I. Guidelines for Preparing Medium- and Long-Term Plans by the Type 1 Specified Business Operator that Install Factories for their Operations in the Manufacturing Industry

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1. General Manufacturing

(all manufactures except four industries specified in the item "2. Specified Industries" hereinafter the same)

When the enterprises, that install factories for operations belonging to the industry classified as general manufacturing in the Type 1 Specified Business Operator, formulate their Medium- and Long-term plans, the following items shall be referred to for accuracy.

(1) Combustion Facility

The following facilities, systems, and technologies (hereinafter referred to as "facilities") are useful for preparing Medium- and Long-term plans as the specified examples determined in the item "(1) Combustion Facility" of "1. Energy Consumption Facilities" of the objectives and measures of rational use of energy regulated in the matters to be used as standards for judgment (hereinafter referred to as "standards for judgment") by manufacturers for the rational use of energy in factories (hereinafter referred to as "objectives and measures part").

① Improvement of Air Ratio

Facility/System/ Technology	Details	Industry/Process to be considered
Oxygen concentration analytical device	Device for analyzing the oxygen concentration in a firing furnace gas or furnace outlet exhaust gas	Every industry that uses industrial furnaces and boilers
Fuel/air flow-ratio adjusting regulator	Device that is composed of a fuel flow rate measurer (instantaneous flow rate and integrating flow rate), fuel flow rate regulator, air flow rate measurer for combustion, and air flow rate regulator for combustion, and controls the air flow rate by carrying out cascade control in accordance with the fuel flow rate	Every industry that uses industrial furnaces and boilers

Automatic combustion control device	Integrated combustion control device that measures the oxygen concentration, temperatures, etc. of furnace gas and exhaust gas and sets flow rate and air ratio	Every industry that uses combustion facilities
Advanced air-ratio control device	Device that determines the patterns of the air ratio in accordance with the combustion conditions of each object and carries out remote control using a computer. Some further advanced systems can carry out the integrated control of multiple facilities.	Every industry that uses industrial furnaces and boilers

② Improvement of Heat Efficiency

Facility/system/ technology	Details	Industry/process to be considered
Combustion air-preheat facility	Facility that recovers waste heat using a heat exchange type or regenerative type heat-recovery system and preheats the air for combustion	Every industry that uses combustion facilities
Capacity variable combustion air blower	Air-blow control using variable voltage and variable frequency (VVVF)	Every industry that uses combustion facilities
Exhaust heat recovery type combustion device	Regenerative burner, trigenerative system, recuperative burner, radiant-tube burner with recuperator, and regenerative- radiant tube burner, etc.	Every industry that uses industrial furnaces such as heating furnaces, heat-treatment furnaces, etc.
Ordering combustion control device(s)	Device that carries out combustion control of multiple burners in turn in accordance with a fixed schedule. It is more effective to combine atmospheric-agitating effect in a furnace using a high-speed jet	Every industry that uses heating furnaces, baking furnaces, and drying devices
Steam atomize and gas atomize	Device that sprays steam or gas in a burner to improve the combustion of heavy oil and vitiated oil	Every industry that uses large industrial furnaces and large boilers
Ceramic made radiant tube	Device that is a ceramic radiant tube burner with high-temperature durability	Heat treatment process, heating process, firing process, and smelting retention process of the metal products manufacturing industry

Oxygen combustion burner and oxygen enrichment combustion burner	Device that enhances the efficiency of heat transmissions reducing the heat loss of exhaust gas and increasing combustion temperatures by using oxygen instead of combustion air Additional facilities: fuel flow rate measurer (instantaneous flow rate and integrating flow rate), fuel flow rate regulator, combustion-air flow rate measurer, and combustion-air flow rate regulator	Industries, including the ceramic industry/stone and clay products manufacturing industry, (except the cement manufacturing industry), that have heating process with high-temperature. Industries that have metal smelting process and cutting process of the nonferrous metal manufacturing industry and metal products manufacturing industry Every industry that has melting ash treatment in the waste treatment process
Catalyst combustion burner	Device that reduces the flame temperature carrying out surface combustion, and then prevents incomplete combustion or achieves low NOx generation	Every industry that uses industrial furnaces, heating devices, drying devices, and air conditioning facilities (space heating)
Flammable liquid waste / flammable exhaust gas mixed firing facility burner	Burner that carries out mixed firing with other fuels using flammable liquid waste and flammable exhaust gas	Industry that uses boilers, firing furnaces, and incinerators in the chemical industry (except the petrochemical basic products manufacturing industry)
Submerged combustion burner	Burner that carries out combustion in a heated material of liquid phase	Heat-treatment process and heating process of the food manufacturing industry, textile industry, and metal products manufacturing industry
High-performance permeation burner	Burner that carries out combustion in a pipe immersed in a heated material with 80% or further efficiency	Heat-treatment process and heating process of the food manufacturing industry, textile industry, and metal products manufacturing industry
Immersion heater	Device that immerses heater in a melting metal and heats it from inside directly	Plating process and smelting retention process of the nonferrous metal forging manufacturing industry and metal products manufacturing industry
Fluidized bed combustion device	Device that carries out complete combustion of solid and powder in a fluidized bed	Every industry that uses boilers, metal heating furnaces, and incinerators

High-efficiency oxygen separation device	Pressure swing adsorption (PSA) type oxygen generator, detached membrane type oxygen generator, and chilled isolation type oxygen generator	High-temperature heating and firing process of the ceramic industry, stone and clay products manufacturing industry (except the ceramic manufacturing industry)

③ Ventilation Device

Facility/system/ technology	Details	Industry/process to be considered
Automatic ventilation measurement and control device	Device that calculates draft capacity based on furnace pressure measurement using a pressure detector and controls the ventilation automatically using furnace pressure control systems such as high-response dampers	Every industry that uses industrial furnaces and boilers
Deposit removal device	Device that removes deposit such as soot in a duct by using a steam jet	Every industry that uses industrial furnaces and boilers
Displacement variable air volume exhaust fan	Device that controls exhaust volume-based on variable voltage and variable frequency (VVVF) using a pressure signal	Every industry that uses industrial furnaces and boilers
Dehumidifier blower for industrial furnace	Air blower with the mechanism of reheating (preheating) dehumidified by freezing air	Forging manufacturing industry in the nonferrous metal manufacturing industry

④ Combustion Management

Facility/System/ Technology	Details	Industry/Process to be considered
Flow rate measurer (instantaneous flow rate and integrating flow rate)	Device that monitors the trend and anomaly of the fuel consumption of a heat facility	Every industry that uses industrial furnaces and boilers
Fuel flow rate regulator	Device that controls the supply of fuel based on a process value	Every industry that uses industrial furnaces and boilers
Air flow rate measurer for combustion and fuel/air flow rate regulator	Device that controls the supply of combustion air based on a process value	Every industry that uses industrial furnaces and boilers
Automatic combustion control device	Refer to (1) ①	
Advanced air ratio control equipment	Refer to (1) ①	

Combustion monitoring device and combustion management / diagnosis system	System that carries out integrated combustion management or diagnosis of fuel consumption, combustion air volume, exhaust gas temperatures, etc. by measuring / monitoring them regularly using a computer	Every industry that uses industrial furnaces and boilers

⑤Others (Boilers and Associated Equipment)

Facility/System/ Technology	Details	Industry/process to be considered
Boiler exhaust-gas sensible-heat recovery device	Feed water preheating device for boilers (economizer) and air preheating devices for combustion (air preheater) using sensible-heat of exhaust gas. Combined use is effective for large boilers.	Every industry that uses boilers
Latent-heat recovery type boiler	Boiler that enhances the heat efficiency by recovering the latent-heat in exhaust gas	Every industry that uses boilers
High-efficiency boiler	Device that utilizes the exhaust heat of combustion of boilers for preheating air or feed water with 1.2 or less air ratio of rating and 90% of or more efficiency	Every industry that uses boilers
High-efficiency hot-water boiler	Boiler with a heat exchanger installed with the temperature of the exhaust gas set to 250℃or less with 1.2 or less air ratio of rating and 88% of or more efficiency in rating capacity operation	Every industry that uses hot-water boilers
Separating boiler system	System that performs optimum operation in accordance with the load of a factory using a computer if two or more boilers are installed	Every industry that uses boilers
Waste heat utilization boiler	Boiler that utilizes the sensible-heat of the exhaust gas of other processes	Every industry that has waste heat generating facilities and uses boilers

(2) Heat Utilization Facility

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(2) Heat Utilization Facility" of "1. Energy Consumption Facilities" of the objectives and measures part of the standards of judgment.

① Efficient Heat Recovery

Facility/System/ Technology	Details	Industry/Process to be considered
High-efficiency heat exchanger	Device with plate type or Swiss roll type fins for expanding the surface area of heat exchange structurally applying surface treatment materials such as chrome plating and chrome deposition or corrosive-resistant materials such as titanium	Every industry that uses industrial furnaces, boilers, and drying devices
Regenerative heat exchanger	Types: ceramic, stainless, metal honeycomb, ceramic honeycomb, metal ball (nugget), ceramic ball (nugget), and rotary thermal storage heat exchange device with ceramics	Every industry that uses industrial furnaces
Sensible-heat recovery device of heated materials	Device that recovers the sensible-heat of heated materials in the cooling process for preheating materials	Industries that use continuous firing furnaces and tunnel kilns in the ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry) Heat-treating process of the metal products manufacturing industry

② Improvement of the Dryness of Steam Utilization Facilities

Facility/System Technology	Details	Industry/Process to be considered
Enhancement of the thermal insulation of steam piping	Thermal insulation carried out in accordance with JIS-A9501 or further advanced standards for steam piping systems such as steam piping, joint, valve, steam trap, etc.	Every industry that uses steam utilization facilities
Steam drain separator	Facility set to an admission port for forcefully separating and excluding drain mist	Every industry that uses steam utilization facilities

③ Improvement of the Emissivity of Furnace Wall

Facility/System Technology	Details	Industry/Process to be considered
Far-infrared coating-drying device High-performance far-infrared drying device	Device that bakes and dries coated materials by irradiating far infrareds with the systems to measure the inside temperature of a furnace and automatically control irradiation, air agitating mechanism, and automatic regulator by using multiple temperature sensors	Drying process of the food manufacturing industry Drying process and coating-baking process of the lumber / wooden products manufacturing industry, plastic products manufacturing industry, ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry), and metal products manufacturing industry
High-efficiency emissive heating drying device	Heated-air dryer with ceramic coating radiant tubes, reflecting plates, and a forced / induced blower	Drying process of the food manufacturing Drying process and coating-baking process of the ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry), and metal products manufacturing industry
Radiant promotion coating for furnace inner walls	Coating technique that enhances the heat emissivity of furnace walls by coating the walls with heat resistant and high radiant materials such as silicon carbide or zirconium coating	Every industry that uses heating furnaces, heat-treating furnaces, and furnaces for the ceramic industry

④ Improvement of Heat Transfer Coefficient

Facility/System/ Technology	Details	Industry/Process to be considered
Agitating device for furnace-inside	Device that agitates / circulates the high-temperature or hyperthermia gas in a furnace and enhances the effect of heat transmission in the furnace	Heat-treating process and heating process of the food manufacturing industry and metal products manufacturing industry
Jet-heating device	Device that reduces the heating time by injecting exhaust gas to heated materials or heating them at close range	Heat-treating process and heating process of the nonferrous metal manufacturing industry and metal products manufacturing industry

High-efficiency radiant tube	Substitute for electric heating with 60% or more efficiency	Industries that use heat-treating furnaces in the nonferrous metal manufacturing industry and metal products manufacturing industry
Convection heating device	Device that heats or cools metal strips, woven textiles, etc. using a roll heater	Heat-treating process and heating process of the textile industry and metal products manufacturing industry
Heating device for fluid bed	Device that heats materials (or medium such as sands) rapidly and evenly by injecting high pressure hot blast from the lower part of fluid bed and agitating them	Heat-treating process and heating process of the food manufacturing industry and metal products manufacturing industry
Direct current-carrying heating device	Device that heats treated materials passing an electric current directly into them. Dielectric current heating type heating method is also useful using secondary current circuit.	Heat-treating process and heating process of the nonferrous metal manufacturing industry and metal products manufacturing industry
Far-infrared coating-drying device High-performance far-infrared drying device	Refer to (2) ③	
Microwave-heating device	Device that heats rapidly from inside using microwave.	Heating process and drying process of the food manufacturing industry, ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry)
Heat transmission simulation in a furnace	Simulation for searching the industrial optimum conditions of the process based on the simulator analysis	Industries that uses heating furnaces and heat-treating furnaces in the nonferrous metal manufacturing industry and metal products manufacturing industry
High-efficiency industrial furnace	Rapid heating type that reduces the heating time by injecting exhaust gas to heated materials or heating them at close range, preheating / heating furnace, high adiabatic insulation, fuel-air flow rate proportional control, and impact jet heating	Heat-treatment process and heating process of the ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry), nonferrous metal manufacturing industry, and metal products manufacturing industry

⑤ Improvement of Heat Exchanger

Facility/System/ Technology	Details	Industry/Process to be considered
Heat exchanger for preheating combustion air	Device that recovers waste heat using a heat exchange type or regenerative type heat recovery device and preheats air for combustion with cleaning equipment is effective.	Every industry that uses combustion-type industrial furnaces
Regenerative heat exchanger	Refer to (2) ①	

⑥ Direct Heating

Facility/System/ Technology	Details	Industry/Process to be considered
Submerged combustion burner	Refer to (1) ②	
Textile-drying device with direct heat	Substitute for a steam dryer drying materials directly by using a hot-blast generating burner	Drying process of the textile industry
Drying device with direct heat	Device that utilizes combustion exhaust gas directly for drying materials	Drying process of the food manufacturing industry, ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry)

⑦ Multi-Effect Evaporator

Facility/System/ Technology	Details	Industry/Process to be considered
High-efficiency multi-effect evaporator	High-efficiency concentration facility that evaporates the moisture of the solution or suspension using multiple evaporators and vacuum system. The device is optimized between the triple-effect and septuple-effect depending on usages.	Distillation / concentration process of the food manufacturing industry, beverage / feed / tobacco manufacturing industry, soda industry, compressed gas / liquefied gas manufacturing industry, oils and fats processing products / soap / synthetic detergent / surface-active agent / coating manufacturing industry, cosmetic products / tooth paste / other cosmetic use products manufacturing industry

⑧ Distillation

Facility/System Technology	Details	Industry/Process to be considered
Distillation device with a recompressing top-steam type heat pump	Device that utilizes the top steam of a tower for preheating materials and as a heat source of a re-boiler or recovery source of other equipment by condensing the steam after compression	Distillation process of the inorganic-chemical-industry products manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical basic products manufacturing industry), oils and fats processing products / soap / synthetic detergent / surface-active agent / coating manufacturing industry, and petroleum / coal products manufacturing industry
ulti-effect type distillation device	Device that divides the tower still into a low pressure and high pressure stills and utilizes the top steam of the high pressure side for preheating the materials of the low pressure side and as a heat source of a re-boiler or recovery source of other equipment	Distillation process of the inorganic-chemical-industry products manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical basic products manufacturing industry), oils and fats processing products / soap / synthetic detergent / surface-active agent / coating manufacturing industry, and petroleum / coal products manufacturing industry

⑨ Combined Use of the Heat in Heating Facilities

Facility/System/ Technology	Details	Industry/Process to be considered
Material drying / preheating device utilizing exhaust heat	Device that dries / preheats charged materials by using the exhaust gas of a smelting furnace, firing furnace, and heating furnace	Every industry that uses heat utilization facilities
Coating combustion type baking and drying furnace	Furnace that recovers the incineration heat of coating solvent vapor and utilizes it as a heat source of baking	Continuous coating-baking process of the metal products manufacturing industry and electric-machinery instrument manufacturing industry
Exhaust gas utilizing tempering furnace	Furnace that utilizes the combustion exhaust gas of a heating furnace as a heat source of a tempering furnace	Heat-treating process of the metal products manufacturing industry

Exhaust gas utilization acid cleaning device	Device that heats the acid cleaning basin by using the exhaust gas of an annealing furnace such as a continuous annealing acid cleaning rolling facility	Heat-treating process of the nonferrous metal manufacturing industry and metal products manufacturing industry
High-heat pressing dehydration drier	Drier that pressurizes (vacuum inhalation) and dehydrates materials heating and increasing the temperature of them	Heating and drying process of the food manufacturing industry and the textile industry
Airless dryer	Device that pressurizes and increases the temperature of the generated steam of dried materials using a screw type compressor in a closed hood and reuses the steam for drying	Beer manufacturing industry and dyeing technical-service industry

⑩ Improvement of Heating Control

Facility/System/ Technology	Details	Industry/Process to be considered
Automatic control system for increasing the energy efficiency of heating facilities	System that monitors and controls the projection / management of energy consumption of heating furnaces, heat-treating furnaces, and boilers by using a computer	Every industry that uses heat utilization facilities
Direct current carrying type heating device	Refer to (2) ④	
Heating pattern control device	Device that enables a batch furnace to select heating patterns in accordance with each treatment. It also enables a continuous furnace to select temperature profile (zone temperature) of a lengthwise distance in accordance with the material movement with the change of treated materials	Every industry that uses batch furnaces and continuous furnaces

⑪ Shortening and Omission of the Heating Process

Facility/System Technology	Details	Industry/Process to be considered
Improvement of processes	Omission, achievement of a low temperature, integration, and achievement of a low pressure	Every industry that carries out a heating process

⑫ Improvement of the Heat-Insulation of Industrial Furnaces

Facility/System/ Technology	Details	Industry/Process to be considered
High-performance furnace wall insulator	Light and low heat transmission insulator such as ceramic fiber	Every industry that uses industrial furnaces

⑬ Improvement of the Insulation of Heating Facilities

Facility/System/ Technology	Details	Industry/Process to be considered
Reinforcement of heat transport pipes	Reinforcement of heat insulation of the inside of a major diameter pipe with light / high adiabatic thermal insulators such as ceramic fiber and of thermal insulation of the exterior of a small diameter pipe with light / high adiabatic thermal insulators such as grass wool, rock wool, ceramic fiber, and "Microtherm"	Every industry that uses heating facilities
Super insulation	Heat insulation of a low emissivity rate cordage bed and vacuum heat insulation	Every industry that uses industrial furnaces
Mold insulation	Warm forging press-slide, heat insulation among molds, and mold chilling mechanism	Heating and forging process of the nonferrous metal forging manufacturing industry
Closed hood with high dew point	Hood that enhances the heat insulation of a steam-heating-closed hood and carries out airtight by an air curtain, avoidance of dead angles by a auxiliary airflow, and setting of the internal surface temperature more than an exhaust dew point on the doorway by the double structure of a exhaust part	Dyeing technical-service industry and felt / nonwoven fabric manufacturing industry

⑭ Reduction / Closed Apparatus at the Opening Part of Combustion Facilities

Facility/System/ Technology	Details	Industry/Process to be considered
Dual system door	Installation of small doors with large doors for a large heating furnace and forging furnace in accordance with each material size	Heating and forging process of the nonferrous metal forging manufacturing industry
Throat curtain	Device that reduces the leakage and radiation loss of the heating gas in a furnace by jetting air or exhaust gas among the partitions on a throat composed of multi-stage metal chains, partition curtains such as a heatproof cloth or partition panels. It is also effective to use an air curtain for a drying furnace.	Heat-treating process and firing and coating drying process of the nonferrous metal manufacturing industry, metal products manufacturing industry, ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry)

Humpback furnace	Furnace that is designed to reduce the leakage of hot gas by installing the heating zone to the upper part of the doorway and confining the gas with high temperatures in a furnace. The furnace is best suited for a continuous heating furnace and a continuous treating furnace relatively small size.	Heat-treating process and firing process of the ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry)

⑮ Rationalization of Heating Medium Transport Pipes

Facility/System/ Technology	Details	Industry/Process to be considered
Reinforcement of the heat insulation of heat transport pipes	Refer to (2) ⑬	
Integration of pipes	Integration of multiple heating transport pipes	Every industry that uses heat-utilization facilities
Minimization of the exposed part of connective joints	Reduction of the joints of heating transport pipes	Every industry that uses heat-utilization facilities
High-performance steam trap	Continuous discharge float type of orifice self-adjusting type	Every industry that uses steam-utilization facilities
High-performance drain siphon	Device for emitting a drain from a high-speed revolving steam cylinder for drying that reduces the residence drain in a cylinder and accompanying steam volume of emission	Dyeing technical-service industry and felt / nonwoven manufacturing industry
Closed type condensate recovery system	System that recovers a high temperature condensate directly to a boiler without opening it and reuses it	Every industry that uses steam-utilization facilities
Steam trap survey / management system	System that diagnosis / measures the operations / steam losses of the steam trap installed in a factory for reducing the steam losses and constructs a database	Every industry that uses steam-utilization facilities

⑯ Primary Treatment of Heated Materials

Facility/System/ Technology	Details	Industry/Process to be considered
Energy-conservation type dryer	The effective models are microwave, exhaust-gas circulation drying furnace with the temperature over 170℃, air-preheating model using heating-medium, drier using the drying-air-utilization absorbent, infrared drying, heat-pump type drier, etc. in accordance with the characteristics of the dried materials and necessary temperatures	Drying process of the food manufacturing industry, lumber / wooden products manufacturing industry, ceramic industry / stone and clay products manufacturing industry (except the cement manufacturing industry)
Material drying / preheating device utilizing exhaust heat	Refer to (2) ⑨	
Counter-cart kiln	Facility that recovers the heat of the sensible-heat of heated materials by making the materials reciprocated in the kiln and utilizes it for preheating	Industries of the ceramic industry / stone and clay products industry (except the cement manufacturing industry) that use continuous firing furnaces

⑰ Thermal Storing Device

Facility/System/ Technology	Details	Industry/Process to be considered
Regenerative chilled/hot-water supply device	Device that supplies chilled water and hot water by using a thermal tank in order to prevent the reduction of the efficiency of a heat-source machine based on the load change in the cooling and heating processes. It is effective for miniaturization of the capacity of the heat-source equipment	Every industry that has cooling machines and products cooling and heating process
Steam accumulator	Device that stores steam temporary if the steam demand is changed. This device also contributes to the miniaturization of the capacity of boilers	Every industry that uses steam

⑱ Heating by a Vacuum-Steam Medium

Facility/System/ Technology	Details	Industry/Process to be considered
Vacuum-steam-driven heating system with low temperatures	System that uses the vacuum steam with a pressure of ambient pressure or lower than that as a heating source instead of hot water.	Every industry that has hot-water heating processes

⑲ Others

Facility/System/ Technology	Details	Industry/Process to be considered
Heat recovering type closed solvent recovery device	Device that introduces used solvent gas with re-circulating nitrogen gas into a solvent recovery device and recovers the solvent with a closed condition by using a cold heat of liquefied nitrogen	Drying process of the lumber / wooden products manufacturing industry, furniture / fixtures manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical-basic products manufacturing industry), chemical textile manufacturing industry, oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry, and photosensitive material manufacturing industry
Cooling tower with a built-in freezing machine	Cooling tower with the structure that does not expose a refrigerant to outside air by closing it in the tower	Cooling / freezing process of the food manufacturing industry, beverage / feed / tobacco manufacturing industry, and pharmaceutical manufacturing industry

High-performance catalyst-utilization device	Device that achieves low temperature, low pressure, and high efficiency of the manufacturing process, waste water treatment process, waste gas treatment process, and waste gas recovery process by using a catalyst	Reaction process, separation process, waste water treatment process, and waste-gas treatment process of the food manufacturing industry, beverage / feed / tobacco manufacturing industry, chemical fertilizer manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical-basic products manufacturing industry), oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry, pharmaceutical manufacturing industry, cosmetic products/ tooth paste / other cosmetic products manufacturing industry, and petroleum / coal products manufacturing industry

High-performance membrane-separation device	Device that achieves low temperatures, low pressures, and high efficiencies of refining process, waste water treatment process, waste gas treatment process, and waste gas recovery process of gas or liquid by using a separation membrane	Reaction process, separation process, waste-water treatment process, waste-gas treatment process, and pure-water manufacturing / desalting of seawater process of the food manufacturing industry, beverage / feed / tobacco manufacturing industry, chemical fertilizer manufacturing industry, soda industry, compressed gas / liquefied gas products manufacturing industry, organic-chemical- industry products manufacturing industry (except the petrochemical-basic products manufacturing industry), oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry, pharmaceutical manufacturing industry, other cosmetic products manufacturing industry, and petroleum / coal products manufacturing industry
Heat pump type heat source device	Heat source device that produces hot water or cold water with the temperature of approximately 65℃ or below 65℃ efficiently based on a heat pump cycle (80℃ or below 80℃ based on a multi-stage condensation cycle)	Food manufacturing industry, lumber / wooden products manufacturing industry, beverage / tobacco / feed manufacturing industry, dyeing technical-service industry, pharmaceutical manufacturing industry, and plastic products manufacturing industry

Heat pump type special waste water concentration treatment system	System that concentrates special waste water by a decompression distilling plant combining steam cycle with a low temperature and a heat pump heating device	Waste water treatment process of the food manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical-basic products manufacturing industry), and photosensitive material manufacturing industry Treatment process of the cleaning liquid of electronic components / device manufacturing industry Coating and plating process of the metal products manufacturing industry
Automatic control device in a facility for efficient energy utilization	Device that carries out the automatic control of the prediction / management of the energy consumption of a heat utilization facility during the manufacturing process of products by using a computer	Every industry that uses heat-utilization facilities
High-efficiency deodorizer	Regenerative deodorizer (deodorizing and combusting device using two burners and thermal storage materials alternately), absorptive type concentration deodorizer (burning low concentration odorous substances after carrying out absorption to absorptive materials and high concentration), and catalyst combustion deodorizer (deodorizing with a low temperature by using a catalyst)	Waste-gas treatment process of the food manufacturing industry, metal products manufacturing industry, electric-machinery instrument manufacturing industry, and transport machine and equipment manufacturing industry

Supercritical-fluid utilization device	Device that achieves simplification, low temperatures, high-efficiency of the manufacturing process, low temperatures and complete harmlessness of the waste treatment process / waste water process taking advantage of the high response rate and selective aspect of supercritical fluid	Reaction process, separation process, waste treatment process, and waste water treatment process of the food manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical-basic products manufacturing industry), oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry, and pharmaceutical manufacturing industry
Biotechnology utilization facility	Device that achieves simplification, low temperatures, and high efficiency of the manufacturing process, waste treatment process, and waste water treatment process by taking advantage of biochemical reactions of microorganisms, enzyme, and cells or that achieves simplification, low temperatures, and high efficiency of the manufacturing process by using useful materials generated in microorganisms, enzyme, and cells	Reaction process, separation process, waste treatment process, and waste water treatment process of the food manufacturing industry, organic-chemical-industry products manufacturing industry (except the petrochemical-basic products manufacturing industry), oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry, and pharmaceutical manufacturing industry

(3) Exhaust Heat Recovery Facility

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(3) Exhaust Heat Recovery Facility" of "1. Energy Consumption Facilities" of the objectives and measures part of the standards of judgment.

① Heat Insulation

Facility/System/ Technology	Details	Industry/Process to be considered
Reinforcement of the heat insulation of heat transport pipe	Refer to (2) ⑬	
Minimization of the exposed part of connective joints	Refer to (2) ⑮	

② Thermal Storing Device

Facility/System/ Technology	Details	Industry/Process to be considered
Thermal tank for heat recovery	Cold-water thermal tank, hot-water thermal tank, latent-heat thermal tank, and drainage storage reservoir installed at the same time with a heat-recovering heat pump	Every industry

③ Effective Use of Exhaust Heats of Heated Materials

Facility/System/ Technology	Details	Industry/Process to be considered
Heated-material sensible-heat recovery device	Refer to (2) ①	
Counter-cart kiln	Refer to (2) ⑯	

(4) Cogeneration Facility

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item"(4) Cogeneration Facility" of "1. Energy Consumption Facilities" of the objectives and measures part of the standards of judgment.

① Cogeneration Facility

Facility/System/ Technology	Details	Industry/Process to be considered
Engine type cogeneration facility	Facility that utilizes the tracking power of the gas engine and diesel engine as prime motors for the driving force of the generator / compressor / etc., and recovers the exhaust heat of cooling water of engines and exhaust gas and utilizes them for a heat source. This is especially effective in order to meet the large demand for hot water as well as the large demand for power or electric power	Every industry
Gas turbine type cogeneration facility	Facility that utilizes the tracking power of the gas turbine as a prime motor for the driving force of the generator / compressor / etc., and recovers the exhaust heat of exhaust gas and utilizes it for a heat source. This is especially effective for the large demand for steam as well as the large demand for power or electrical power. The variable type is also useful changing the output balance between heat and electricity if the balance of the demand is irregular.	Every industry
Fuel-battery cogeneration system	System that utilizes electricity and hot water or steam using a fuel cell instead of a prime motor. This is effective for the large demand for hot water or steam as well as the large demand for electrical power.	Every industry
Factory steam optimum operation system	System that controls the entire steam balance with multiple steam pressures for recovering the power by using a back-pressure turbine to the low pressure steam and by using a condensing turbine that exhausts the steam for the balance. A volume type rotary expansion machines is useful to a small-size system.	Every industry that uses various steam pressures

② Remodeling of Bleeder Turbine and Back-pressure Turbine

Facility/System/ Technology	Details	Industry/Process to be considered
Multistage extraction turbine	Turbine that has the mechanism to extract the steam of two or three different pressures	Every industry that uses cogeneration facilities
High-efficiency steam turbine blade	Device that is designed by means of three-dimensional fluid-analysis technology	Every industry that uses cogeneration facilities

③ Others

Facility/System Technology	Details	Industry/Process to be considered
Exhaust-gas re-combusting burner and reheating burner	Burners that utilize the residual oxygen of the exhaust gas of a gas turbine, combust the fuel, reheat the exhaust gas, and increase the volume of the exhaust-heat recovery steam	Every industry that uses boilers
Exhaust-heat utilizing cold-heat production device	Exhaust-heat heat-source absorptive freezer and exhaust-heat utilization absorptive-type cold heat generating machine	Every industry that uses air conditioning, cooling, and freezing facilities
Exhaust-heat utilizing desiccant air-conditioning system	Dehumidifying system that utilizes the exhaust heat of a gas engine, etc.	Every industry that uses dehumidification, humidity-control, and humidistat facilities
Loading-factor improvement device of cogeneration facilities	The effective devices and systems are systematic-series system protection device, high-speed power-control system improving loading-factor, presumed reverse power-flow control device improving loading-factor, and ultra-fast changing switch to improve the loading factor of facilities for achieving integrated efficiency	Every industry that uses cogeneration facilities

(5) Electrical Facility

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(5) Electrical Facility" of "1. Energy Consumption Facilities" of the objectives and measures part of the standards of judgment.

① High/Efficiency Motor

Facility/System/ Technology	Details	Industry/Process to be considered
High-efficiency motor	Motor, except the case where explosion-proof type motor is used, that reduces losses compared to the genetic type by adopting a high-grade iron core and improving a wound-rotor and a cooling fan	Every industry

② Revolution-Control Device

Facility/System/ Technology	Details	Industry/Process to be considered
Inverter control device	Device that controls the flow rate of a pump, blower, etc. by using an inverter. For the demanding load of more elaborate speed limits and frequently reversible operation, a vector inverter drive device is useful.	Every industry
Mechanical stepless variable device	Stepless variable machine combined with an electric motor (composed of a ring corn pulley and a belt, etc.)	Every industry
Static Leonard device	Leonard device with a static equipment such as a thyristor device	Textile industry and printing industry
Thyristor motor	Motor for acceleration and deceleration composed of a brushless synchronous motor, thyristor inverter, rotor position detector, and a gate control circuit. The motor is especially useful for the drive of device with a large capacity, elaborate speed control / frequently reversible operation.	Every industry
Poles change motor	Motor that changes the revolutions in stages by changing the number of the poles of an electric motor. The motor is useful to the load with fixed demand or two to three stages of changing speed.	Every industry

③ Improvement of Power Factor

Facility/System/ Technology	Details	Industry/Process to be considered
Phase advance capacitor	Capacitor that improves the power factor of a receiving terminal in a factory or a potential facility to be effectively improved by installing oil-filled and dry type power capacitors (phase advance capacitor)	Every industry
Automatic power factor improvement device	Device that automatically performs introduction / opening of a phase advance capacitor bymeasuring the power factor of the system and then sets the factor to 1.0	Every industry
Motor figure phase advance capacitor	Device for improving the power factor of each facility by installing it within every individual motor	Every industry

④ Measurement Management Device

Facility/System/ Technology	Details	Industry/Process to be considered
Automatic measuring device	Device that measures electric consumption, flow rate, etc. automatically by using ultrasound	Every industry
Automatic temperature control system of electric heating	Device that controls temperatures automatically based on the feedback system or the combination of the feedback forward system and feedback system	Every industry that uses electric heating facilities
Demand control device	Device that monitors maximum electric power all the time and gives alarms or cuts off load. The device effectively cuts of load with less impact on a production line	Every industry

Electric power load factor improvement system	System that controls electric power load optimally using independently or combining the load buffer systems including the system that controls the management of electric power load such as adjustment of manufacturing process in a factory by using a computer, thermal storage system, or highly efficient storage battery system (NaS battery and redox flow battery, etc.), in order to achieve the reduction of power loss of a power substation and a power distribution facility installed to a factory with a low power load factor. Effective for factories carrying out multiple processes with large loads of electric furnaces and freezing facilities.	Every industry
Operating number control of transformers	System that carries out parallel off of a free transformer at its light load. Effective for facilities with minimal loads during holidays / the night	Every industry
Automatic control device of running number	Device that controls automatically the number of the multiple devices such as pumps, compressors, and small boilers in accordance with the loads. Some devices carry out on-off control by using sequences.	Every industry

⑤ Electric Heating Facility

Facility/System/ Technology	Details	Industry/Process that to be considered
High-performance arc furnace	Highly sensitive response arc furnace, UHP arc furnace, direct-current arc furnace, and arc furnace with a preheating device by exhaust gas	Nonferrous metal manufacturing industry
High-performance resistance furnace	Resistance furnace with thyristor (or triac) phase control, made of high-efficiency thermal insulation.	Every industry that carries out heating and firing processes
High-performance high-frequency furnace	High-frequency smelting furnace, high-frequency induction heating furnace, and high-frequency power supply of a static type (using transistor and thyristor component)	Every industry that carries out heating and smelting processes of metal
High-performance smelting / channel-type retaining furnace	Channel-type furnace with a continuous metal temperature measuring device or applied electric power continuous control device	Nonferrous metal manufacturing industry

⑥ Others

Facility/System/ Technology	Details	Industry/Process to be considered
Low-loss transformer	Two types of transformers are available: one that uses low-loss ferromagnetic materials and the other that has the low-loss structure (mold transformer, etc.)	Every industry
Supply voltage stabilizing device	Device that supplies electricity with further stable voltage by using a voltage regulator such as on-load tap changing transformer, on-load voltage regulator, and induction regulator if the voltage drop is large or exceeds the permissible regulation even though the power distribution to the load center by high voltage and the reduction of system impedance are carried out.	Every industry
400 volts class wiring system	Wiring facility of the 3-phase 4-wire type wiring system of 400 V class for supplying electricity to low voltage power device in factories, air conditioning and sanitary power equipment, elevator power, and lighting load.	Every industry
High-performance electrolysis furnace/plating furnace	It is effective to change a cyan-bathing plating furnace to a sodium-bathing furnace and to change a hard-chrome-bathing furnace to a fluoride-bathing furnace if the furnaces of an electrolysis furnace and a plating furnace are capable with high-voltages with transformer-mounted rectifiers and applied electric-power regulators.	Smelting-plating industry
Aluminum-dross valuable recovery system	System that recovers aluminum from aluminum-dross with high-efficiency by using a rotary-type arc furnace	Nonferrous metal manufacturing industry

(6) Air Conditioning Facility

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(6) Electrical Facility" of "1. Energy Consumption Facilities" of the objectives and measures part of the standards of judgment.

Facility/System/ Technology	Details	Industry/Process to be considered
Regenerative air conditioning system	System that reduces the load changes of a heat source for air conditioning by using a thermal tank and enhances the efficiency of operation, or that recovers the thermal exhaust heat and exhaust heat of coolers of a factory.	Every industry
Heat recovering heat-pump heat source device	Device that recovers and stores the exhaust heat of a cooler and temperature difference energy during air conditioning and heating based on the heat-pump cycle to a thermal tank and utilizes them for heating space	Every industry
Engine-drive heat-pump system	System that utilizes the exhaust heat of engine for heating space and supplying hot water with the air-conditioning is operating based on the heat-pump cycle	Every industry
Advanced double-effect absorptive chilled/hot water machine	Device that has the mechanism preheating air for combustion or absorbing solution or producing hot water by using exhaust heat generated during the regeneration or condensation processes of absorbing solution. The device also automatically controls the flow rate of absorbing solution in accordance with the flow rate of chilled/hot water and temperature change.	Every industry
Exhaust-heat heat-source absorptive chilled/hot-water machine	Machine that utilizes the exhaust gas, exhaust-heat vapor, and exhaust-heat hot water for a heat source	Every industry
Far-infrared utilization heater	Device that directly heats human bodies rather than the surrounding air using far-infrared radiation	Every industry
Desiccant air-conditioning system	Compared to the super-cooling reheating system, the desiccant air-conditioning system is highly efficient because the system directly absorbs the hygroscopic moisture in the air. Utilization of exhaust heat for the drying process is more effective.	Every industry that uses dehumidification, humidity-control, and humidistat facilities

Large-temperature difference and variable-flow control / heat-carrier system	System that reduces the carrier power by enlarging the circulation-temperature difference of a heating medium for air conditioning (water or air) by using heat-source equipment and a heat exchanger with a large-temperature difference. It is more useful to use a variable-flow control device (VAV control device and VWV control device) together in accordance with the loads.	Every industry
System increasing-efficiency of carrying energy for air-conditioning	System that circulates heat medium naturally based on the relative density difference between liquid and gas and that utilizes the medium in stages by arranging multiple air conditioning units serially	Every industry

(7) Lighting Facility

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(7) Lighting Facility" of "1. Energy Consumption Facilities" of the objectives and measures part of the standards of judgment.

① High-Efficiency Lighting Fixture

Facility/System/ Technology	Details	Industry/Process to be considered
High-pressure sodium lamp	The general-type lamp is highly efficient although it is of inferior color-rendering compared to a fluorescent-mercury lamp. The sodium lamp can substitute for the mercury lamp effectively, and is also available with an improved color-rendering type.	Every industry
Metal-halide lamp	The lamp is efficient with superior color-rendering, and can substitute for a mercury lamp effectively.	Every industry
High-frequency lighting system lighting fixture	By using an inverter, the lighting / dimming of the fixture are manageable. It is also effective for elaborate visual performance such as working of conveyer lines.	Every industry
High-output lighting fixture	Equipment with 110 W fluorescent lamps that is effective for large conveyer lines.	Every industry
High-reflectivity plate	High-reflectivity plate placed to a fluorescent lamp	Every industry

② Automatic Control System

Facility/System/ Technology	Details	
Automatic flasher	Simplified automatic-lighting instrument such as a timer and daylight sensor	Every industry
Lighting-control system	System that automatically controls lightning amount by time scheduling, daylight use, a human sensor, etc.	Every industry

(8) Utilization of Excess Steam and Others

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(2) Utilization of Excess Steam" of "2. Other Rational Uses of Energy" of the objectives and measures part of the standards of judgment.

Facility/System/ Technology	Details	Industry/Process to be considered
Waste-pressure recovery turbine	Device that recovers the backpressure of fluid with high-pressure or large capacity by using a expansion turbine	Reaction process of the petroleum / coal products manufacturing industry and fertilizer manufacturing industry
Power-generation re-powering facility	Facility that increases the generation output and recovers waste-heat of exhaust gas with a gas-turbine equipped to an existing steam-power generating facility and utilizes the heat for the facility	Every industry that uses steam-power facilities
Mixed-pressure turbine	Turbine that combines other outside steam to the middle of the turbine in case steam with different pressure generates in a process and converts the steam into different-pressure steam in the single turbine	Every industry that uses private electric power generation
High-efficiency gas separator	Device that recovers the by-production gas generated in accordance with a production process and separates the gas with more than 80%of purity (pressure-swing absorption, membrane-separation, and heat-swing absorption)	Reaction process, distillation, evaporation, concentration process, and waste treatment process of the petroleum / coal products manufacturing industry, chemical fertilizer manufacturing industry, oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry

(9) Utilization of Unused Energy

The following facilities are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures determined in the item "(3) Utilization of Unused Energy" of "2. Other Rational Uses of Energy" of the objectives and measures part of the standards of judgment.

Facility/System/ Technology	Details	Industry/Process to be considered
Device for making gas / liquid (oil) / solid fuel from waste and waste liquid	Device that performs gasification and liquefaction (oil), or produces solid fuel by utilizing waste and waste liquid	Waste-processing process of the food manufacturing industry, beverage / tobacco / and feed manufacturing industry, petroleum / coal products manufacturing industry, chemical fertilizer manufacturing industry, oils and fats processing products / soap / synthetic detergent / surface-active agent / coating manufacturing industry
Heat-utilization and generation device by making gas / liquid (oil) / solid fuel from waste and waste water	Device that performs gasification and liquefaction (oil), or produces solid fuel by utilizing waste and waste liquid, generates steam, and utilizes it for power or generation of electric power by firing the fuel in a boiler, or generates power by using a gas turbine	Steam and motorized-force generation process of the food manufacturing industry, beverage / tobacco / feed manufacturing industry, petroleum / coal products manufacturing industry, chemical fertilizer manufacturing industry, oils and fats processing product / soap / synthetic detergent / surface-active agent / coating manufacturing industry
Effective-utilization system of drainage-anaerobic treated methane gas	System that utilizes the methane gas generating from anaerobic drainage-treatment facilities for fuel-cell facilities	Food manufacturing industry, beverage / tobacco / feed manufacturing industry
Temperature-difference energy utilization system	System that recovers the temperature-difference energy from sewage, river water, and ground water near factories by using an efficient heat pump and utilizes it for processing cooling / heating, air conditioning, and hot water supply. It is useful to install a thermal tank that enhances the efficiency of heat-recovering rate and system operation depending on conditions.	Every industry

2 Specified Industries

When the enterprises, that install factories for operations belonging to the energy consuming industries classified as pulp manufacturing and paper manufacturing industries, petrochemical basic product manufacturing industry, and cement manufacturing and iron steel industries in the Type 1 Specified Business Operator, formulate their Medium- and Long-term plans, the following items shall be referred to for accuracy.

(1) Pulp Manufacturing and Paper Manufacturing Industries
The facilities described in the "Table 1"are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures with regard to the major processes raging from pumping process (Kraft pulp (KP), mechanical pulp, and recycled pulp), papering process (paper and paperboard) to power process and other major energy consumption facilities in the pulp manufacturing and paper manufacturing industries.

(2) Petrochemical Basic Products Manufacturing Industry
The facilities described in the "Table 2"are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures with regard to the major processes raging from naphtha resolution process, high temperature separation, compression process, compression process by freezing to low temperature separation process in a naphtha resolution plant and other energy consumption facilities and heating furnace, reaction operation, compression operation, evaporation operation and separation operation and other energy consumption facilities in other plants in the petrochemical basic products manufacturing industry.

(3) Cement Manufacturing Industry
The facilities described in the "Table 3"are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures with regard to the major processes raging from grinding process, firing process, finishing process, and other energy consumption facilities in the cement manufacturing industry.

(4) Iron and Steel Industry
The facilities described in the "Table 4"are valid for preparing Medium- and Long-term plans as the specified examples of the facilities for achieving the objectives and measures with regard to the major processes raging from iron making process (cokes process, sinter process, and blast furnace process), steel making process, steel rolling, metal working, and surface treatment process, ferroalloy manufacturing process, wire drawing process, drawing process to cast iron pipe manufacturing process and the other major energy consumption facilities in the iron making industry with blast furnace or electric furnace, iron making industry and steel making and steel rolling industry without blast furnace, steel stock manufacturing industry, surface treatment steel stock manufacturing industry, and cast iron pipe manufacturing industry without steel making (except surface treatment steel stock), major processes raging from smelting process, casting process finishing process to heat treatment process and the other major energy consumption facilities in the pig iron cast manufacturing industry and malleable casting manufacturing industry, major processes raging from steel making process, casting process, cast finishing process, heat treatment process to machining process and other major energy consumption facilities in the cast steel manufacturing industry, major processes raging from material cutting process, heating process, forging process, heat treatment process mold forming process to finishing and inspection process and the other major energy consumption facilities in the forged products manufacturing industry, major processes raging from steel making process, pit casting process, heating process, forging process, excess material cutting process, heat treatment process to machining process and the other major energy consumption facilities in the forging steel manufacturing industry.

Table 1

Process	Category	Details of facility/system/technology
Pulping process (Kraft pulp (KP))	Combustion facility	1. Kiln automatic combustion-control device 2. Oxygen concentration management of exhaust-gas (advanced air-ratio controller, combustion management / diagnosis system) 3. High-efficiency burner
	Heat-utilization facility	1. Counterflow-type continuous cooking-digestion device 2. Low-temperature/long-time cooking-digestion device (isothermal continuous cooking-digestion device, Lo-Solid(low-solid) cooking digestion device) 3. Polysulfide cooking-digestion device 4. Super-badge cooking-digestion device 5. Pressurizing liquid-filtration device
	Waste-heat recovery facility	1. Kiln waste-heat recovery facility 2. Pre-evaporator
	Electricity-utilization facility	1. High-efficiency pulp cleaner 2. Pulp fluidizing-type breaching device 3. Oxygen delignification device 4. Continuous cooling-digestion kiln-chip supply system 5. High-efficiency screen device
	Energy-conservation manufacturing process	Bio-bleaching system
Pulping process (Mechanical pulp)	Heat-utilization facility	High-concentration bleaching device
	Waste-heat recovery facility	Recovery of TPM exhaust heat
	Electricity-utilization facility	1. High-efficiency screen device 2. Refiner-load regulation system 3. Refiner-plate pattern
Pulping process (Recycled pulp)	Electricity-utilization facility	1. High-efficiency flotator 2. High-efficiency disperser (kneader) 3. High-concentration pulper 4. Closed high-concentration washer 5. Low-differential pressure dusting device 6. High-efficiency screen device
Papering (Paper / paperboard / fixing / painting, and finishing processes)	Combustion facility	1. Automatic combustion-control device of a hot-blast device for a drier 2. High-performance infrared-radiation drying device 3. Oxygen-concentration management of exhaust gas (advanced air-ratio controller and combustion –management system)

	Heat-utilization facility	1. High-performance surface-pressure dehydration device 2. High-performance size-press device 3. Fixed drier siphon for high-speed papering machinery 4. Drier bar 5. Drier drainage system 6. High-performance hot-blast drying device 7. Closed hood of a drier 8. High-dew point drier hood 9. Vacuum foil for papering machine 10. High-concentration painting-liquid painting machinery
	Waste-heat recovery facility	1. Drier-food heat-recovery device 2. Turbo-blower waste heat recovery
	Electricity-utilization facility	1. Energy-conservation type crown controlled roll 2. High-temperature soft calendar 3. Low-differential pressure dusting device 4. Refiner load-regulating system 5. Refiner plate pattern 6. High-efficiency screen device 7. Power-recovery system of a winder-brake 8. High-performance automatic cutter
	Energy-conservation manufacturing process	1. Automatic-winder control device (introduction of opt-reel) 2. On-coater machine
Power process (heavy oil, coal, city gas, solid fuel, etc.)	Combustion facility	1. Automatic combustion-control device of a boiler 2. Exhaust-gas oxygen, carbon-monoxide concentration management (advanced air-ratio controller, combustion management / diagnosis system) 3. High-efficiency burner / high-efficiency combustion equipment 4. Super-fine-grinding mill
	Heat-utilization facility	1. Air-supply preheating equipment/ water-supply preheating equipment of a boiler 2. Exhaust-heat utilization boiler 3. Energy-conservation soot blower
	Exhaust-heat recovery facility	1. Heat recovery of a scrubber drainage 2. Heat recovery from a desulfurizing absorptive tower 3. Heat recovery of the condensate equipment of a condensing-turbine 4. Heat recovery of flue gas

	Cogeneration facility	1. High-temperature and high-pressure boiler 2. Adoption of a multistage extraction steam turbine, and high-efficiency steam turbine blades 3. Reheat cycle 4. Low-pressure condensate turbine 5. Mixed pressure turbine 6. Power-generation re-powering facility 7. High-efficiency gas turbine 8. Diesel power-generation/heat-recovery device 9. RPF and RDF boiler/power-generation facility 10. Sludge-combustion boiler/power-generation facility
	Electricity-utilization facility	1. Phase advance capacitor 2. Automatic power-factor improvement device 3. Automatic control of power-distribution voltage (on-load tap changing transformer)
Power process (recovery black liquid)	Combustion facility	1. Boiler automatic-combustion control device 2. Exhaust gas oxygen, carbon-monoxide concentration management (advanced air-ratio controller, combustion management / survey system) 3. Recovery boiler char-bed monitoring device 4. High-performance burner
	Heat-utilization facility	1. Falling liquefied-film evaporator 2. Hot-water utilization turbine and evaporator 3. Boiler air-supply preheating equipment/water-supply preheating equipment 4. Energy-conservation soot blower 5. Indirect black-liquid heater
	Exhaust-heat recovery facility	1. Exhaust-heat recovery of a dissolver 2. Heat recovery of scrubber drainage 3. Heat recovery from desulfurizing-absorptive tower 4. Heat recovery from flue exhaust gas 5. Heat recovery of the condenser of a condensing turbine
	Cogeneration facility	1. High-efficiency, high-temperature, and high-pressure recovery boiler 2. Adoption of a multistage air-bleed steam turbine and a high-efficiency stem turbine blade 3. Low-pressure condensing turbine 4. Mixed-pressure condensing turbine
	Electricity-utilization facility	1. Phase advance capacitor 2. Automatic power-factor improvement device 3. Automatic control of power-distribution voltage (on-load tap changing transformer)

Common process (Pulping process, papering process, and power process)	Heat-utilization facility	1. Reinforcement of thermal insulation of steam piping 2. Reinforcement of drain recovery by using a high-performance steam trap
	Waste-heat recovery facility	1. Heat-pump type heat-source device 2. Efficient recovery of drain and flash-steam utilization facility 3. Other exhaust heat recovery facility
	Electricity-utilization facility	1. Rotating speed control of the driving motor of pump, agitator, and fans 2. High-efficiency motor 3. 400 V class wiring facility 4. Vacuum pump type selection 5. Optimum pump facility (runner change and runner cut) 6. Impeller cut of pumps, fans, etc.
	Energy-conservation manufacturing process	Improvement of processes
	Others	1. Computer control system 2. Improvement of the yield ratio (electromagnetic induction heating device of a papering machine and a painting machine for adjusting paper volume, high-efficiency air-floating system, etc.)
Other major energy consumption facilities	Heat-utilization facility	Achievement of low-pressure of using steam
	Electrical facility	1. High-efficiency sludge-dehydration device 2. Anaerobic biological-treatment reactor 3. Biological filtration activated-sludge treatment device 4. Oxygen-aeration device
	Air-conditioning facility and hot-water supply facility	1 Temperature-control device 2. Regenerative air-conditioning / hot-water supply system
	Lighting facility	1. High-efficiency lighting fixture (high-pressure sodium lamp and high-output lighting fixture) 2. Lighting-control system (advanced human sensor, lighting sensor, and timer)

Table 2
(Naphtha-cracking plant)

Process	Category	Details of facility/system/technology
Naphtha-cracking process (Cracking furnace and rapid-cool heat exchanger)	Combustion facility	1. Improvement of combustion air-ratio ①Oxygen-concentration analytical instrument ②Fuel/air flow-rate adjusting regulator ③Exhaust-gas carbon-monoxide concentration analytical instrument ④Automatic combustion-control device 2. Improvement of heat efficiency Steam atomizing of heavy-oil and vitiated-oil 3. Accurate control of combustion air volume ①Automatic air volume measuring controller ②Revolution control of inducing fan 4. Advanced combustion management of combustion facilities by using a computer, etc. ①Integrated combustion-management system ②Devices and systems for combustion monitoring and diagnosis 5. Control device of naphtha dilution-steam ratio 6. Automatic control of naphtha cracking-severity Automatic continuous-analytical instrument of degradation products 7. Extension technology of de-caulking cycle
	Heat-utilization facility	1. Reinforcement of heat insulation of the furnace wall of a cracking furnace High-performance furnace-wall insulator including ceramic fiber, etc. 2 High-pressure steam super-heater 3. High-temperature resistance radiant pipe 4. High-efficiency radiant pipe 5. Furnace-wall radiant promotion coating 6. High-efficiency rapid-cool heat exchanger
	Waste-heat recovery facility	1. Combustion air preheater 2. Dilution steam and feed naphtha preheater 3. Boiler feed-water preheater
	Others	Gas-turbine type cogeneration facility

High-temperature separation process (Decomposition-gasoline separation tower, water-cooled tower)	Heat-utilization facility	1 Generator of dilution steam utilizing sensible-heat of circulation oil 2. Generator of low-pressure steam utilizing sensible-heat of circulation oil 3. Water-supply preheater of boiler utilizing sensible-heat of circulation oil 4. Reinforcement of piping heat-insulation 5. High-efficiency preheating heat exchanger 6. Achievement of high-efficiency of column stills and water-cooling tower ①High-efficiency internal (tray and filling materials) ②Low-pressure loss internal (filling materials) 7. Adoption of heat-recovery optimization technology
	Waste-heat recovery facility	1. Re-boiler heat-source utilization technology of waste water of quench-water 2. Boiler water-supply preheater
Compression process (Decomposition-gas compressor, etc.)	Heat-utilization facility	1. Adoption of high-efficiency blades ①High-efficiency compressor ②High-efficiency turbine 2. Multistage-extraction steam turbine 3. Low-pressure loss ①Low-pressure loss discharge valve ②Lowering-pressure loss technology of the non-return-valve of outlet-side ③Lowering-pressure loss of the filling materials of a intermediate separation tank 4. Prevention of lowering operation efficiency due to fouling ①Compressor blade cleaner ②Injector of fouling inhibitor 5. Inter-cooler outlet temperature optimization technology
	Exhaust-heat recovery facility	Re-boiler heat-source utilization technology of the sensible-heat of discharge gas

Freezing -compression process (Freezing compressor, etc.)	Heat-utilization facility	1. Adoption of high-efficiency blades ①High-efficiency compressor ②High-efficiency turbine blades 2. Multistage-extraction steam turbine 3. Low-pressure loss ①Low-pressure loss discharge valve ②Lowering pressure-loss technology of the non-return-valve installed to an outlet ③Lowering pressure-loss technology of the filling materials of an intermediate separation tank 4. Optimization technology of compressor intermediate-stage suction pressure
Low-temperature separation process (column still, etc.)	Heat-utilization facility	1. Achievement of high-efficiency of column stills ①High-efficiency internal (tray and filling materials) ②Low-pressure loss internal (filling materials) ③Reduction technology of transmission ratio in accordance with the reduction of operation pressure 2. Expander on the top of a dimethanizer 3. Repressing top-steam type heat pump system (column still) 4. High-efficiency heat exchanger ①Aluminum plate-fin heat exchanger ②Surface-treatment heat-transmission pipe for promoting heat transmission 5. Introduction of advanced control driving operation technology ①Model-prediction control technology ②Dynamic-response prediction control technology ③On-line optimization control technology 6. Reinforcement of thermal insulation and cold insulation
	Others	High-efficiency gas-separation device ①Pressure swing absorptive device (PSA) ②Gas-separation membrane
Other major energy consumption facilities	Heat-utilization facility	1. High-efficiency steam utilization facility ①Reinforcement of piping thermal-insulation and steam drain separator ②High-performance steam trap 2. Absorptive freezer (utilizing exhaust heat type)

	Waste-heat recovery facility	Heat-recovering heat-pump system heat-source device
	Cogeneration facility	Gas-turbine cogeneration facility
	Electricity-utilization facility	1. Achievement of high-efficiency control of rotating machines, and inverters of fans, blowers, and pumps 2. High-efficiency motor
	Lighting facility	1. High-efficiency lighting ①High-pressure sodium lamp ②High-output lighting fixtures 2. High-efficiency lighting control device ①Human sensor ②Illuminance sensor ③Timer, etc.
	Others	1. Heat integration with other plants 2. Introduction of advanced control technology ①Digital-control system by means of a control computer ②Online-optimization control system of the entire plant 3. Improvement of processes ①Omission and integration of processes ②Achievement of low pressure of processes

(Other plants)

Process	Category	Details of facility/system/technology
Heating-furnace process (Piping type heating furnaces, boilers, etc.)	Combustion facility	1. Improvement of combustion air-ratio ①Oxygen-concentration analyzer ②Fuel/air flow-ratio adjusting regulator ③Automatic combustion-control device 2. Improvement of heat efficiency ①Waste-heat recovering combustion device ②Catalyst-combustion burner ③Oxygen combustion or oxygen-enrichment combustion burner ④High-efficiency gas-separation device for oxygen enrichment ⑤Flammable waste liquid / flammable exhaust-gas mixed-firing burner ⑥Submerged-combustion burner ⑦Steam atomizing of heavy oil and vitiated oil 3. Accurate control of ventilation air volume ①Automatic draft-gage measuring device ②Revolution control of inducing fan and forced fan 4. Advanced combustion management of combustion facilities by using a computer ①Integrated combustion-management system ②Devices and systems for combustion monitoring and diagnosis ③Exhaust gas / furnace gas measurement-control device 5. Boiler feed water preheater (economizer) 6. Latent-heat recovery boiler 7. High-efficiency boiler and high-efficiency hot-water boiler 8. Fluidized-bed combustion device
	Heat-utilization facility	1. Reinforcement of the heat insulation of furnace wall High-performance furnace-wall heat insulator including ceramic fiber 2. Furnace-wall radiation promotion coating 3. High-efficiency heat exchanger 4. Regenerative heat exchanger 5. Reinforcement of the heat insulation of steam piping 6. Steam-drain separator
	Waste-heat recovery facility	1. Air preheater for combustion air 2. Waste-heat utilization boiler

Reaction-operation process	Heat-utilization facility	1. Steam generator recovering reaction heat 2. Hot-water generating device recovering reaction heat 3. Boiler feed water-preheater recovering reaction heat 4. Reaction -distillation device 5. High-efficiency heat exchanger 6. High-efficiency agitation blades 7. Reinforcement of the heat insulation of piping
	Others	High-performance catalyst
Compression-operation process	Heat-utilization facility	1. Adoption of high-efficiency blades ①High-efficiency compressor ②High-efficiency turbine 2. Multistage extraction steam turbine 3. Low-pressure loss ①Low-pressure loss discharge valve ②Low pressure-loss of the non-return valve installed to an outlet 4. Prevention of lowering operation efficiency due to fouling ①Cleaning device for the inside of centrifugal compressor ②Injector of fouling inhibiting substance 5. Inter-cooler outlet temperature optimization technology
	Waste-heat recovery facility	Hot-water generation by discharge-gas sensible heat
Evaporating operation process	Heat-utilization facility	1. High-efficiency multi-effect evaporator 2. Steam re-compressing heat-pump system 3. High-efficiency heat exchanger Surface-treatment heat-transmission pipe for promoting heat transmission

Separation-operation process (column stills, extraction stills, etc.)	Heat-utilization facility	1. Achievement of high-efficiency of column stills ①High-efficiency internal (tray and filling materials) ②Low-pressure loss internal (filling materials) ③Reduction technology of transmission ratio in accordance with the reduction of operation pressure 2. Repressing top steam type heat-pump system (column still) 3. Utilization of the latent-heat of top steam ①Multi-effective type evaporator type distillation device ②Generation of low-pressure steam ③Hot-water generation 4. High-efficiency heat exchanger ①Heat-transmission promotion internal ②Surface-treatment heat-transmission pipe promoting heat transmission 5. Introduction of advanced control technology of operation ①Model-prediction control technology ②Dynamic-response prediction control technology ③On-line optimization control technology 6. Reinforcement of thermal insulation and cold insulation
	Others	1. High-performance membrane-separation device 2. Pressure-swing type absorptive separation device (PSA) 3. Absorptive-separation type solvent recovery device
Other major energy-consumption facilities	Heat-utilization facility	1. High-efficiency steam utilization facility ①Reinforcement of piping thermal insulation and a steam drain separator ②High-performance steam trap 2.Reinforcement of the heat insulation of heat-transport pipes 3. Super-insulation 4. Energy-conservation type drier 5. Regenerative chilled/hot water supply device 6. Heat-pump type heat-source device 7.Heat-recovering closed solvent-recovery device 8. High-efficiency deodorant device 9. Cooling tower with a freezer

	Waste-heat recovery facility	1. Heat-recovering heat-pump system heat-source device 2. High-pressure liquid exhaust-pressure recovery turbine 3. Low-pressure steam exhaust-pressure recovery turbine
	Cogeneration facility	1. Combined cycle generator 2. Combined use gas turbine generator 3. Heat-supply power generator 4. Fuel-cell cogeneration facility 5. Heat/power ratio variable type gas turbine 6. Exhaust-air re-firing burner / reheating burner 7. Exhaust-heat heat-source absorptive freezer 8. Public power connection system protection device 9. High-speed power-control system improving loading-factor 10. Presumed reverse-power flow control system improving loading-factor 11. Ultra-fast changing switch
	Electricity-utilization facility	1. Achievement of high-efficiency of fans, blowers, pumps, etc. ①Control of the revolutions of rotating machines and utilization of inverters ②Mechanical stepless-variable device ③Poles-converting motor ④High-efficiency motor 2. Phase advance capacitor (including motor figure type) 3. Automatic power-factor improvement device
	Air-conditioning facility	1. Advanced double-effect absorptive chilled/hot water equipment 2. Engine-driven heat-pump system 3. Exhaust-heat heat-source absorptive hot/cold-water equipment 4. Regenerative air-conditioning system
	Lighting facility	1. High-efficiency lighting ①High-pressure sodium lamp ②High-output lighting fixture 2. High-efficiency lighting control device ①Human sensor ②Illuminance sensor ③Timer

	Others	1. Heat integration with other plants 2. Introduction of advanced control ① Digital-control system by means of a control computer ②Online-optimization control system of the entire plant 3. Improvement of process ①Omission and integration of processes ②Technology of low pressure of processes 4. High-efficiency kneading machine 5. High-efficiency extruding machine 6. Machine for gasification and liquefaction from waste and waste-liquid 7. Generator for gasification and liquefaction from waste and waste-liquid 8. Machine for producing solid fuel from waste 9. Generator utilizing solid fuel of waste 10. Energy-conservation type sludge-dehydration device

Table 3

Process	Category	Details of facility/system/technology
Grinding process	Grinding facility	1. High-efficiency vertical roller mil 2. High-efficiency classifier
	Others	Achievement of revolution control (inverter) of fans, motors, etc.
Firing process	Coal-grinding facility	1. High-efficiency vertical roller mill 2. High-efficiency classifier
	Combustion facility	High-efficiency pulverized coal burner
	Exhaust-heat recovery facility	1. NSP (or SP) with exhaust-heat boiler system clinker-firing facility 2. NSP (or SP) with five-stage cyclone system clinker-firing facility 3. High-efficiency clinker cooler facility
	Heat-utilization facility	Reinforcement of the heat insulation of a kiln, provisional calciner, preheater, clinker-cooler, and waste-heat boiler facility
	Waste-fuel utilization facility	1. Introduction and promotion of waste-tire utilization facilities 2. Development of utilization technology of waste-plastic, RDF, and papers (RPF) and introduction and promotion of utilization facilities 3. Development of utilization technology of waste oil, by-production oil, and other waste fuel and introduction and promotion of utilization facilities
	Others	Achievement of revolution control (inverter) of fans, motors, etc.
Finishing process	Clinker-grinding facility	1. Finishing mill with a preliminary grinder 2. High-efficiency classifier
	Slag-grinding facility	1. High-efficiency vertical roller mil 2. High-efficiency classifier
	Others	Achievement of revolution control (inverter) of fans, motors, etc.
Other major energy-consumption facilities	Heat-utilization facility	1. Achievement of high-efficiency of generic boilers ①Exhaust-gas oxygen-concentration control device (advanced air-ratio control device, combustion management / diagnosis survey system) ②Achievement of revolution control (inverter) of exhaust-gas fans 2. Achievement of high-efficiency of private generators (development of the utilization technology of waste fuel and introduction and promotion of utilization facilities)

	Electricity-utilization facility	1. Achievement of high-efficiency of fans, blowers, pumps, air compressors, etc. ①Achievement of revolution control (inverter) ②Runner cut ③Automatic on-off control 2. Energy conservation of precipitators ①Runner-cut of exhaust-gas fans ②Achievement of revolution control (inverter) of exhaust-gas fans
	Air-conditioning facility and hot-water supply facility	1. Air-conditioning facility with a heat-exchanger 2. Temperature-control device 3. Regenerative air-conditioning system 4. Regenerative hot-water supply facility
	Lighting facility	1. High-efficiency lighting fixture (high-pressure sodium lamp and high-output lighting fixture) 2. Automatic on-off control device

Table 4
(Iron making industry with blast furnaces, iron industry and steel manufacturing / rolling industry without blast furnaces, steel stock manufacturing industry and surface treatment steel stock manufacturing industry without steel manufacturing)

Process	Category	Details of facility/system/technology
Pig-iron process (coke process, sintering process, and blast-furnace process)	Combustion facility	1. Automatic combustion facility of coke 2. Sintering high-efficiency lighting-furnace burner 3. Hot-blast furnace combustion control 4. Advanced combustion management by using computers of other combustion facilities
	Heat-utilization facility	1. Prevention of the heat radiation of a hot-metal ladle 2. Reinforcement of the heat insulation of the furnace roof of coke-furnace 3. Other radiation-preventing devices
	Waste-heat recovery facility	1. Coke dry-type quenching facility (CDQ) 2. Coke combustion exhaust-gas sensible-heat recovery 3. Coke furnace gas sensible-heat recovery 4. Sintering-cooler waste-heat recovery 5. Sintering main-exhaust gas waste-heat recovery 6. Blast furnace dry-type furnace-top pressure recovery generator 7. Blast furnace-top even pressure equalizing gas recovery 8. Blast furnace slag sensible-heat recovery 9. Dehumidifying air-blower for blast furnaces 10. Hot stove waste-heat recovery facility 11. Material-drying preheater 12. Other waste-heat recovery facilities
	Energy-conserving type production process	1. Pulverized coal injection (PCI) 2. Coal humidity adjusting
	Others	1. Blast furnace inset distribution control device 2. Achievement of revolution control of precipitation and combustion blowers 3. Sintering-segregation input
Steel-making process	Combustion facility	1. Oxygen-enrichment combustion device 2. Burner-combustion control device 3. High-speed oxygen incineration device 4. Powder incineration device (coal material, aluminum ash, etc.)

	Heat-utilization facility	1. Arc-furnace optimum power control system 2. Advanced conductor-electrode supporter 3. Arc furnace electrode VVVF elevation device 4. Ladle-smelting optimum-operation control system 5.Enlargement of the transformer volume of arc-furnaces
	Waste-heat recovery facility	1. Converting-furnace gas sensible-heat recovery facility 2. Regenerative heating device 3. Material preheater for electric furnace
	Energy-conserving design manufacturing process	1. High-temperature steel continuous outgoing facility 2. High-performance de-phosphorus furnace 3. High-performance high-frequency smelting furnace 4. Direct-current system water-cold furnace-wall type arc furnace 5. Arc furnace and ladle smelting complex process
	Others	1. Converting-furnace gas latent-heat recovery facility (including closed type recovery facilities) 2. Achievement of revolution control of OG inducing air-blowers and precipitator blowers 3. Achievement of high-speed of electrode-elevation speed and furnace-roof open-close speed 4. Achievement of high-conduction of furnace-wall coolers and furnace-roofs 5. Thermal-insulating roof for preventing heat radiation of waiting ladles 6. Sealing of the removing outlet of slag, steel, and alloy inlet 7. Repair machine for hot-automatic fireproof materials
Steel-rolling, metal-working, and surface-treatment process	Combustion facility	1. High-performance industrial-furnace waste-heat recovering combustion device 2. High-performance combustion-control device (exhaust-gas oxygen-concentration control, furnace-pressure control, number-control operation of burners, extraction temperature, finishing temperature control, etc.)

	Heat-utilization facility	1. Thermal-insulation cover for steel slabs 2. Thermal-insulation pit for slab 3. Furnace body with ceramic fiber 4. Heat-transmission promotion coating / heat-transmission promotion materials installation 5. Sealing of charge / discharge door 6. Reinforcement of skid heat-insulation 7. Installation of partition walls 8. Opening-blocking plate 9. Skid shift 10. Reinforcement of liquid tank thermal insulation 11. Automatic control of chemical-drier temperature
	Waste-heat recovery facility	1. Waste-heat utilization boiler 2. High-efficiency recuperator 3. Regenerative heat exchanger
	Energy-conserving design manufacturing process	1. High-performance wire-rolling facility 2. Control of the width of steel slab 3. High-performance steel plate formation controller 4. Steel plate formation control facility 5. Hot-rolling mill processing heat-treatment facility 6. Inline heat-treatment facility 7. High-efficiency batch annealing furnace 8. Hot charge (DHCR, HCR) 9. Direct rolling 10. Small electrode-span type electroplating device
	Others	1. High-performance high-frequency induction -heating device 2. Plunger type Descaling-pump 3. Edge heater
Ferroalloy manufacturing process	Combustion facility	1. Sintering high-efficiency ignition furnace burner 2. Oxygen-enrichment device 3. Advanced-combustion management by using computers, etc. of other combustion facilities
	Heat-utilization facility	1. Material-drying kiln 2. Material preheater 3. Advanced-heat insulation structure facility 4. High-efficiency capacitor 5. Enlargement of electric-furnace transformer capacity volume

	Waste-heat recovery facility	1. Sintering machine exhaust gas sensible-heat recovery device 2. Sintering cooler waste-heat recovery device 3. Kiln waste-heat recovery device 4. Kiln cooler waste-heat recovery device 5. Drier waste heat recovery device 6. Electric furnace exhaust gas recovery device 7. Metal sensible-heat utilization facility 8. Slag sensible-heat utilization facility 9. Dehumidifying air-blower
	Energy-conserving manufacturing process	1. Sintering-hot charge 2. High-efficiency preheating reduction process 3. Slag multi-purposes utilization process 4. Metal multi-purposes utilization process
	Others	1. Energy-conservation crashing device 2. High-efficiency separation device 3. Multi-purpose grinding device
Wiredrawing process Drawing process Cast-iron pipe manufacturing process	Combustion facility	1. Combustion-air preheater 2. Fuel/air flow rate regulator 3. Installation of prevention plates against outside-air invasion 4. Concentric-burner automatic-change control device 5. Metal heating by using an immersion burner 6. High-turn down ratio burner 7. Cupola-coke automatic-combustion control device 8. Cupola-combustion air-dehumidifier 9. Cupola oxygen-enrichment combustion facility 10. Cupola exhaust-gas carbon-monoxide automatic-combustion control device 11. Casting-core drying-furnace temperature automatic control device 12. Annealing-temperature automatic-control device 13. Coating drying temperature automatic-control device 14. Coating-pipe heating-furnace exhaust-heat circulation device
	Heat-utilization facility	1. Furnace-exterior wall thermal-insulation working 2. Adoption of direct-heating system 3. High-efficiency industrial furnace 4. Adoption of ceramic-fiber for the furnace body of an annealing furnace 5. Automatic open/close-control device of the hatch of an annealing furnace 6. Automatic control device of pipe-steam maturation and heating-temperature

	Waste-heat recovery facility	1. Improvement of the heat-recovery ratio by enlarging the conduction surface 2. Exhaust-heat utilization sludge drier 3. Waste-heat utilization boiler 4. Combined-use type gas-turbine generator 5. Feedwater heat-up device for waste-heat utilization boiler water-supply/hot water supply device 6. Steam accumulator heat storage 7. Annealing waste-hot water heat exchanger 8. Annealing exhaust-gas heat-recovery device
	Energy-conserving manufacturing process	1. Heat-recovery type sealed solvent recovery device 2. High-performance high-frequency induction heating device 3. Change of pig-iron heating system of plating-process molten zinc-bathing to ceramic bath and immersion burner type 4. Pig-iron pipe hot-charge annealing furnace 5. Inverter control plasma cutter 6. Cupola-coke breezing device
Other major energy-consumption facilities	Combustion facility	1. High-efficiency boiler 2. High-performance boiler combustion-control device (exhaust-gas oxygen-volume control and fan-revolution control)
	Heat-utilization facility	1. High-efficiency generator (high-efficiency blades, multistage extraction type turbine, axial flow exhaust back-pressure turbine, and combined-use type gas turbine) 2. High-efficiency steam-utilization facility (reinforcement of piping thermal-insulation, installation of steam-drain separator, high-performance steam trap, etc.) 3. Automatic on-off control of compressed air by means of an electromagnetic valve
	Waste-heat recovery facility	1. Boiler air preheater 2. Boiler fuel-gas preheater 3. Boiler-feed water supply preheater
	Cogeneration facility	1. Multistage air-bleed type steam turbine 2. Back pressure turbine 3. Heat-electric ratio variable gas-turbine 4. Combined-use type gas turbine generator 5. Heat/power-supplying power generator
	Electrical-utilization facility	1. Achievement of high-efficiency of fans, blowers, pumps, etc. (revolution-control, operation of unit-control, etc.) 2. Power-factor improving device (phase advance capacitor, etc.) 3. High-efficiency motor

	Air-conditioning facility / hot-water supply facility	1. High-performance air-conditioning facility, hot-water supply facility (automatic temperature-control device, regenerative air-conditioner / hot-water supplying system, etc.) 2. Absorptive freezer (exhaust-heat utilization type) 3. Waste cooling-water with temperature recovery facility
	Lighting fixture	1. High-efficiency lighting facility (high-pressure sodium lamp, high-output type lighting fixtures, etc.) 2. High-efficiency lighting-control device (human sensor, illuminance sensor, timer, etc.)
	Others	1. Energy-center demand/supply management system 2. High-efficiency gas-separation device (MS type chilled-separation type, pressure swing type, and membrane-separation type) 3. High-efficiency large compressor (high-efficiency blades, low-pressure loss discharge valve, low-pressure loss filter, suction air cooling system, etc.) 4. Low-loss transformer

(Pig-iron cast manufacturing industry and malleable-casting manufacturing industry)

Process	Category	Details of facility/system/technology
Smelting process	Combustion facility	1. Cupola oxygen-enrichment device 2. Hot blast blowing type cupola
	Heat-utilization facility	1. High-efficiency industrial furnace (raw material preheating type) 2. Prevention of the heat radiation of a hot-metal ladle (adoption of heat-insulation for the roof of a ladle, change of heat insulation material) 3. Other radiation prevention facilities (changing furnace roofs and heat insulators)
	Waste-heat recovery facility	1. Cupola waste-heat recovery device 2. Dehumidifying blowing device for cupolas
	Electrical facility	1. High-performance electric-heating furnace (energy-conservation type induction furnace) 2. Power-factor improvement device (phase advance capacitor) 3. Water-supply pump with a revolution controller 4 Induction furnace with a liquid-temperature continuous measurer

	Others	1. Revolution control of precipitation blower and cupola blower 2. Chip/sand removal shot blast 3. Chip crusher
Casting process (Making, hydraulic core, hot-watering, sanding, and deformation)	Electric facility	1. Power-factor improving device (phase advance capacitor) 2. Adoption of electric power drive to hydraulic and pneumatic drive
	Others	1. Revolution control of a precipitation blower 2. Precipitator with selection function (portable suction hood) 3. High-efficiency sand-cooling device (drum type) 4. High-performance sand-mold recycling device (machinery) 5. Electric motor with inverter control
Finishing process (Folding, cast-finishing process, inspection, and coating)	Heat-utilization facility	Far-infrared radiation utilization drier
	Others	1. High-performance shot blast 2. Precipitator with a revolution control device
Heat-treatment process	Heat-utilization facility	High-efficiency industrial furnace (reinforced heat-insulation type)
	Waste-heat recovery facility	High-performance industrial furnace waste-heat recovery combustion facility
Other major energy-consumption facilities	Electrical facility	1. Revolution control device 2. Low-loss transformer (mold transformer)
	Others	1. Automatic control of operation number of air compressors 2. Automatic control of operation number of pumps for cooling water 3. Molten metal saving technology by using sheet casting materials 4. High-efficiency lighting fixtures (high-pressure sodium lamp and high-output lighting fixtures)

(Cast-steel manufacturing industry)

Process	Category	Details of facility/system/technology
Steel-making process	Combustion facility	High-speed oxygen injection device
	Heat-utilization facility	1. Arc furnace optimum-electric-power control system 2. Arc furnace electrodes-elevation device 3. Ladle smelting optimum-operation control system 4. Expansion of arc furnace transformer capacity
	Waste-heat recovery facility	1. Material-preheater for electric-heating furnace 2. Ladle preheater
	Electrical facility	Ladle-smelting furnace

	Others	1. Achievement of the revolution-control of a precipitation blower 2. Achievement of high-speed of electrodes-elevation speed and furnace-roof opening/closing speed 3. Prevention of the heat radiation of a waiting ladle 4. Sealing the removing outlet of a slag removal port, discharge port of steel, and alloy inlet
Casting process (Making, hydraulic core, hot-watering, sanding, and deformation)	Electrical facility	1. Cylinder with a servomotor 2. Electric motor driven cylinder (mold making line)
	Others	1. Achievement of the revolution-control of a precipitation blower 2. Sand compactability controller 3. High-efficiency sand cooling device 4. High-performance sand recycling device
Cast-finishing process	Cast-finishing facility	High-performance shot blast
	Others	Revolution-control of a precipitation blower
Heat-treatment process	Heat-treatment facility	1. Automatic-temperature controlling heat-treatment facility 2. High-efficiency batch system heat-treating furnace 3.High-performance industrial furnace waste-heat recovering combustion device
	Waste-heat recovery facility	1. High-efficiency recuperator 2. Regenerative heat exchanger
Machining process	Machining-process facility	High-performance metal working machine (lathe, ball panel, and milling machine)
Other major energy-consumption facilities	Waste-heat recovery facility	1. Boiler air-preheater 2. Boiler fuel-gas preheater 3. Boiler feed water preheater
	Electrical facility	1. Achievement of the efficiency of fans, blowers, and pumps ①Automatic on-off control device of rotating machines ②Revolution control of rotating machines and use of inverters ③Automatic number control of rotating machines 2. Power-factor improving device (phase advance capacitor) 3. High-efficiency motor 4. Low-loss transformer
	Air-conditioning facility and hot-water supply facility	1. Temperature-control device 2. Regenerative air-conditioning and hot-water supply system

	Lighting facility	High-efficiency lighting fixtures ①High-pressure sodium lamp ②High-output lighting fixtures
	Others	High-efficiency compressor

(Forged products manufacturing industry)

Process	Category	Details of facility/system/technology
Material-cutting process	Cutting facility	1. NC type steel cutting band saw 2. Automatic gas-cutter 3. Plasma cutter
Heating process	Heating facility	1. High-efficiency induction heating device 2. Fully automatic preheating rotary furnace 3. Waste-heat recovering automatic-walking-beam furnace 4. High-efficiency batch furnace (enhanced heat-insulation type) 5. High-performance industrial -furnace waste-heat recovery system combustion device 6. Burner combustion-control system
	Waste-heat recovery facility	1. High-efficiency recuperator 2. Regenerative-heat exchanger
Forging process	Forging facility	1. Fully-automatic forging press 2. Super-high speed friction screw press 3. Computer control system forging hammer 4. Fully-automatic rolling mill 5. Multistage homer 6. Revolving forging machine 7. Hydraulic hammer
Heat-treatment process	Heat-treatment facility	1. Automatic temperature control continuous heat-treatment device 2. High-efficiency batch annealing furnace 3. High-frequency quenching device 4. Burner combustion-control system
Mold-forming process	Mold-engraving process Surface-treatment facility	1. High-performance NC electrical discharge processing machine 2. Super high-speed machining center 3. Wire-cut processing device 4. Ion-nitride device
Finishing and inspection process	Finishing facility	High-performance shot blast

Other major energy-consumption facilities	Electrical facility	1. High-efficiency compressor 2. Achievement of efficiency of fans, blowers, and pumps ①Automatic on-off control device of rotating machines ②Revolution control of rotating machines with inverters ③Automatic unit-control device of rotating machines 3. Power-factor improving device (phase advance capacitor) 4. High-efficiency motor
	Combustion facility	1. High-efficiency boiler 2. High-performance boiler combustion-control device ①Exhaust-gas oxygen control (optimum control of air-ratio) ②Revolution control of IDF fans
	Waste-heat recovery facility	1. Boiler air preheater 2. Boiler fuel-gas preheater 3. Boiler water-supply preheater
	Air-conditioning facility and hot-supply facility	1. Temperature-control device 2. Regenerative air-conditioning and hot-water supply system
	Lighting facility	High-efficiency lighting device ①High-pressure sodium lamp ②High-output lighting fixtures

(Forged-steel manufacturing industry)

Process	Category	Details of facility/system/technology
Steel-making process	Combustion facility	1. Burner combustion-control device 2. High-speed type oxygen injection device 3. Secondary-combustion device
	Heat-utilization facility	1. Arc furnace optimum-power control system 2. High-conductive electrode-conductor supporters 3. Arc-furnace electrode-elevation device 4 Ladle-smelting optimum-operation-control system 5. Increase of arc-furnace transformer capacity 6. Vacuum arc re-smelting furnace optimum-operation-control system 7. Electro-slag re-smelting furnace optimum-operation-control-system
	Waste-heat recovery facility	1. Material preheater for electric furnaces 2. Ladle preheater

	Energy-saving manufacturing process	1. Direct current arc furnace with water-cooled wall 2. High-performance high-frequency smelting furnace 3. Arc furnace, ladle-smelting complex process 4. High-performance vacuum-arc re-smelting furnace 5. High-performance electro-slag re-smelting furnace
	Others	1. Revolution control of precipitating blowers 2. Achievement of high-speed of electrode-elevating speed and furnace-roof opening/closing speed 3. Achievement of high-heat conductivity of furnace-wall coolers and furnace-roofs 4. Thermal insulation cover preventing waiting-ladle heat emission 5. Sealing of the removing port of a slag, steel-discharge, and alloy-inlet port 6. Hot automatic-refractory material repairer
Pig-casting process	Heat-utilization facility	1.Steel-ingot thermal-insulation cover 2. Hot materials transport device
Heating process	Combustion facility	1. High-performance industrial furnace waste-heat recovering combustion device 2. Automatic-control device for heating-facility energy-utilization efficiency 3. High-performance combustion-control device(exhaust gas oxygen control and furnace-pressure control) 4. Burner combustion-control system
	Heat-utilization facility	1. Steal-ingot thermal-insulation pit 2. Semi-product thermal-insulation cover 3. Furnace body with ceramic fiber 4. Sealing of charge and discharge cover 5. Reinforcement of skid heat-insulation 6. Installation of partition walls 7. Opening-optimum control system 8. Skid shift
	Exhaust-heat recovery facility	1. Waste-heat utilization boiler 2. High-efficiency recuperator 3. Regenerative heat exchanger
	Energy-conserving manufacturing process	High-efficiency batch furnace
	Others	Automatic tong
Forging process	Energy-conserving manufacturing process	1. Computer-controlled forging press 2. Computer-controlled forging hammer 3. Fully-automatic rolling mill
Excess material cutting process	Combustion facility	Automatic gas-cutting device

Heat-treatment process	Combustion facility	1. Automatic-temperature control type heat-treatment device 2. High-efficiency batch type heat-treatment furnace 3. Medium-frequency quenching device 4. Subzero (chilled quenching) device 5. Burner combustion-control system
	Waste-heat recovery facility	1. High-efficiency recuperator 2. Regenerative heat exchanger
Machining process	Machining process	High-performance metal working machine (lathe, ball panel, and milling machine)
Other major energy-consumption facility	Combustion facility	1. High-efficiency boiler 2.High-efficiency boiler combustion-control facility ①Exhaust-gas oxygen control (accurate control of air-ratio) ②Revolution control of IDF-fans
	Heat-utilization facility	High-efficiency steam-utilization facility Installation of piping-thermal insulation and steam-drain separator High-performance steam trap
	Waste-heat recovery facility	1. Boiler air preheater 2. Boiler fuel-gas preheater 3. Boiler feed water preheater
	Electrical facility	1. High-efficiency compressor 2. Achievement of high-efficiency of fans, blowers, and pumps ①Automatic on-off control device of rotating machines ②Revolution-control of rotating machines with inverters ③Automatic number-control device of rotating machines 3. Power-factor-improving device 4. High-efficiency motor
	Air-conditioning facility and hot-water supply facility	1. Temperature-control device 2. Regenerative air-conditioning and hot-water supply system
	Lighting fixtures	1. High-efficiency lighting fixtures ①High-pressure sodium lamp ②High-output sodium lamp
	Others	Energy center demand/supply control system