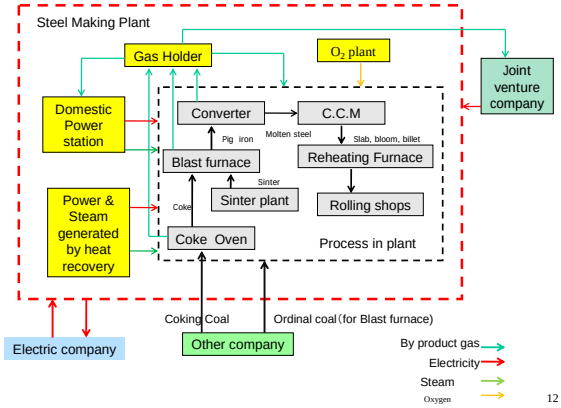
Benchmark : 0.51kL/ton



Crude oil : 38.2 GJ/kL
Coking coal : 29 GJ/ton
Ordinary coal: 25.7 GJ/ton
Electricity: 9.97 GJ/1000kWh
Blast furnace gas: 3.41 GJ/1000Nm³

Operation condition
Coke ratio in BF : 400kg/ton
Pulverized coal injection: 140kg/ton

Boundary of Steel Making Plant



Power Sector (Thermal Power Station)

Official Indicator

$$\frac{\text{Gross Thermal Efficiency (high heat value) at the Rated Output Test}}{\text{Design Thermal Efficiency}}$$

Additional Information

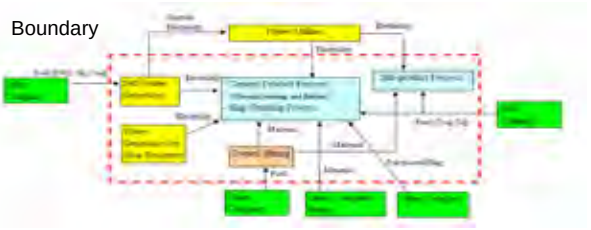
$$\frac{\text{Output}}{\text{Input}}$$

Cement Sector

Indicator

$$\frac{\text{Energy Consumption of Material Process}}{\text{Material Output (Clinker equivalent)}} + \frac{\text{Energy Consumption of Burning Firing Process}}{\text{Output of Clinker in Burning Firing}} + \frac{\text{Energy Consumption of Finisher Process}}{\text{Finished Output in Finisher Process (Portland Cement equivalent)}} + \frac{\text{Energy Consumption of Shipping Process}}{\text{Shipping Output (Various Type of Cement and Clinker)}}$$

Boundary



Bench Mark of Petroleum Refineries

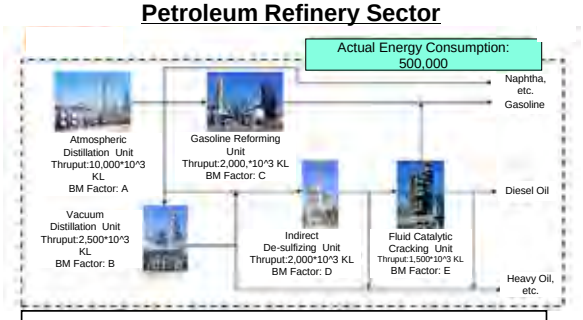
$$\text{Bench Mark(BM) of Refineries} = \frac{\text{Actual Energy Consumption}}{\text{Standard Energy Consumption}}$$

1) Equation
Standard Energy Consumption
= Σ (Throughput of Each Plant × BM Factor of Each Plant)

2) BM Factor is derived from the average of plants in the world based on **the Solomon's data** (340 refineries)

3) The target of bench mark was decided as 0.876.

Petroleum Refinery Sector



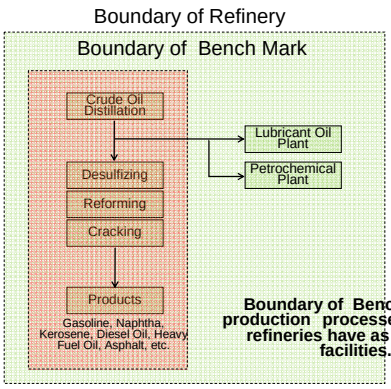
$$BM = \frac{500{,}000}{10{,}000*A + 2{,}500*B + 2{,}000*C + 2{,}000*D + 1{,}500*E}$$

Actual Energy Consumption

Standard Energy Consumption

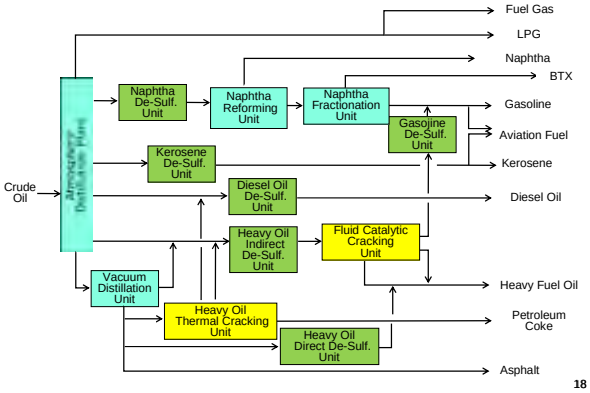
Atmospheric Distillation Unit | Vacuum Distillation Unit | Gasoline Reforming Unit | Indirect De-sulfizing | Fluid Catalytic Cracking Unit

Boundary of Bench Mark



Boundary of Bench Mark is production processes which all refineries have as common facilities.

Example of Process Configuration in Refinery



Sector-wise Benchmark Plan of EU

(still under discussion)

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	

EU Benchmark Indicator Planning(2)

[illegible]	Product		Benchmark Indicator (Planning)	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	

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	

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	
—	—	—	

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/	0.08t-CO_2	
	Glass wool reinforced Gypsum board	0.18t-CO_2	
—	—	—	

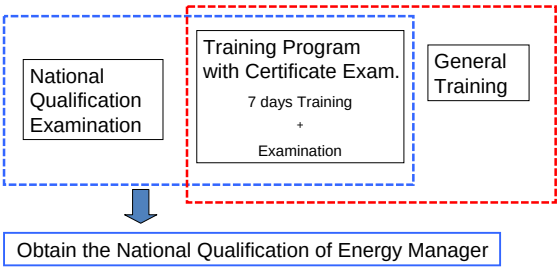
Training Programs for Energy Manager in Japan

JICA Study Team

Contents

Ⅰ. Introduction

Qualification System and Training Programs



Classification of Training Programs

Classification	Contents
Training program with certification examination for candidates of Energy Manager	●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	●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.)

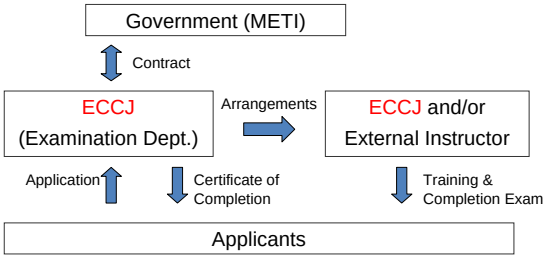
EE&C Activities and Tasks of Energy Manager (1)

	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.

EE&C Activities and Tasks of Energy Manager (2)

	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.

Workflow of the National Qualification of Energy Manager



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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

10

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

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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

Ⅲ. General Training Programs

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

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

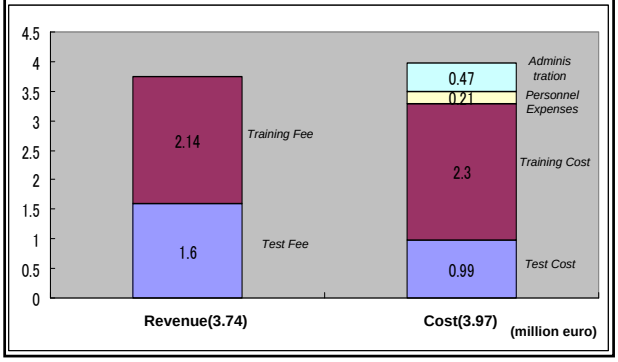
1. Sourcing:
   (1) People of academic standing
   (2) People of practical experience in EC
   (3) Expert of EC audit
   (4) Representatives of factories and/or buildings who are to make presentations on best EC practices
   (5) ECCJ officer in charge of EC related laws & regulations
2. Officials charging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

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

Examination and Training Revenue and Cost (2008)



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

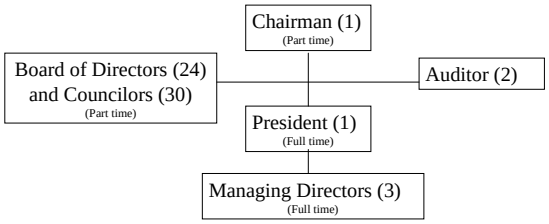
Outline of ECCJ

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

Main Activities of ECCJ

Industrial	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	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	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

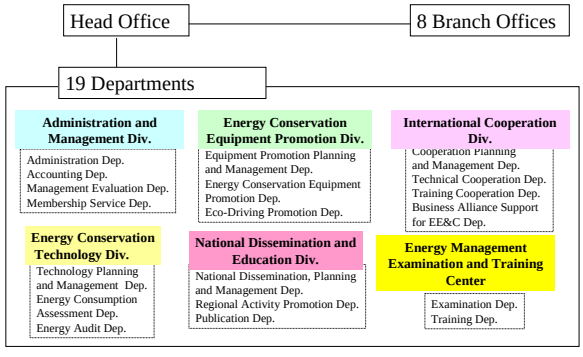
Organization (1): Governance



(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

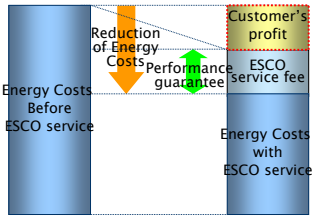
1. Many industries/companies cooperate with the activities of ECCJ.
→ Top companies (TEPCO, Toyota, Mitsubishi, Matsushita, etc.) are assigned as Chairman and Directors.
2. Many industries/companies support ECCJ activities by membership fee.
→ Fee is small. But participation consciousness is very important 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 payed from the savings of Energy Cost

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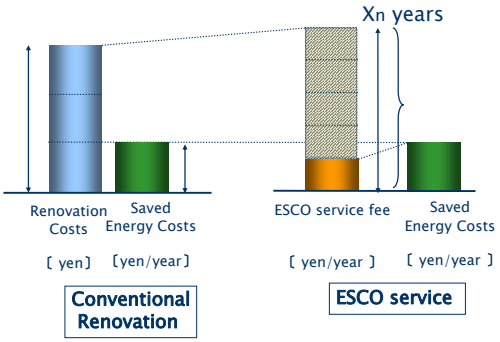
Concept of ESCO (2)



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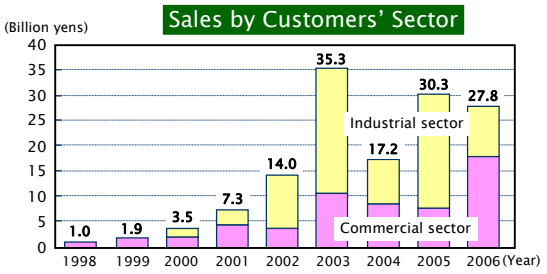
ESCOs in JAPAN (1)

Market Size of ESCO (1)



Source: Japan Association of Energy Service Companies

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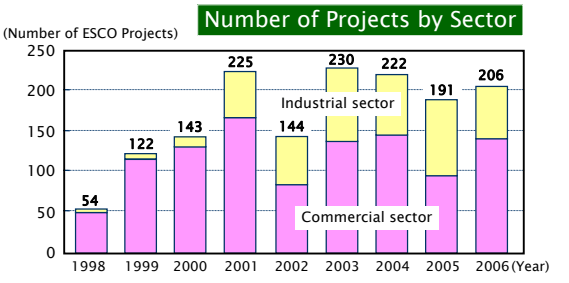
ESCOs in JAPAN (2)

Market Size of ESCO (2)



Source: Japan Association of Energy Service Companies

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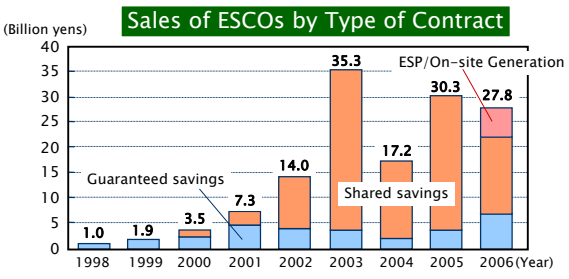
ESCOs in JAPAN (3)

Market Size of ESCO (3)



Source: Japan Association of Energy Service Companies

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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

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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

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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

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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)

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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%)
  - Kandenko Co.,Ltd (10%)
- Capital Fund : 490 million yen
- Employees : 45 persons
- Turnover : 11,540 million yen (2006 FY)
- Profit : 380 million yen (2006 FY)

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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...

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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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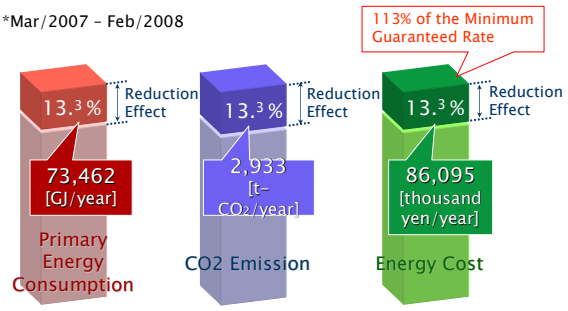
Practice1: ESCO (1)

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

City Office
- Total Floor Space: 14,123 m²
- Number of Floors: 8
- Completion Year: 1971

Culture Center
- 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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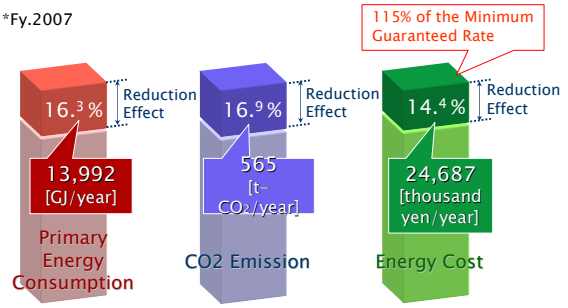
Practice1: ESCO (2)

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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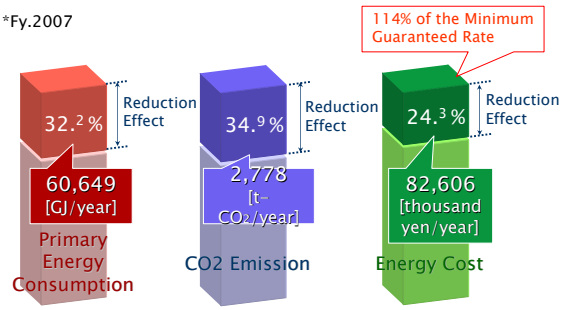
Practice1: ESCO (3)

Effect of Energy Conservation

*Fy.2007



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Practice1: ESCO (4)

15 Buildings in Edogawa Ward

Outline of Buildings

	Facility Name	m²
1	General Culture Center	16,496
2	Hotel Seaside Edogawa	5,564
3	Edogawa City Office	15,774
4	Sports Center	10,230
5	Sports Land	6,169
6	General Gymnasium	5,257
7	Central Library	8,452
8	Nishi-Kasai Library	2,342

	Facility Name	m²
9	Koiwa Urban Plaza	7,538
10	Edogawa Community Center	9,465
11	Komatsugawa Community Facility	5,234
12	Kasai Community Center	4,927
13	Tobu Friend Hall	6,080
14	Koiwa Community Center	3,685
15	Shinseicho Community Center	2,899
	Total	**110,112**

Outline of ESCO Service

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

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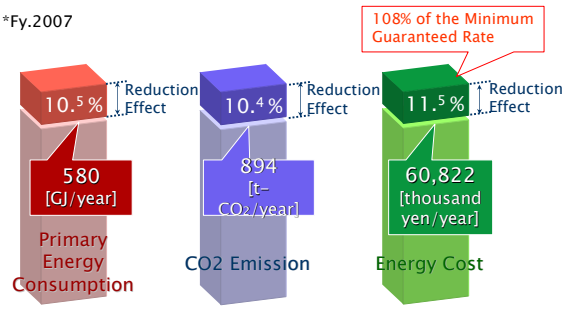
Practice1: ESCO (4)

Effect of Energy Conservation

*Fy.2007



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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)

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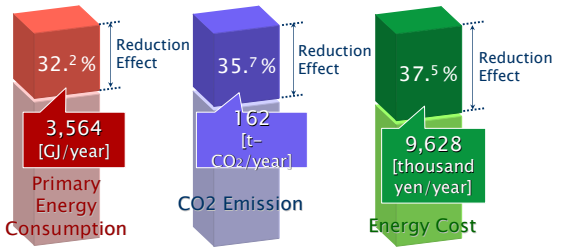
Practice1: ESCO (5)

Effect of Energy Conservation

*Expectation of Energy Conservation



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Thank you very much
for kind attention.

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TEPCO's Strategy & Program for the Low Carbon Society

JICA Study Team
Tokyo Electric Power Company (TEPCO)

Principle for Low Carbon Society

- 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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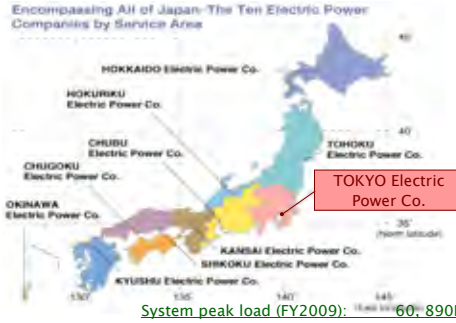
Service Area of TEPCO



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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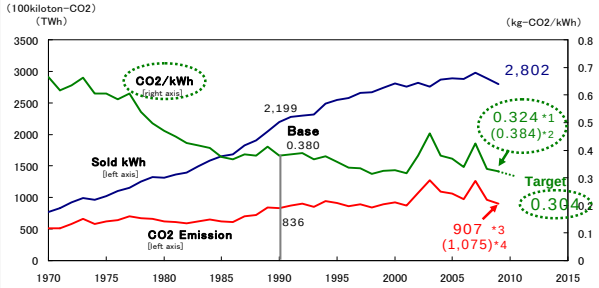
Trend of Carbon Emission from TEPCO

- 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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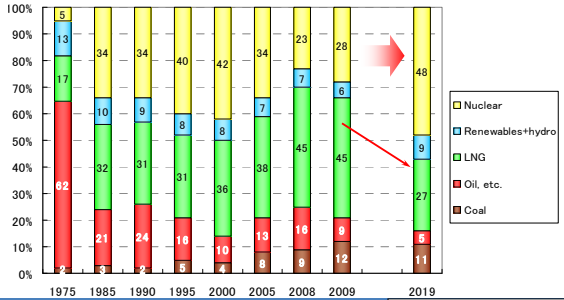
Diversification of Primary Energy Sources

- 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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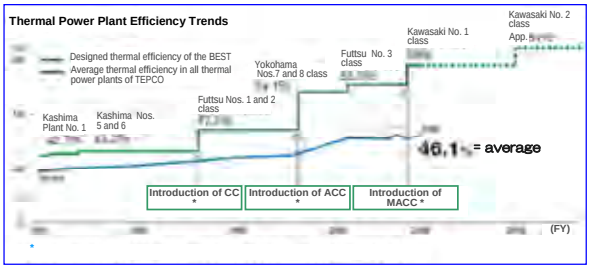
Efficiency Improvement in Thermal Power Plants

7

- Generation efficiency has increased mainly by the of LNG combined cycle power generation since 1980s.
  - 1,500℃ class “MACC” (with thermal efficiency of 59%) was introduced in 2007.
  - 1,600℃ 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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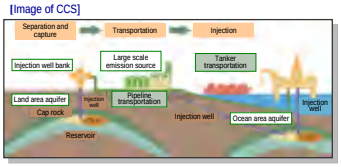
Carbon Capture & Storage (CCS)

8

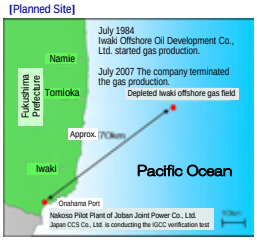
- Separate and capture CO_2 emitted from factories and power plants, and store them in the ground at a depth of approx. 1,000m and more.
- 32 companies including TEPCO along with 10 EPCos, invested in May 2008 in the new company called “Japan CCS Co., Ltd.,” which will study the feasibility of the CCS business.

◇ The company is conducting a feasibility study for storing CO_2 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

[Image of CCS]



[Planned Site]



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Mega-Solar Projects of TEPCO

9

- Generation Capacity：30MW, Estimated CO_2Reduction)：14,000 t /year
- Good cooperation with local municipalities is important.

Ukishima PV Power Station

Kawasaki City, Kanagawa Pref.

- PV Capacity 7MW
- Estimated kWh 7.4 Million kWh
- CO_2Reduction: 3,100 ton/year
- Construction starts in 2009FY
- Launch in 2011FY

Ohgishima PV Power Station

Kawasaki City, Kanagawa Pref.

- PV Capacity 13MW
- Estimated kWh 13.7 Million kWh
- CO_2Reduction: 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
- CO_2Reduction: 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

Internet Screen

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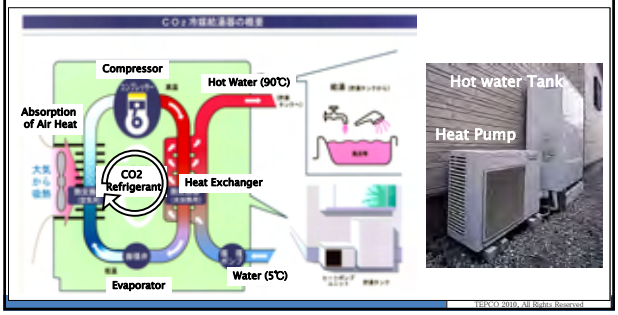
Eco-Cute (Heat Pump Hot Water Supply Unit) 13

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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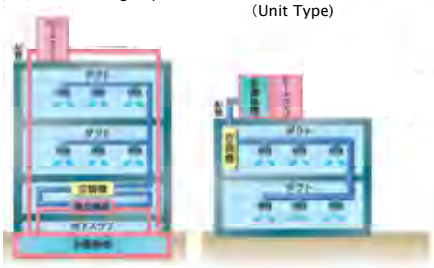
Thermal Storage HVAC System 15

- Night-time electricity is appro.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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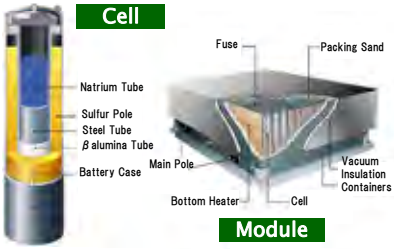
NAS Battery 16

Installation : 177 MW
by TEPCO at 96 sites of customers



Cell Battery	
Voltage	2V
Capacity	1,220Wh
Size	D: 91mm 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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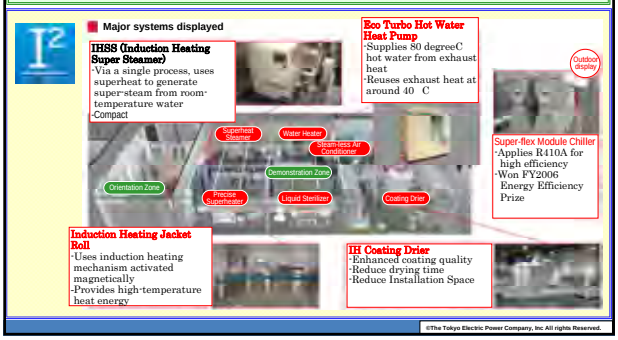
TEPCO Electric Factory " I² " (I Square) 17

- 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 CO_2 emissions with the latest heat pump and IH (Induction Heating) technologies.



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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 CO_2	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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Electrification will contribute Low Carbon Society

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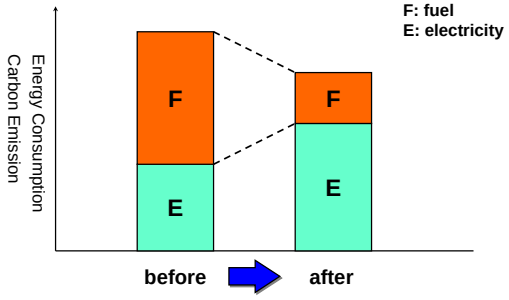

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TEPCO Group's Energy Solutions

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

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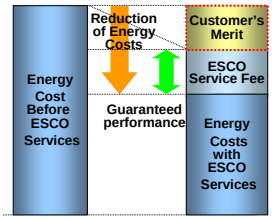

- TEPCO set up a subsidiary company (Japan Facility Solutions, Inc = JFS) for ESCO business in Dec.2000.
- JFS has been very successful to achieve 77 ESCO contracts and more than 200 building audits.
- Japan Association of ESCOs (JAESCO) has 130 member companies and there are approx. 10 active ESCOs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

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Energy Centre Business

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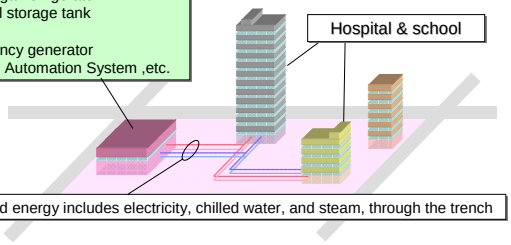
ISEHARA campus of Tokai Univ.

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)



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Energy Centre Business

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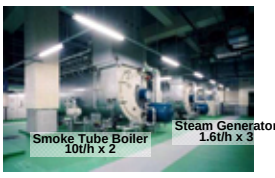
Installed Facilities at ISEHARA Campus



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PV Energy Service by TEPCO Group

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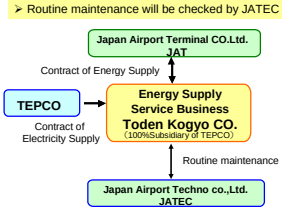
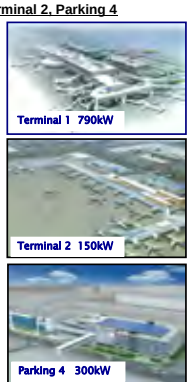
●Tokyo International Airport(Haneda) Terminal 1, Terminal 2, Parking 4

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



- PV Capacity 1.2 MW(TOTAL)
- Estimated kWh 1.2 Million kWh/year
- CO_2Reduction 440 ton/year
- Construction starts in 2009FY
- Launch in 2010FY



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Thank you for your kind attention.

TEPCO is providing various types of Overseas Consultancy Services.

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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

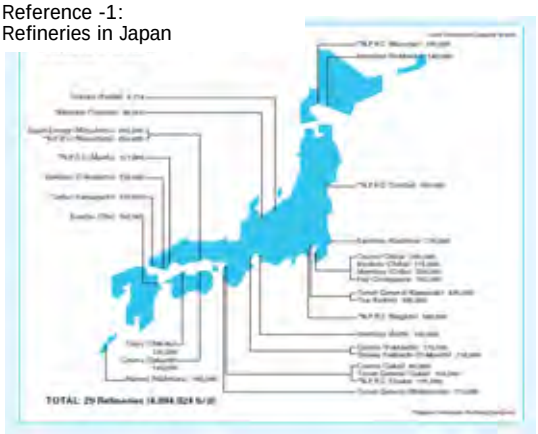
1-1. EE&C Activities

1) 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

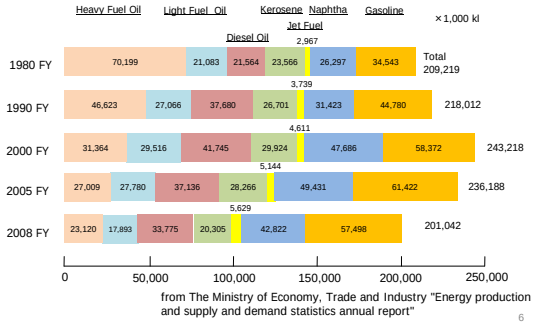
1-2. Consideration Matters on EE&C

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

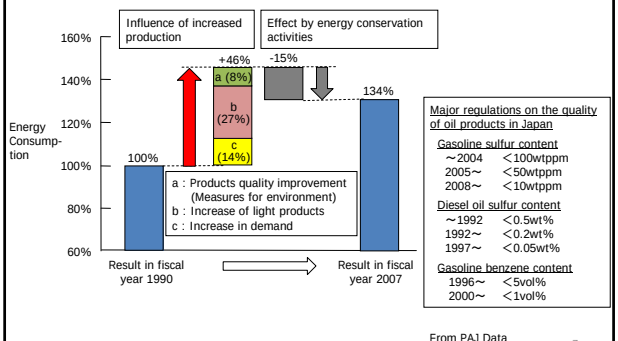


Reference-2 :
Change of demand on each petroleum product in Japan



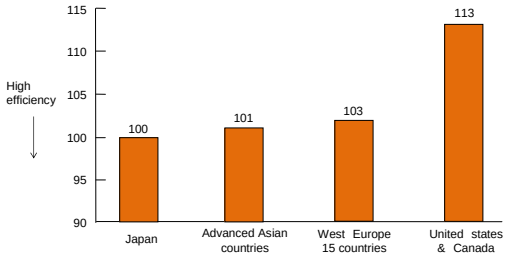
from The Ministry of Economy, Trade and Industry "Energy production and supply and demand statistics annual report"

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



From PAJ Data

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



From Solomon Associates data

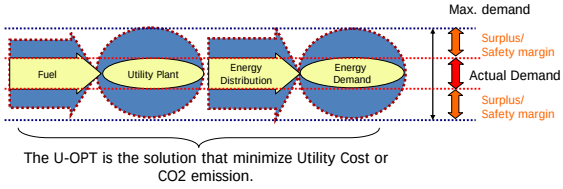
2. Examples of EE&C Measures at Refineries in Japan

Example-1 :
Introduction of Utility Optimization System

1. Merit of Utility Optimization System

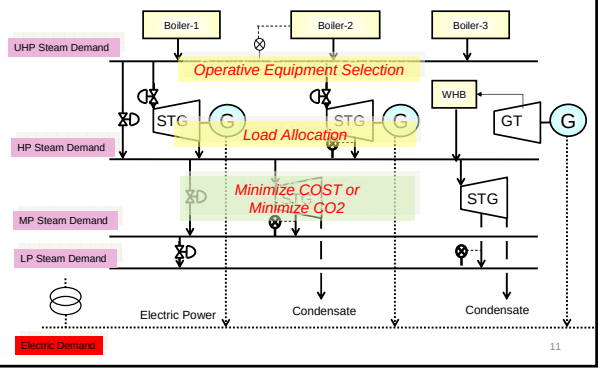
- Stable supply of utilities
- Cost saving and CO2 reduction
- Reduction for operator workload

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

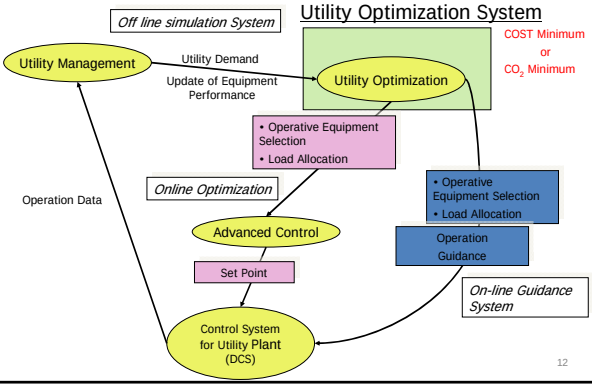


The U-OPT is the solution that minimize Utility Cost or CO2 emission.

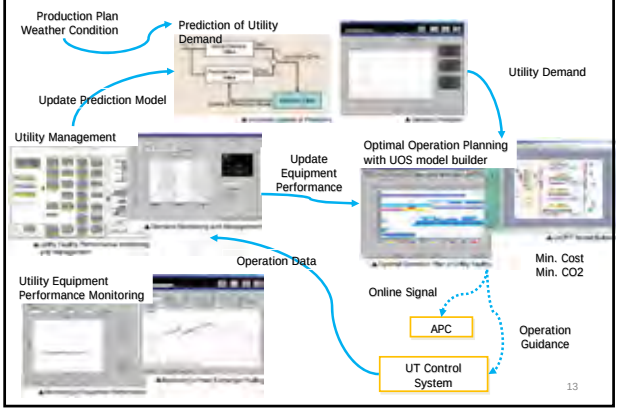
2. Concept of Utility Optimization System



3. Major Function of Utility Optimization System

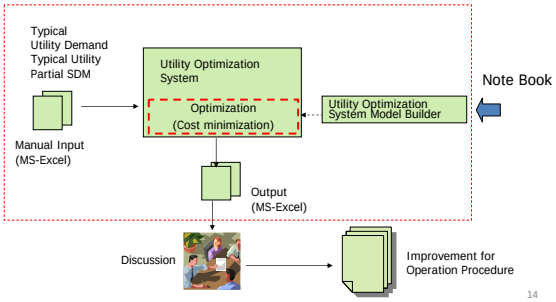


3. Outline of Utility Optimization System

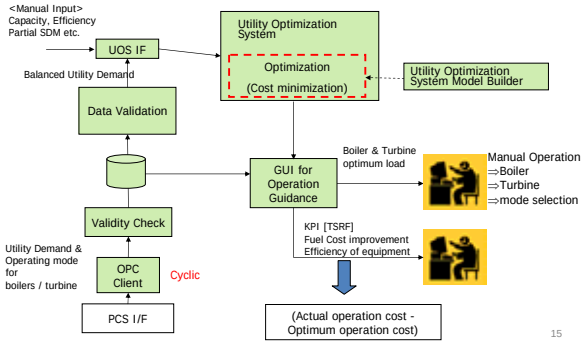


4. Off line simulation System

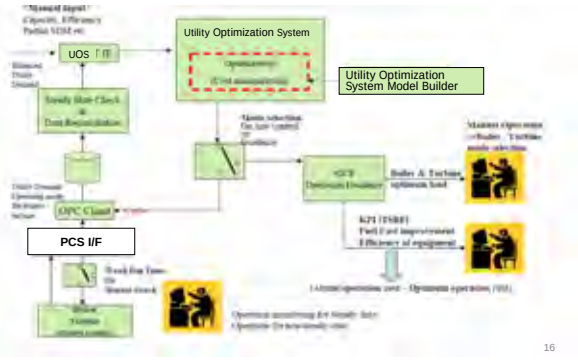
- Improvement in operation procedure
- Investment Analysis



5. On-line Operation Guidance System



6. On-line Optimization (Control)



7. Benefit Analysis for improvement current operation

Actual Operation
・Utility Cost
・CO_2 Exhaust Amount

Improvement

Optimal Operation
・Utility Cost
・CO_2 Exhaust Amount

Benefit Analysis (Cost & CO_2)

Improve Standard Operating Procedure

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

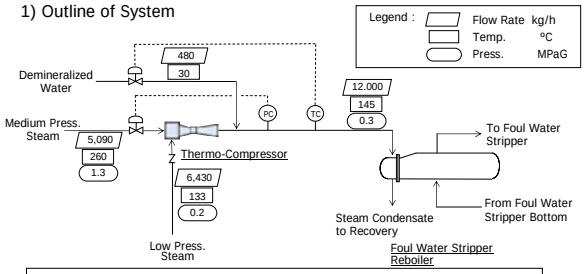
2-1. Utilizing Low Pressure Steam by Raising Pressure at Foul Water Stripper Reboiler

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

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

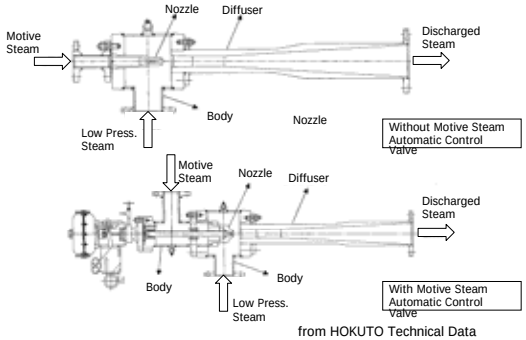
Nippon Oil
Mizushima Refinery

1) Outline of System



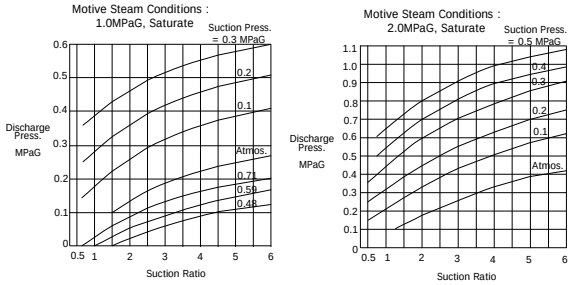
Notes :
1) Heating source for Foul Water Stripper Reboiler
Medium press. steam → Medium press. Steam + Low press. steam
2) Especially in summer season, low press. steam was released to atmosphere in large quantity because of the excessive condition.

2) Thermo-Compressor



from HOKUTO Technical Data

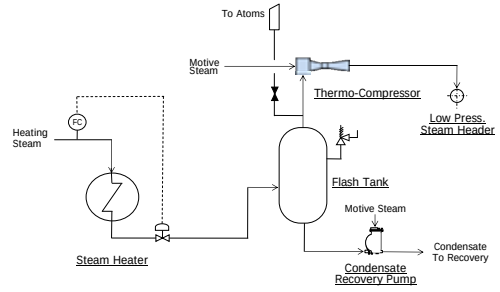
3) Typical Performance of Thermo-Compressor



$$\text{Suction Ratio} = \frac{\text{Motive Steam (kg)}}{\text{Suction Steam (kg)}}$$

from HOKUTO Technical Data

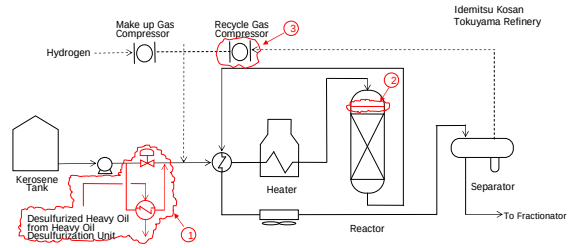
2-2. Flash Steam Recovery from High Temp. Steam Condensate



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

1) Contents of Countermeasures



Countermeasures
- ① Rising feed temp. by heat recovery from Desulfurized Heavy Oil From Heavy Oil Desulfurization Unit
- ② Improving distribution in reactor by replacement of Distributor
- ③ Lowering H2/HC mol ratio

2) Total Effect

(1) Temperature change
- Feed oil temp. : 60℃ up
- Heater ΔT : 6℃ down
- Reactor inlet temp. : 15℃ 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%

Reference:
Improvement of Liquid Distribution in Reactor

Requirement for Good Distribution at Distributor
1) Narrow intervals of distributor nozzles
2) Small pressure drop
3) Small inclination of distribution tray
4) Wide turndown of liquid flow
5) Wide gas/liquid ratio
6) No clogging with scale

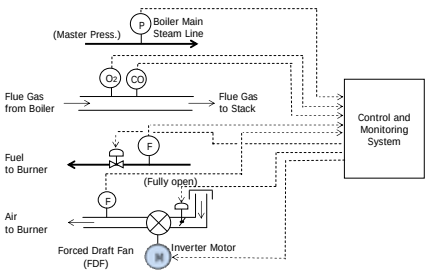
Effects of Good Distribution Tray
1) Lowering of reactor temperature
→ Decrement of fuel consumption at Reactor Charge Heater
2) Improvement of heat stability of desulfurized product

Example-4 :
Introducing O_2/CO Control System at Power Boiler

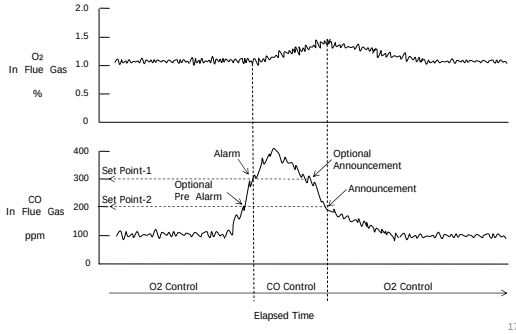
Nippon Oil
Mizushima Refinery

1) Purposes of introducing this system
(1) Lowering O2% in flue gas so as to save fuel
(2) Prevention of trouble and fuel loss by imperfect combustion

2) Outline of O2/CO Control System



3) Concept of Control Pattern at O2/CO Control System



Example-5 :
Steam Saving by Management of Steam Traps

Fuji Oil
Sodegaura Refinery

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

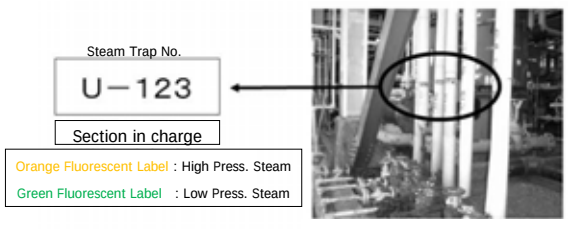
3) Confirmation of Current Status
   (1) Confirming the performance of steam traps on each type and manufacturer by actual measurements
   (2) Analysis of present conditions
   - Leaking steam quantity and the loss amount of money
   - Malfunction rate and the breakdown

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

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 CO_2 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

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



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

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

Nippon Oil
Negishi Refinery

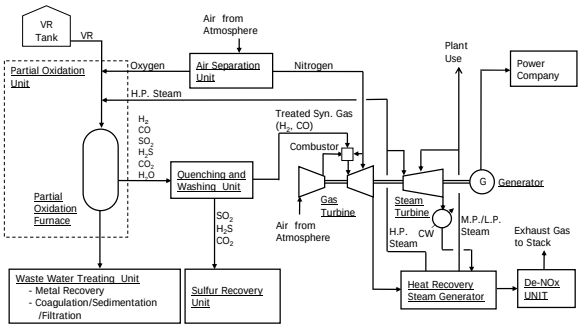
1. Reason of Introducing VR IGCC
   1) Change of demand pattern on oil products
      ⇒ Decrement of bitumen consumption
   2) Promoting IPP (Independent Power Producer) politically
   3) High power generation efficiency

   Note: VR: Vacuum Residue

2. Aspect of VR IGCC

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

3. General Configuration of VR IGCC



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 Section	Gasification Method	Partial Oxidation
	Fuel	Vacuum Residue (Asphalt)
	Fuel Consumption	50,000 ton/month
Combined Cycle	Type	One Shaft Combined Cycle
Gas Turbine	Main Fuel	Synthesis Gas (Main Component : CO, H2)
	Combustion Temp.	1,350 ℃ Class
	Exhaust Gas Temp.	570 ℃
	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

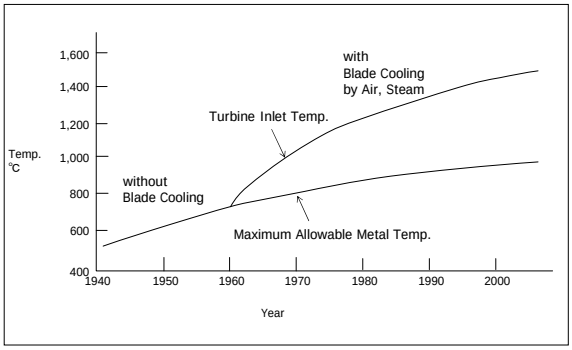
from http://www.eneos.co.jp/

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

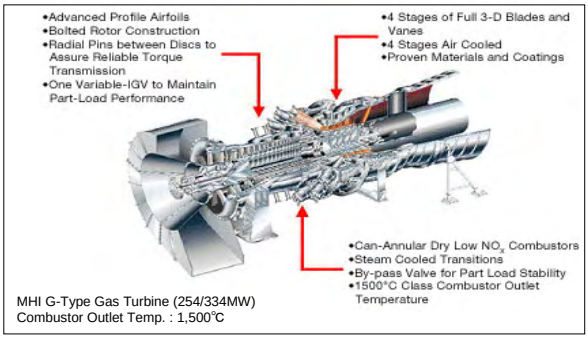
Items	VR IGCC	Boiler-Turbine Generator (Conventional)
Terminal Efficiency(LHV) %	46	39
CO_2 Emission g-CO_2/kWh	598	706

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

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



Reference-2:
Advanced Gas Turbine



MHI G-Type Gas Turbine (254/334MW)
Combustor Outlet Temp. : 1,500℃

Thank you very much for your attention

Steam System EE&C Technology of Japan

July 2010
JICA Study Team

Contents

Combustion Air Ratio Control

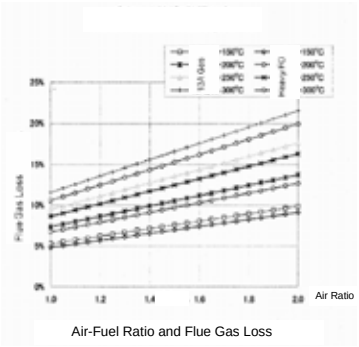
1. Excess Combustion Air Causes Energy Loss
2. Excess O_2 Reduction Saves Certain Amount of Fuel
3. Oxygen Content is the Indicator of Proper Air Ratio
4. Periodical Measurement of O_2 Concentration
5. EE&C Law of Japan regulates Adequate Air Ratio

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

CLASSIFICATION		Boiler Load %	Standard of Air Ratio (O2 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.

Air - Fuel Ratio and Flue Gas Loss



Air-Fuel Ratio and Flue Gas Loss

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

Date and Time	Temp. ° C	O2 (Dry) %	CO2 (Dry) %
Nov.3, '09 10:31	264.5	5.2	12.4
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

Boiler Operation Condition
- Evaporation : 3.8 t/h
- Steam Press. : 10.5 bar
- Steam Temp. : 185.2 ° C (Saturate)

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

Non-insulated Valves in Steam System

- Flow Sheet of Steam System

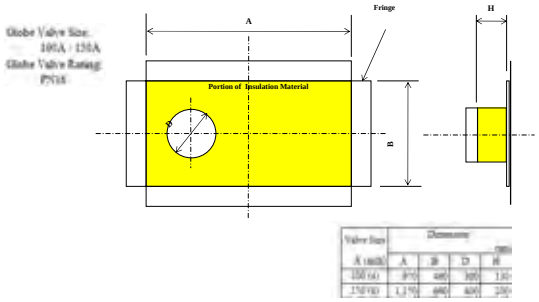
Insulation on Non-Insulated Valves

- 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

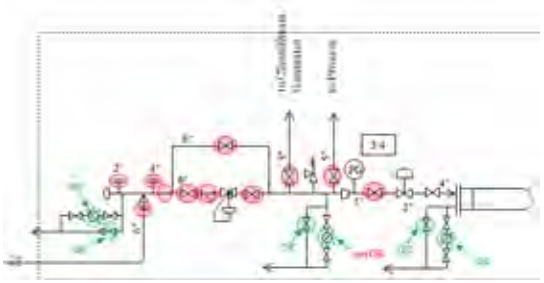
Outline of Prefabricated Insulation Jacket



Management of Steam Trap

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

Steam Traps in Production line



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

Reduction of Evaporation Steam Pressure

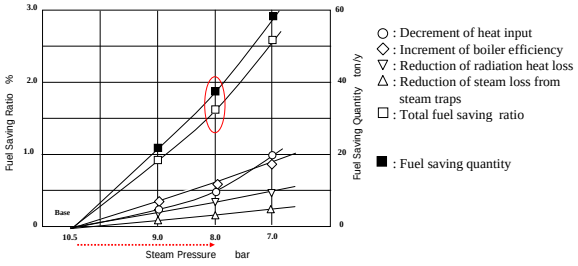
1. Energy Loss from Excessively High Steam Pressure
2. Review of Adequate Steam Pressure at Production Lines

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

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



Fuel Saving Ration and Fuel Saving Quantity

High Investment and High Return

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

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

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

Thank you
for your attention!

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%

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

Measurement Audit of Compressed Air System

Target : Compressed Air System

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

Compressor Specification

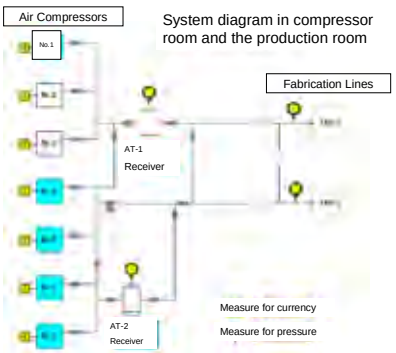
250kW 4units

Atlas Copco GA250

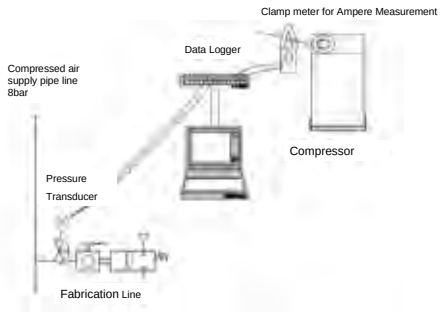
Annual Power Consumption

3 618MWh

Compressors Operation Analysis



Measurement

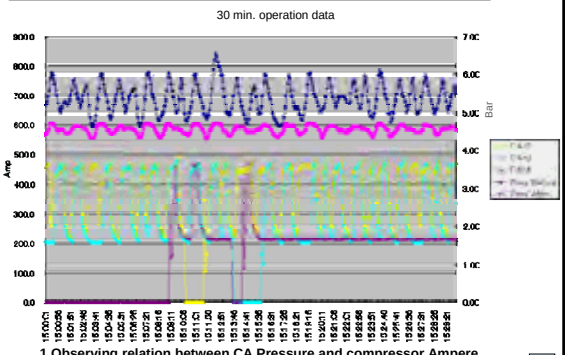


Measurement Instrument

Data Logger for Ampere and Pressure Measurement

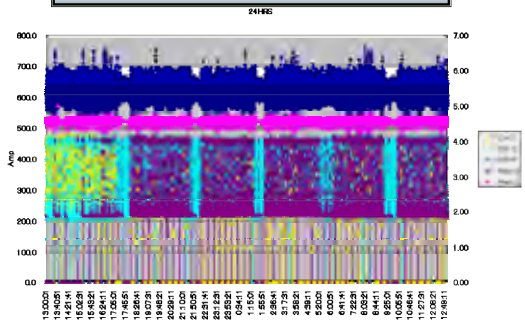
HIOKI 8430 MEMORYHILOGGER (HIOKI HP)

Operation Data of 30 minutes



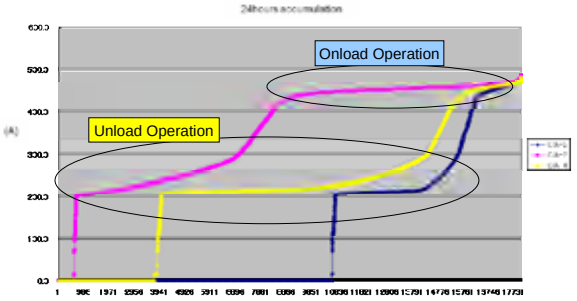
1.Observing relation between CA Pressure and compressor Ampere
2. Observing on load, unload and idling operation of 3 compressors

24hrs Measured Data



Observing 24hours operation and pressure of compressed air system

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%

Countermeasure for Power Saving

1. Adequate pressure setting for each air compressor

2. Application of variable speed drive compressor

Reduction of Unload Operation

Power Consumption = √3 X kV X A X PF X Running Hour

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

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

= 696 616 kWh/y

Detection of Compressed Air Leakage

1. Compressed air leaks from the CA pipe lines of the factory

2. Noise from products operation disturbs leakage detection by operator's ears

3. Ultrasonic air leakage detector helps easy detection

Ultrasonic Air Leakage Detector

Monarch VPE 1000 (Monarch HP)

Air Leakage Loss

1mm Hole 4m^3/h 0,4kWh

(Experimental leakage power loss)

80 leakage points during 1 hour survey

0,4kWh /2 x 80 x 24hrs x 300days

(Leakage prevention makes onload operation to unload operation)

= 115 200 kWh

Power Saving from Compressed Air

Original power consumption	3 618MWh
Saving from unload reduction	696MWh
Saving from leakage reduction	115MWh
Saving amount	811MWh (22%)

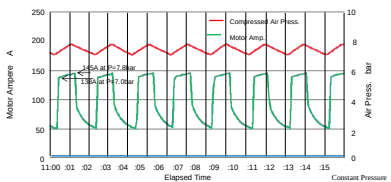
Actual countermeasure

Adequate pressure setting of Feed in and out for compressors

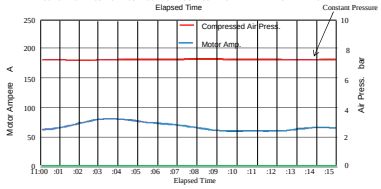
Periodical leakage detection by ultrasonic leakage detector

Application of VSD Control

Load/Unload Control



Inverter Control



EC Points of Compressed Air System

1. Elimination of unnecessary unload operation
2. Setting adequate pressure
3. Prevention of air leakage
4. Energy saving blow nozzle
5. Adequate suction air temperature
6. Utilization of exhaust heat from air cooler
7. Application of blower

Thank you for your attention

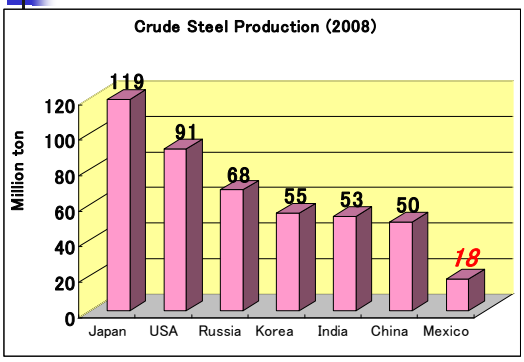
Energy Conservation Measures on Steel Making Plant

JICA Advisor

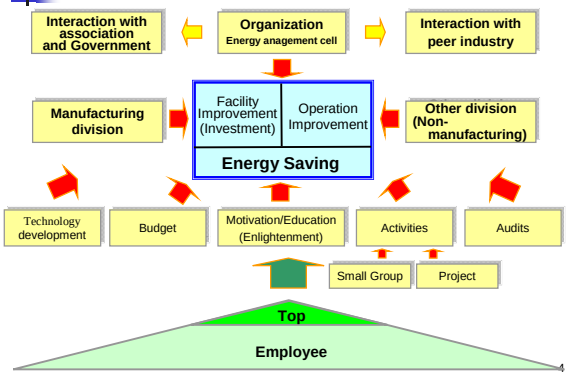
Yoshiharu IKEUCHI

Contents

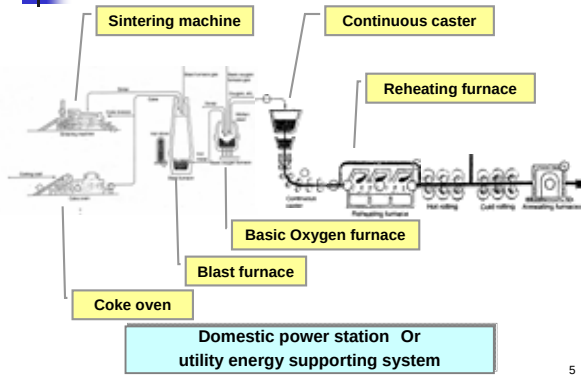
1. Crude Steel Production in Each Country



2. Energy Saving Activity

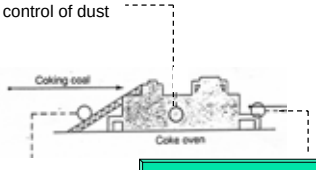


3. Process Flow on Integrated Steel Making Plant



4. Coke Oven / Energy Saving Measures

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

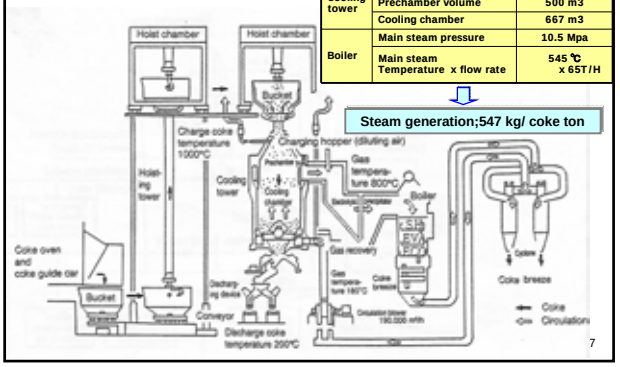


Coal moisture control

Coke dry quenching
(Steam recovery, electric power recovery)

4. Coke Oven / Coke Dry Quenching

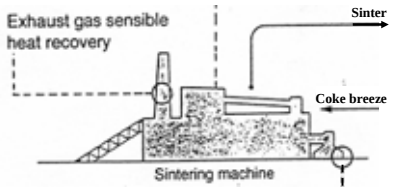
Item		Specification
Cooling tower	Coke treaty capacity	150 T/H
	Prechamber volume	500 m3
	Cooling chamber	667 m3
Boiler	Main steam pressure	10.5 Mpa
	Main steam Temperature x flow rate	545 ℃ x 65T/H



Steam generation;547 kg/ coke ton

5. Sintering Machine / Energy Saving Measures on Sintering Plant

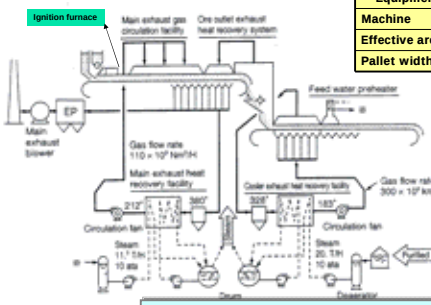
- Fuel saving measure in ignition furnace
- Rotation speed control of main exhaust fan
- Increase of layer thickness of sinter



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	222m²
Pallet width	3,700mm

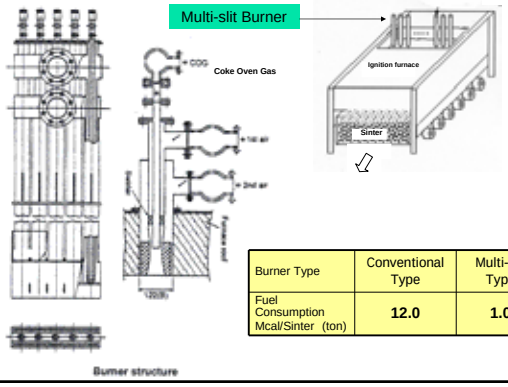


Cooler
Effective area:280m²

Recovery Steam = 8.6T/H (main Exhaust gas) + 17.2T/H(Coller)
= 25.8T/H (1Mpa,260 ℃)

5. Sintering Machine / Effective Burner on Ignition Furnace

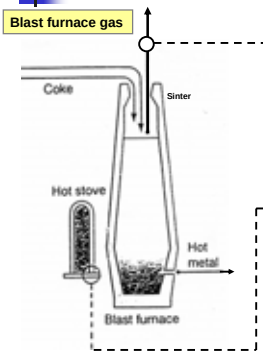
Multi-slit Burner



Burner Type	Conventional Type	Multi-slit Type
Fuel Consumption Mcal/Sinter (ton)	12.0	1.0

6. Blast Furnace / Energy Saving Measures

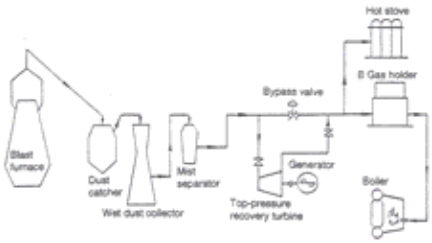
Blast furnace gas



- Pulverized coal injection to BF
- Top pressure recovery turbine
- Rotating speed control of dust collector fan

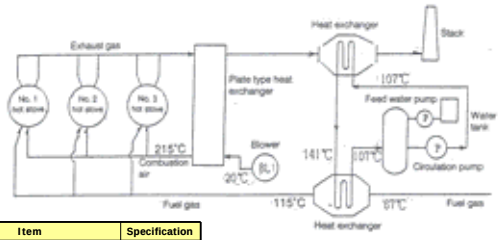
- Hot stove waste heat recovery (Combustion air preheating, Fuel preheating)
- Higher efficiency of blast furnace blower

6. Blast Furnace / Top-pressure Recovery Turbine



Item	Specification
Gas pressure	0.162 Mpa
Gas temperature	58 ℃
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)



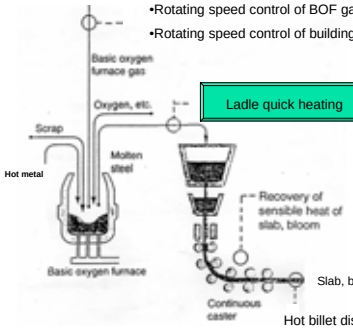
Item		Specification
Combustion Air	Air flow rate	63,200m3/H
	HE type	Plate type
	Heating area	2,131 m2
Fuel gas	Fuel gas flow rate	83,600m3/H
	HE type	Multi-tube type
	Heating area	1,575 m2

	From	To
Combustion air	20℃	215℃
Fuel gas	67℃	115℃

Recovery energy
28 x 10⁹ cal/year
9 x 10⁹ kcal/year

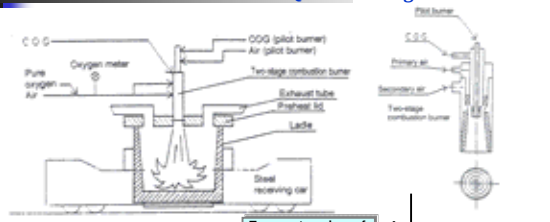
7. Basic Oxygen Furnace & Continuous Casting Machine / Energy Saving Measures on BOF & CCM

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



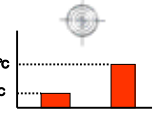
Hot billet discharging from CCM (Continuous casting machine)

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



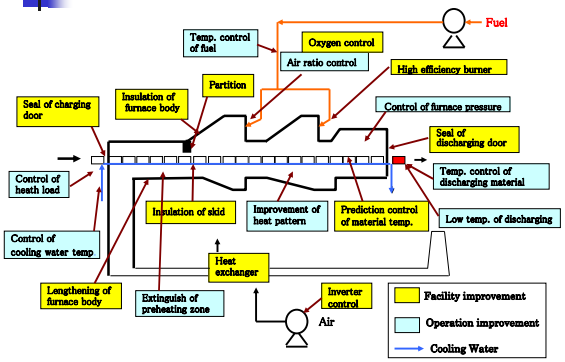
Item		Specification
Type		Ladle preheating
Heating temperature		Max:1,600 ℃
Fuel		Coke oven gas
Oxygen enrichment		21% to max. 60%
Burner	Capacity	600 x 104 kcal/h
	Type	Two-stage combustion

Temperature drop of molten steel can be suppressed by 12 ℃ in average

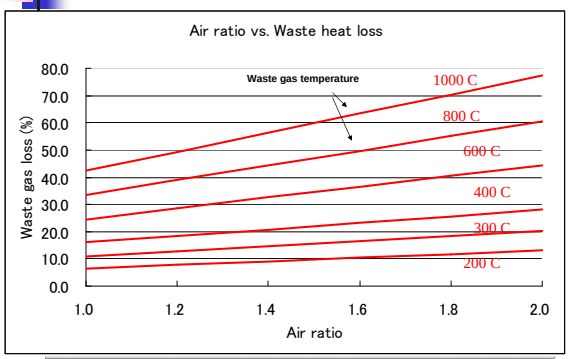


Type	Conventional	New type
COG flow rate Nm3/h)	400	1,200
O2 enrichment	21	60
Heating time (min)	15	15

8. Reheating Furnace / Energy Saving Technology on Reheating Furnace

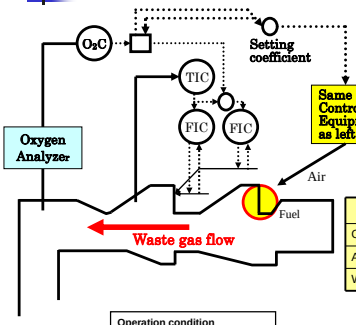


8. Reheating Furnace / Air ratio vs. Waste heat loss



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

8. Reheating Furnace / Oxygen Control in Waste Gas

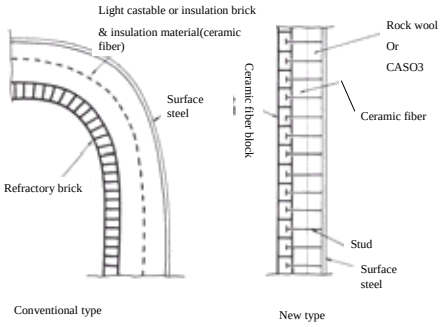


	Before	After (O2 control)
O2 content	5%	1.5%
Air ratio	1.31	1.08
Waste gas loss	42%	36%

Operation condition
Outlet waste gas temp.:800℃

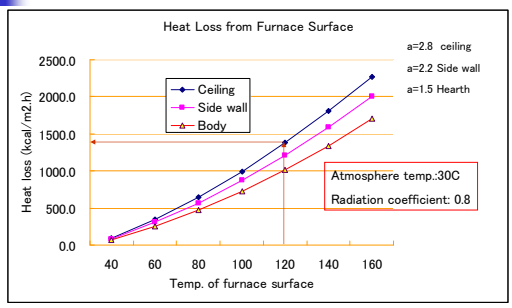
Reduction of fuel consumption: 6%

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

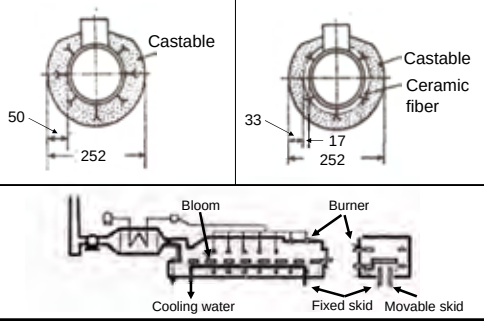
8. Reheating Furnace / Heat Loss from Furnace Surface



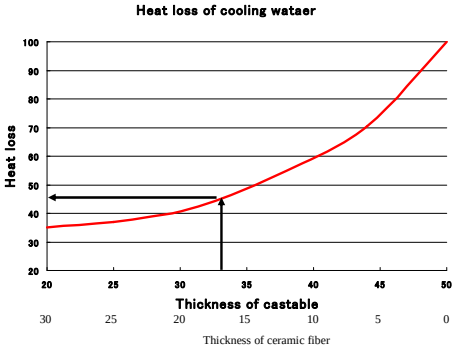
$Q=a*(t-b)^{(5/4)}+4.88*\varepsilon\,(((t+273)/100)^4-((b+273)/100)^4)$

8. Reheating Furnace / Insulation on Skid Pipe

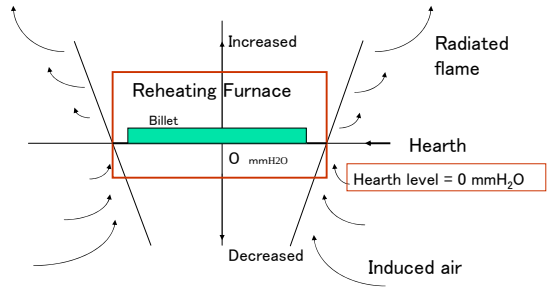
Conventional	Improvement
Size of skid pipe	Size of skid pipe



8. Reheating Furnace / Effect of Ceramic Insulation

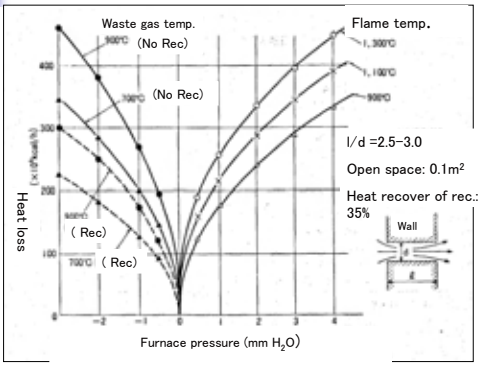


8. Reheating Furnace / Furnace pressure



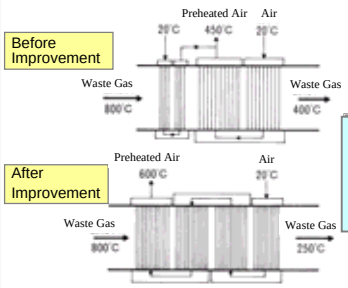
1m ≒ 1mm H_2O in reheating furnace

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



Furnace pressure vs. Heat loss of open space

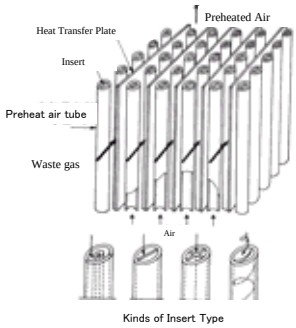
8. Reheating Furnace / Increasing Heat Transfer Area



Item	Before	After
Area of heat transfer	652 m2	1,434 m2
Dia. of pipe	61 ϕ	45 ϕ
Pieces	288 & 1,368	4,176

Specific energy consumption:
300,000kcak/t
⇩
270,000kcal/t

8. Reheating Furnace / Improvement of Heat Exchanger



Kinds of Insert Type

Q = U x A x T

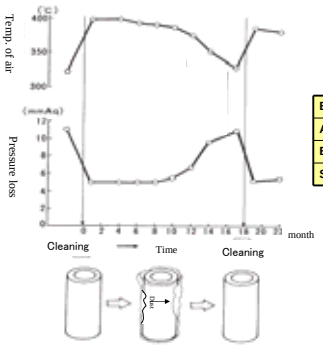
Heat Transfer = Coefficient of heat transfer x Area of heat transfer x Temperature

(kcal/h) = (kcal/m2.h.C) x (m2) x (C)

⇩

Improvement of U

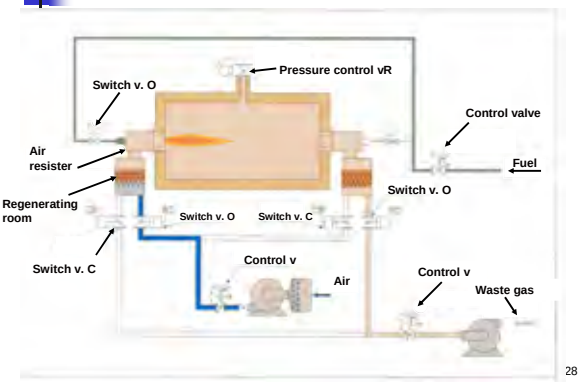
8. Reheating Furnace / Cleaning of Heat Exchanger



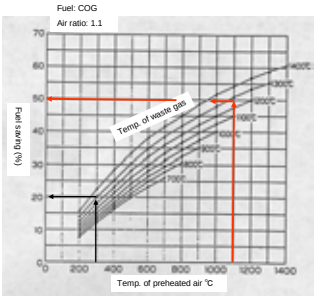
Effect of Cleaning

Before	400,000 Kcal/T
After	384,000 Kcal/T
Effect	16,000 Kcal/T
Saving rate	4 %

8. Reheating Furnace / Regenerative Burner



8. Reheating Furnace / Fuel Saving vs Waste Gas Temperature

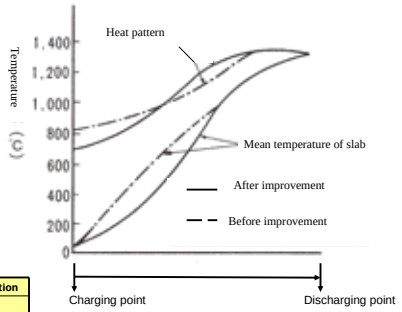


Temperature of preheated air can be raised more than 1,000 ℃

⇩

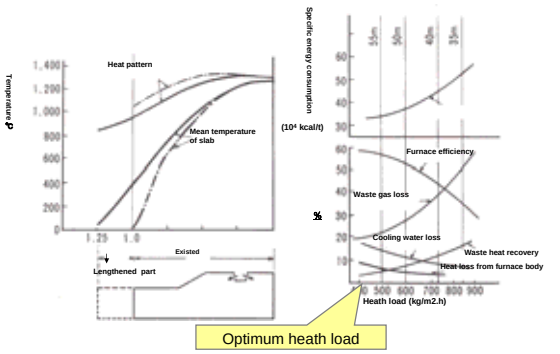
Fuel consumption can be saved more than 30%

8. Reheating Furnace / Heat pattern



Heat pattern	Fuel consumption
— · —	100%
———	93%

8. Reheating Furnace / Lengthening Furnace Body



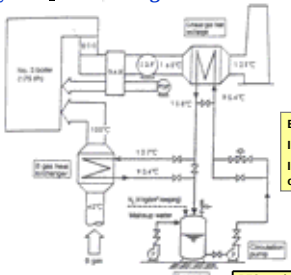
Optimum heath load

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



Effect

Increase of boiler efficiency: 1.6%

Increase of power generation output: 480kW

Exhaust gas heat exchanger		
Type : Fin tube type		
Heating area		4,290m2
Shell side	Exhaust gas	222,870 Nm3/hj
	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 m2
Shell side	BFG gas	142.000 Nm3/hj
	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	Nm3/ton	340
Sintering Plant	Steam generation	Kg/ton	126
	Energy consumption of ignition furnace	MJ/ton	5
Blast furnace	BFG generation	Nm3/ton	2,000
	Electricity generation by TRT	kWh/ton	47
	Energy consumption of HS	MJ/ton	1,600
Basic Oxygen Furnace	BOF gas generation	Nm3/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

Contents

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

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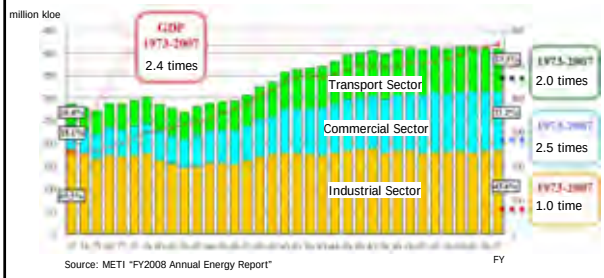
Statistics

Final Energy Consumption by Sector



Source: METI "FY2008 Annual Energy Report"

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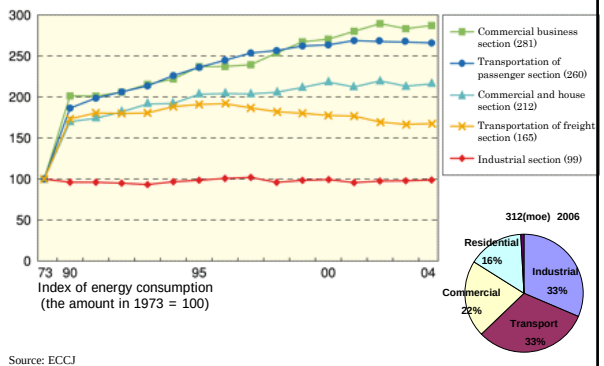
Final Energy Consumption by Sector



Source: ECCJ

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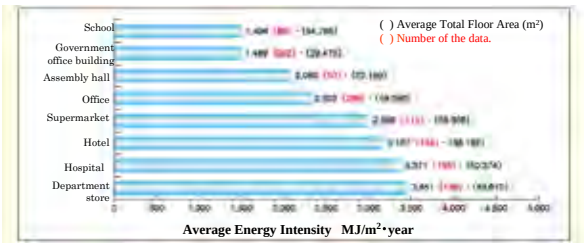
Energy Intensity by Building Type of Commercial Sector

- Energy intensity = energy consumption per floor area



Source: ECCJ

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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		Transport Sector
			Building Sector	Residential Sector	
Regulation	Energy Conservation Law	Building Code for Energy Efficiency / The Energy Management Regulation System (EMS) / Minimum Standards for Equipment The Top-Runner Program			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			
		Public loan for small & medium companies purchasing EE equipment		Tax reduction for EE houses	
	Others	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 envelops (walls and windows)
  - PAL = thermal load of inside perimeter area (MJ/year) / floor area of inside perimeter area (m²)
- **CEC (Coefficient of Energy Consumption)**
  - Indicate energy efficiency of each equipment
    - AC, V, L, HW and EV
  - CEC = **Annual** Energy Consumption (MJ/year) / Annual **Standardized** Energy Consumption (MJ/year)
  - **Special software for calculation**

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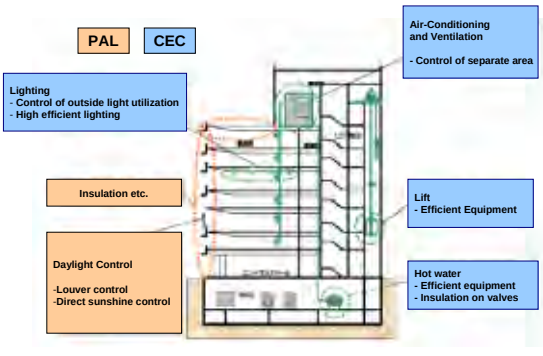
Building Code for Energy Efficiency



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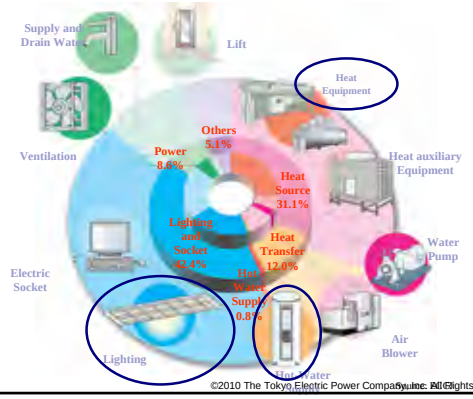
Technology for Energy Efficiency

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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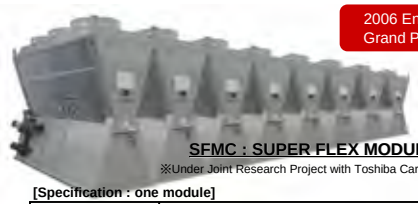
ex: Efficient Air-Cooled HP Chiller



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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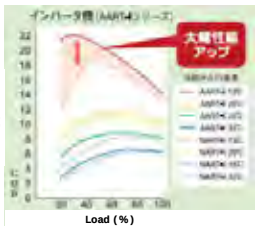
ex: An Efficient Centrifugal Chiller

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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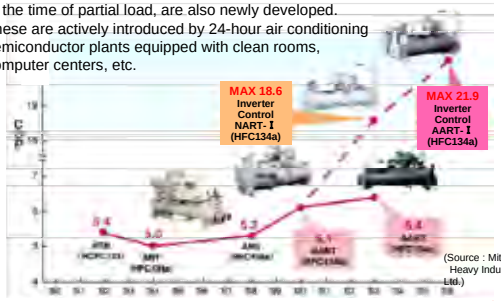
Changes in Performance of Centrifugal Chillers

- 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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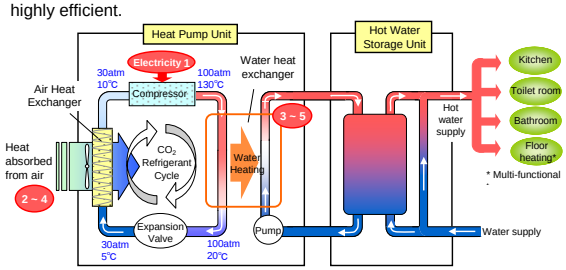
What is "Eco Cute" ?

The **natural refrigerant (CO_2)** heat pump water heater, **"Eco Cute",** is highly efficient.



1 (Electric Energy) + **2~4** (Atomospheric Heat) = **3~5** (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 (CO_2) heat pump water heaters.

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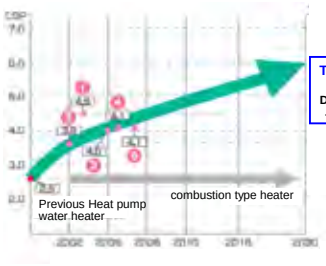
TEPCO's Development of Heat Pump Water Heater for Business Use

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



TEPCO Joint Develop-ment

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

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Efficient Air Conditioner (AC) for Home Use

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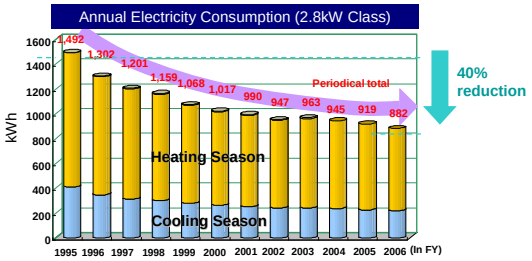
Efficiency Improvement of House AC

- 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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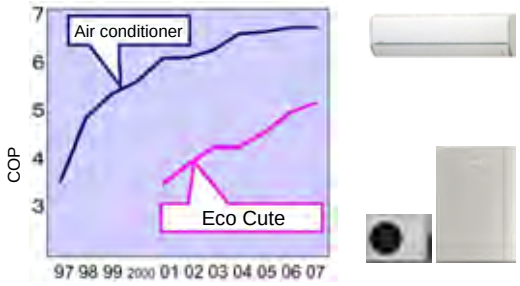
Efficiency Improvement



Efficiency of air conditioners and Eco Cute increased twice as high and 50%, respectively.

ed.

Efficient Lighting System

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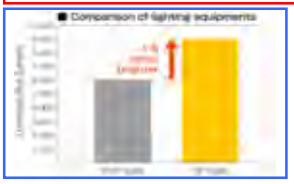
High-efficiency lamp and Lighting control system

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



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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 m2
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

	Primary Energy	CO2 Emission
Reduction	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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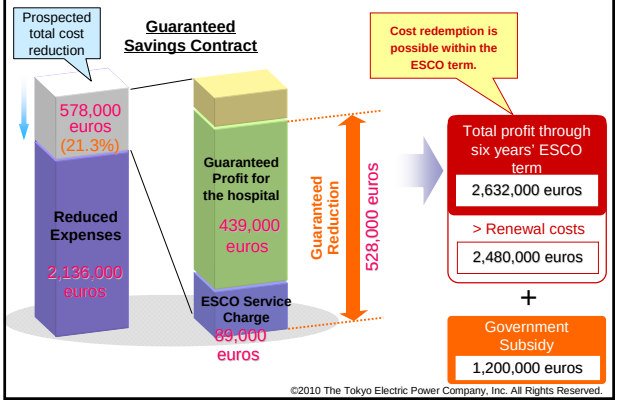
Cost and Profits as an ESCO Service



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

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, CO_2 emission, overall cost including construction cost, cost, administrative and 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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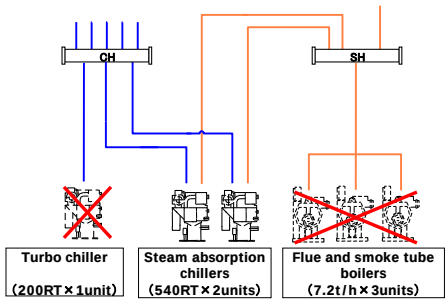
Before Retrofit



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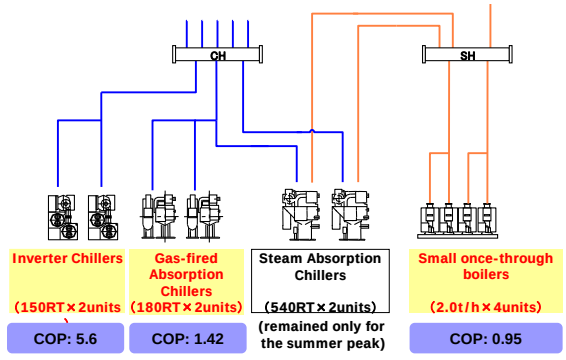
After Retrofit



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Heat Generating Equipment

Inverter chillers
(150RT×2units)

Gas-fired absorption chillers
(180RT×2units)

Small once-through boilers
(2.0t/h×4units)

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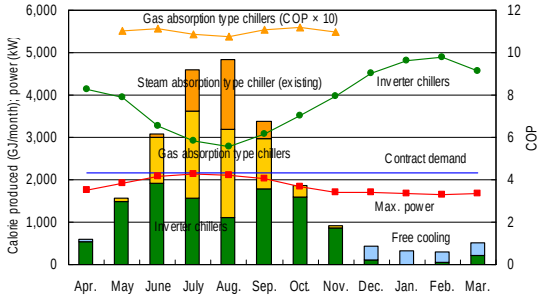
Generated Heat for Cooling

Shift from gas to electricity, controlling the power demand



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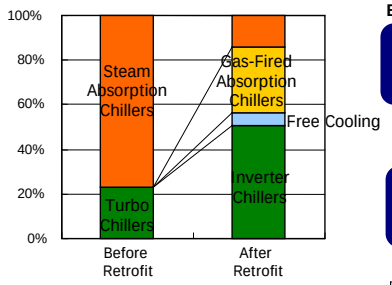
Amount of Heat Generated for Cooling



Before

About 80% by Steam Absorption Chillers.

After

More than 50% by Inverter Chillers.

Parameter	
Electricity	9.83 MJ/kWh
Gas	44.064 MJ/kWh

COP improved from **0.75** to **1.45**

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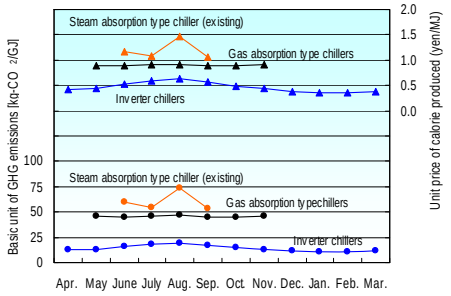
Comparison of CO2 and cost intensity



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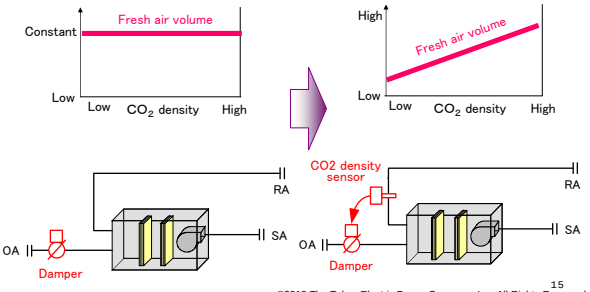
B. Optimum Control of Fresh Air

Reduce fresh air volume according to CO2 sensor

Before	After



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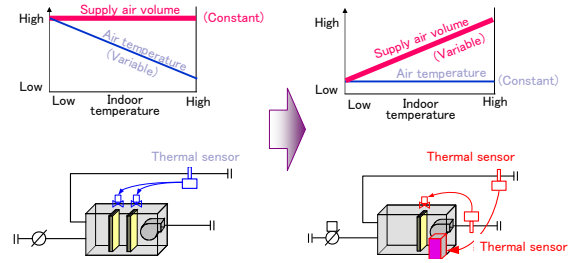
C. VAV: Variable Air Volume (AHU) Control

Control supply air volume according to indoor temperature instead of controlling supply air temperature

Before	After



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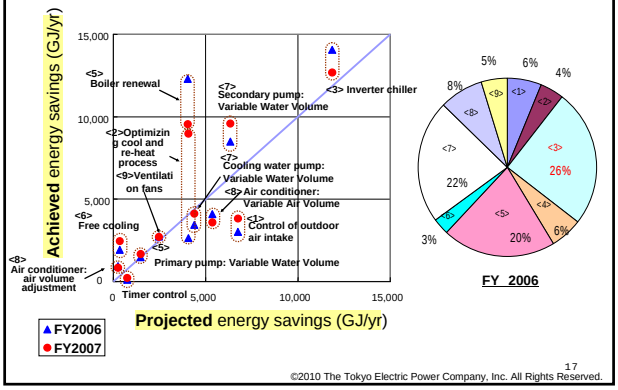
Overall Results of Energy Saving



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A Case of Office Building:

Energy Management in
Tokyo Electric Power Company
(Head Office Building)

July 2010

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Contents

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

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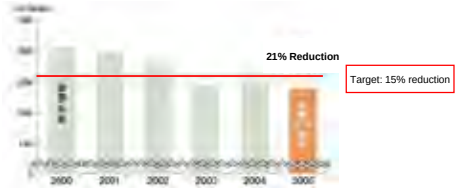
TEPCO as a whole

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

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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

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Energy saving measures taken at the construction of the building

Since 1972

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■ 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.

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Energy saving measures after COP3

Since 1997

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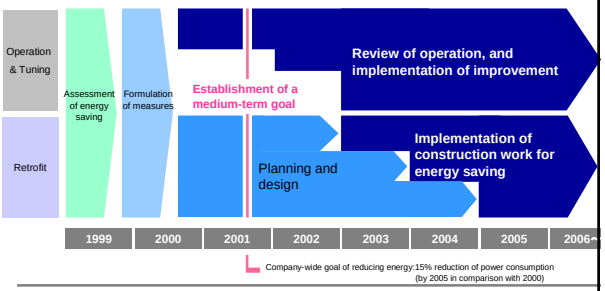
Implementation of systematic energy saving measures



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

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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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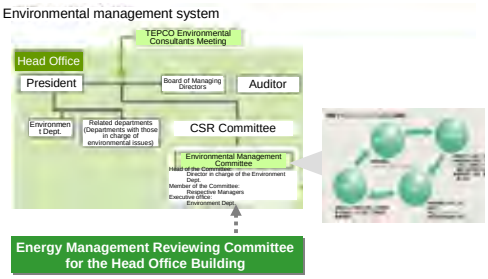
Response to the Energy Conservation Law

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

Environmental management system



- 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 CO_2 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

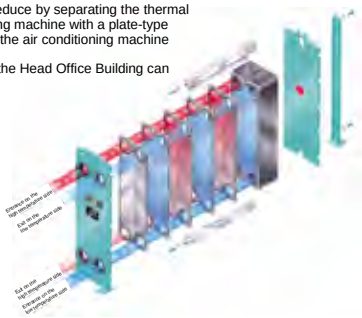
  A machine to exchange the heat of cold water (or hot water) in a thermal storage tank, and circulated water in an air conditioning machine.

- 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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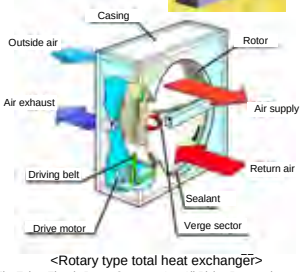
Rotary Total Heat Exchanger (Air Conditioning Machine)

- 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

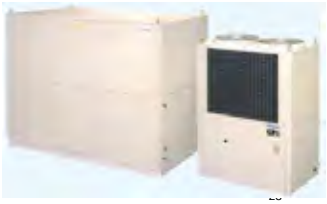
  EcoCute use a non-toxic, non-flammable, and idealistic natural refrigerant (CO2), which has an ozone layer depletion coefficient of zero, a global warming coefficient of one (about one one-thousand-seven-hundredth of a fluorocarbon refrigerant). EcoCute is excellent in terms of environmental protection.

- 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 (CO_2). 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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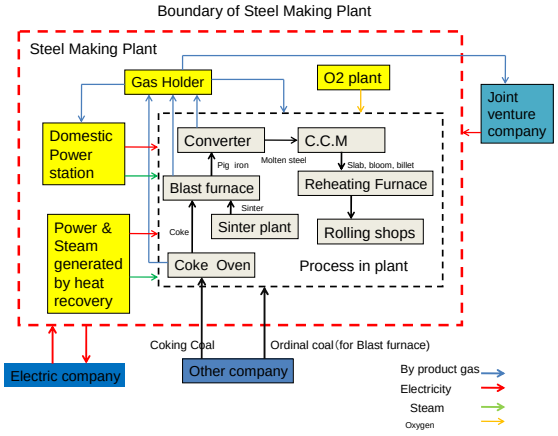
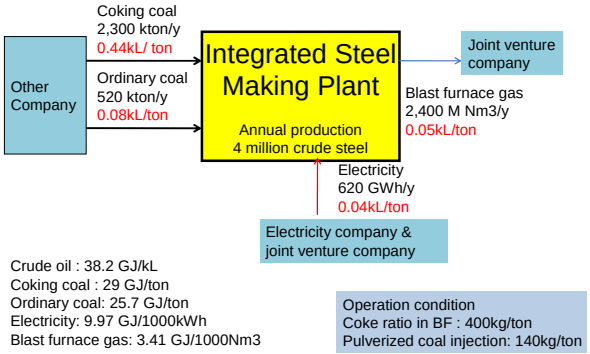
Example of Benchmark in Integrated Steel Making Plant

JICA STUDY TEAM

Yoshiharu IKEUCHI





Calculation of Benchmark

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

Annual total energy consumption = Purchased energy(Coking coal + Ordinary coal + Electricity – Sold energy(Blast furnace gas)
= 66,700 TJ + 13,364 TJ + 6,181 TJ –8,184TJ = 78,061 TJ

Benchmark = 78,061 TJ ÷ 4,000,000 ton = 19.5GJ/ton
= 19.5GJ/ton ÷ 38.2 GJ/kL =0.51 kL/ton

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

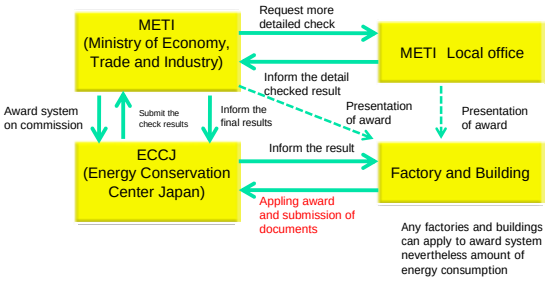
JICA Study Team
Yoshiharu Ikeuchi

Contents

1. Purpose of Award System

- 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 Employees	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

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

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

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

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

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	(kL)			
⑤ Amount of product				
⑥ Energy intensity				
⑦ Ratio against previous year				

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 betaken on new installation
Rationalization of fuel combustion (Combustion facility)	Status of establishing management standards for air ratio and others ☐ Already established ☐ Being established (%) ☐ To be establis hed	Status of measurement/record defined in management standards ☐ Regularly done ☐ Done as needed ☐ Not done	Status of maintenance/inspection defined in management standards ☐ Regularly done ☐ Done as needed ☐ Not done	Status of measures to be taken on new installation of combustion facilities ☐ Done ☐ Not done ☐ Not applica ble
Rationalization of heating, cooling and heart transfer (Heat consumption facility)	Status of establishing management standards for heating equipment and others ☐ Already established ☐ Being established (%) ☐ To be establis hed	Status of measurement/record defined in management standards ☐ Regularly done ☐ Done as needed ☐ Not done	Status of maintenance/inspection defined in management standards ☐ Regularly done ☐ Done as needed ☐ Not done	Status of measures to be taken on new installation of heating equipment and others ☐ Done ☐ Not done ☐ Not applica ble

A
BIG
THANK YOU!!

Curriculum of Energy Efficiency in Japanese Universities

August, 2010

Mayo Yoneyama
JICA Study Team

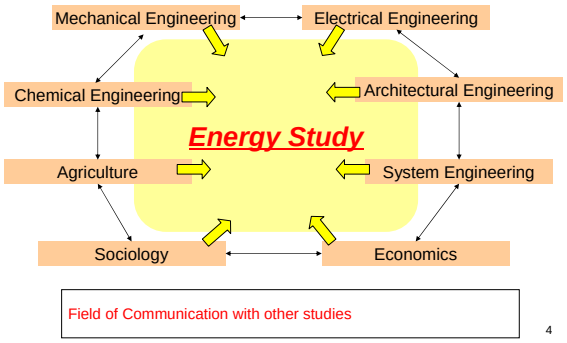
Contents

1. Any Faculty of Energy Engineering in Japan?

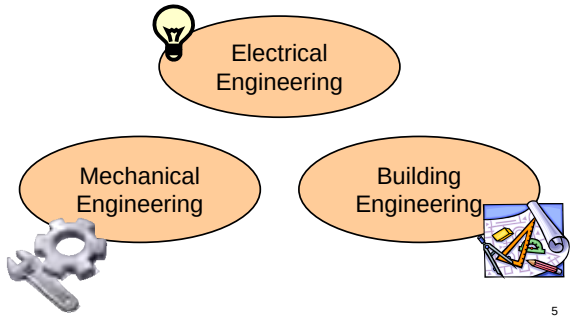
There's no faculty named "Energy Engineering".

- 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

Electrical Engineering **Building Engineering** **Mechanical Engineering**

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

5.1 Kyoto University

[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.

	< Department >	**< Course >**
Energy Science	Socio-Environmental Science	Energy Social Environmental
	Fundamental Energy Science	Chemical energy course Physical energy course
	Energy Conversion Science	Combustion and engine system Material and system integrity Fusion and nuclear power
	Energy Science and Technology	Electricity and electronics Materials Resources Energy science and technology

[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

[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	

[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

[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**

*Advanced Study on Energy Science and Technology	*Ocean Resources and Energy Technology
*Introduction to Energy Science and Technology	*Numerical Approach to Working Processes
*Lecture on Advanced Integrated Circuits	*Computational Physics
*Thin Film Nanodevices	*Advanced Physical Chemistry
*Effective Utilization Engineering in Electrical Energy System	*Physics of Energy Conversion Materials
*Materials Processing	*Photon and Quantum Energy
*Functional Materials Processing	*Electromagnetic Energy
*Thermochemistry	*Effective Utilization of Energy
*Thermodynamic Strategy for Environmental-Friendly Processes	*Energy Development
*Resource and Energy System	*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

- Division of Transdisciplinary Sciences
- Division of Biosciences
- Division of Natural Environmental Studies
  - Course
    - Natural Environmental Studies
    - Ocean Technology, Policy, and Environment
    - Environment Systems
    - Human and Engineered Environmental Studies
    - Socio-Cultural Environmental Studies
    - International Studies
  - Program
    - Health Science
    - Environmental Design
    - Environmental Management
    - Sustainability Science
    - Environmental Engineer Training
    - Environmental Manager Training
- Department of Computational Biology

[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

21

[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

[Nagoya University]

School of Engineering

- **Faculty of Engineering**
  - Chemical and Biological Engineering
  - Physical Engineering
  - Electrical and Communication Engineering
  - Mechanical and Aeronautical Engineering
  - Social Environmental Engineering

[Nagoya University]

Department of Social Environmental Engineering

- Undergraduate
  - Civil Engineering Course
  - Architecture Course
- Graduate
  - Civil Engineering
  - Environmental Studies
    - Earth and Environmental Science
    - **Environmental Engineering and Architecture**
    - Social and Human Environment

5.5 Waseda University

[Waseda University]

Faculty of Science and Engineering

Fundamental Science and Engineering	**Creative Science and Engineering**	**Advanced Science and Engineering**
Mathematics	Architecture	Advanced Science and Engineering
Applied Mathematics	Modern Mechanical Engineering	Physics
Computer Science and Engineering	Industry and Management Systems Engineering	Applied Physics
Applied Mechanics And Aerospace Engineering	Civil and Environmental Engineering	Chemistry and Biochemistry
Electric and Photonic System	Resources and Environmental Engineering	Applied Chemistry
Intermedia Art Science		Life Science and Medical Bioscience
		Electrical Engineering and Bioscience

[Waseda University]

Faculty of Science and Engineering

Department for Undergraduate & Graduate School	Department only for Graduate School
<Aim at the Lecture> Education and research emphasizing cooperation among the five departments Nurturing individuals to the creation of a more affluent society	< Aim at the Lecture> Training scientists and engineers who offer the advanced knowledge and broad perspectives required to solve society's problems
Fundamental Science and Engineering Creative Science and Engineering Advanced Science and Engineering	+ Global Information and Telecommunication Studies Environment and Energy Engineering Information and Systems

[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 (Pratice/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 Univerisity]

Curriculum of Resources and Environmental Engineering

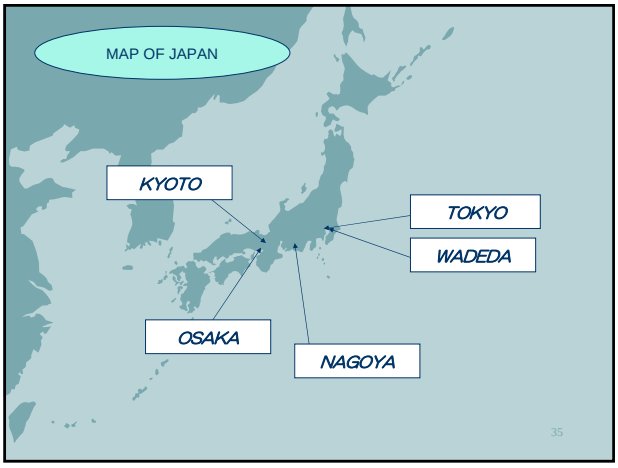
Graduate	Environment and Safety Engineering Environment Study of Ecological System Advanced Aquatic Chemistry Resources Recycling Resources Separation Technology Materials Processing Engineering Formation Fluid and Environmental Engineering Advanced Numerical Production Engineering Applied Geophysics	Geosphere Environmental Engineering Geochemistry of Mineral Resources Advanced Raw-Materials Science Physics and Chemistry of Minerals Thermodynamics in Petrology Isotope Isotope Geochemistry Structural Petrology Advanced Paleontology
Undergraduate	Resource and Environmental Engineering Laboratory Applied Physical Chemistry and Exercise Applied Mathematics and Exercise Applied Physical Chemistry and Exercise B Crust Information Engineering and Exercise Atmospheric Environment and Engineering Working Environment Engineering Environmental Geochemistry Water Environment Engineering Environmental Risk Analysis Particle Control Technology Resource Separation Engineering Solid-Liquid Separation Resource Recycling Introduction to Chemical Industry Metals Production Engineering Geophysical Engineering Overview of Resource and Environmental Engineering Earth Science A, B Computer Literacy Environmental Instrumental Analysis on Cutting-Edge Technology of Mineral Resources Fundamentals of Geoexploration Engineering on Cutting-Edge Technology of Oil and Gas Development	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 GeoexplorationEngineeringIntroduction to Development and Environmental Engineering Materials Processing Engineering Principles Creative Science and Engineering Literacy

6. Examples: Energy Programs of 5 Japanese universities

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

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.



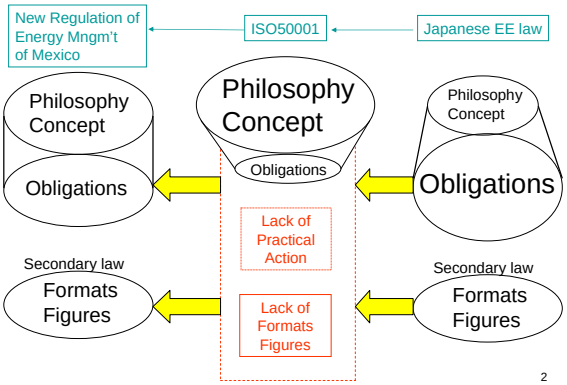
Thank you for your attention!

ISO50001
&
Energy Management Regulation

August, 2010

JICA Study team
TEPCO

Roadmap for the new Regulation in Mexico



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	

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.

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 low
Evaluation of performance	Observation of significant energy consumption and availability of action plan	Report (energy consumption, specific energy consumption rate, concrete technical index)

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

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**

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 (kl /year of crude oil equivalent)		3,000 kl/year and above	1,500 kl/year – 3,000 kl/year	Less than 1,500 kll /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	EE&C Results Report	–
		Middle and Long Term Plan 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 Advice/ collection of the reports of energy consumption		
		Investigation of factories and buildings Investigation of the situation and Observation of Evaluation Criteria		

2. Implementing Organization (ISO50001)

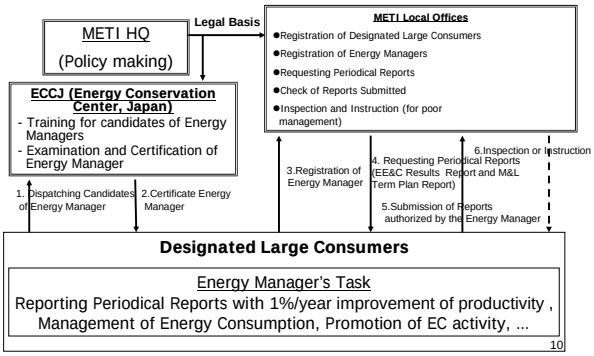
International Organization for Standardization (ISO)

<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.

2. Implementing Organization (Japanese Law)

Players of Energy Management Regulation



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.

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

4. EE&C Activities within the Site (ISO50001)

(1) Establish the management framework

(2) Provide effective operation and maintenance

(3) Provide the management standard of equipments

4. EE&C Activities within the Site (Japanese Law)

(1) Establish the management framework

(2) Provide the management standard for equipments

5. Periodical Reports to the Regulators (ISO50001)

ISO is the private standard ,so no report is required to the Government.

Consumption record should be kept internally.

5. Periodical Reports to the Regulators (Japanese Law)

Periodical Reports to METI must include mid-and-long term plan, energy consumption data and benchmarking figures.

6. Monitoring and Checking (ISO50001)

6. Monitoring and Checking (Japanese Law)

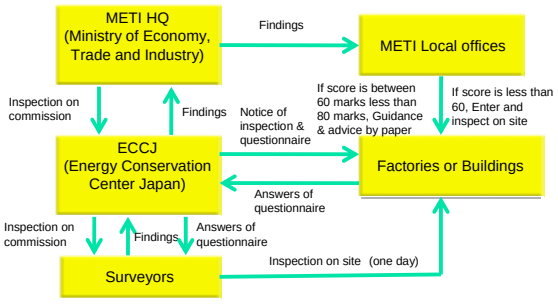
Periodical Reports which were submitted from companies are checked within METI.

7. Inspection and Penalty (ISO50001)

According to Traditional ISO System in Japan , there are two types of review; regular surveillance (Twice a year) and renewal surveillance (Once every three years).

	Regular Surveillance (Twice a year)	Renewal Surveillance (Once every three years)
Method	Random check	All ISO system check
Check Point	Performance of ISO system	Will of the management level of the company
Purpose	Correction of wrong performance	Go out of mannerism

7. Inspection and Penalty (Japanese Law)



7. Inspection and Penalty (ISO50001)

These 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 have to submit paper of all thing 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.

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.

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.

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.

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 & still (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.

Draft Proposal for

the New Mexican Energy Management Regulation

based on the ISO50001

Materials for discussion

1. Designation of Energy and Consumers

(1) Energy

Electricity	Fuel	Heat

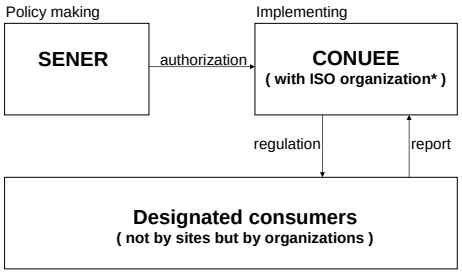
(2) Management should be carried out not by sites but by organizations

(3) Category & Thresholds*

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

* **Thresholds can be in CO2 emission.**

2. Implementing Organization



* **ISO organization : entrusted companies in ISO certification processes**

3. Qualifications/Licenses of Energy Managers

(1) category

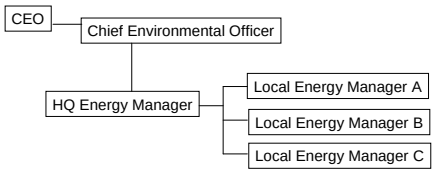
Electric Engineering	Mechanical Engineering

(2) pathway

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

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

5. Periodical Reports to the Regulators

3 kinds of report shall be submitted once a year.

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

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.

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

Thank you for your attention.

Let's discuss in details.

System of Random check on Site in Japan

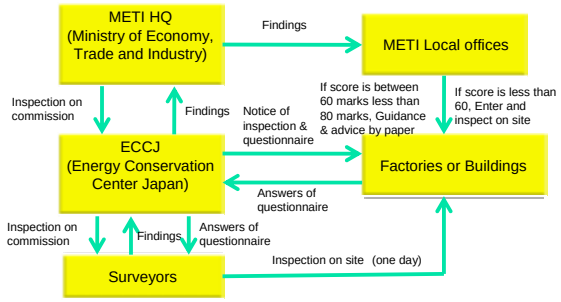
JICA Study Team
Yoshiharu Ikeuchi

Contents

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**

2. Players of Random Check on Site



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 8 blocks in Japan and they are selected among experts of rational energy use in ECCJ

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

5. Contents of Questionnaire

1. Number of licensed energy mangers
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

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						

7. Annual Energy Consumption Table (1)

Process	Facility and equipment Kind	Capacity & unit	Energy consumption Fuel and heat GJ	Fuel and heat kL	Electricity MWh	Electricity kL	Total kL		Consumption rate	MS
A division	Air-conditioner	18	34,275	884	1,475	372	1,256	●	10.3	4
	Absorption chiller	4	47,558	1,227	111	28	1,255	●	10.3	3
	Lighting				3,528	889	889	●	7.3	1
							0		0.0	
	Subtotal		81,837	2,111	5,115	1,289	3,400		27.9	
	Others		0	0	469	118	118		1.0	
	Total		81,837	2,111	5,584	1,407	3,518		28.8	
B division	Air-conditioner	16	29,994	774	1,290	325	1,099	●	9.0	4
	Lighting		0	0	437	110	110	●	0.9	1
							0		0.0	
	Subtotal		29,994	774	4,314	1,087	1,861		15.3	
	Others		0	0	437	110	110		0.9	
	Total		29,994	774	4,751	1,197	1,971		16.2	
Manufacturing division	Arc furnace	10 ton x2			4,800	1,210	1,210		9.9	6
	Compressor	10kWx4			254	64	64	●	0.5	8
	Air-conditioner	11	21,425	553	925	233	786	●	6.4	4
	Lighting				3,024	762	762		6.2	1
							0		0.0	
	Subtotal		21,425	553	9,003	2,268	2,822		23.1	
	Others		0	0	131	33	33		0.3	
	Total		21,425	553	9,134	2,302	2,855		23.4	
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	9
	incinerator.	50t/day x1	9,457	244	65	16	260	●	2.1	7
	Lighting				885	223	223	●	1.8	1
	Transformer&power supply				369	93	93	●	0.8	8
									0.0	
	Subtotal		133,565	3,446	1,564	394	3,840		31.5	
	Others		0	0	75	19	19		0.2	
	Total		133,565	3,446	1,639	413	3,859		31.6	
Total	Subtotal		266,821	6,884	19,996	5,039	11[illegible]		97.2	
	Others		0	0	1,112	280	280		2.3	
	Full total		266,821	6,884	21,108	5,319	12,203		100.0	

MS: Number of management standard

7. Annual Energy Consumption Table (2)

Process	Facility and equipment Name	capacity& unit	Energy consumption Fuel and heat GJ	Fuel and heat kL	Electricity MWh	Electricity kL	Total kL		Energy Consumption rate	MS
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	9
	incinerator.	50t/day x1	9,457	244	65	16	260	●	2.1	7
	Lighting				885	223	223	●	1.8	1
	Transformer& power supply				369	93	93	●	0.8	8
									0.0	
	Subtotal		133,565	3,446	1,564	394	3,840		31.5	
	Others		0	0	75	19	19		0.2	
	Total		133,565	3,446	1,639	413	3,859		31.6	

∗ Including estimated value

MS: A number of management standard

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

8. Evaluation criteria of rational energy use (2)

NO	Contents
1.	Rationalization of combustion of Fuels
2. 2-1 2-2	Rationalization of heating and cooling as well as heat transfer. ●Heating units, etc ●Air-conditioning equipment and hot water supply system, etc.
3.	Recovery and utilization of waste heat.
4. 4-1 4-2	Rationalization of conversion of heat into power, etc. ●Exclusive generation system ●Cogeneration system
5. 5-1 5-2	Prevention of Energy loss due to emission, conduction, resistance, etc ●Prevention of heat loss due to radiation and conduction, etc ●Prevention of electricity loss due to resistance, etc
6. 6-1 6-2	Rationalization of conversion of electricity into power, heat, etc. ●Electric motor appliances and electric heating appliances, etc ●Lighting system, elevating machines, office appliances and consumer equipment

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

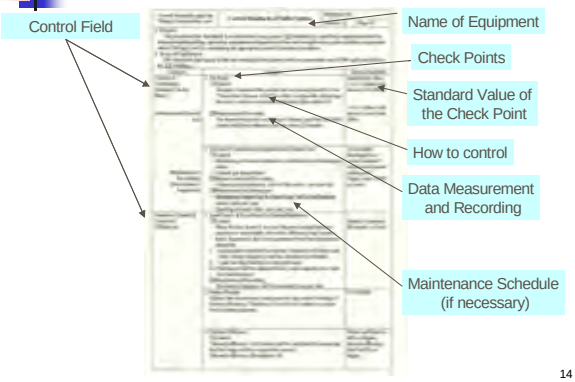
For the combustion system, periodic maintenance and inspection shall be performed to keep the good condition. **"Management Standard"**

(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.

8. Sample of Management Standard (4)



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 are done based on Control or 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	

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	○	○	○	△
				18	12

30 marks

Contents of NO. are connected with evaluation criteria

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.

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

(3) Maintenance and inspection

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

Score = (30 + 14 + 16)/(36 + 16 + 20) X 0.211 = 17.6

Consumption rate

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

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.

A
Big
Thank You!!

Details of Training Programs for Energy Managers in Japan

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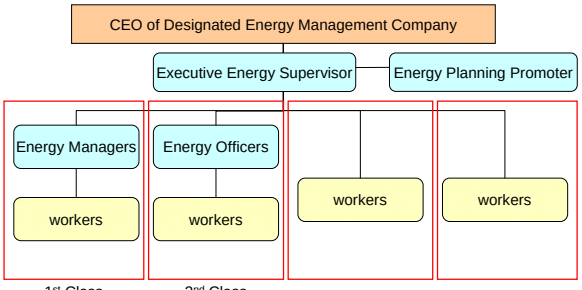
JICA Study Team

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**		EE&C Practice Course
			The Course for new applicants	**The Course Improving quality of them**	
timing of implemen-tation	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

1. Outline of Energy Management and Law and Regulations
   (1) Energy Conservation Law and Regulations
   (2) Energy Situation, Policy and General Statement
   (3) Basic of Energy Management Technology

4. Examination Subjects of Energy Management (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) Heat utilization facility

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

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

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

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)

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)

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

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

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

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.

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

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

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

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

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

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 stream 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

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
- Cast 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)

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

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

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

Thank you for your attention!