

III -2 Environmental goal management and progress to date

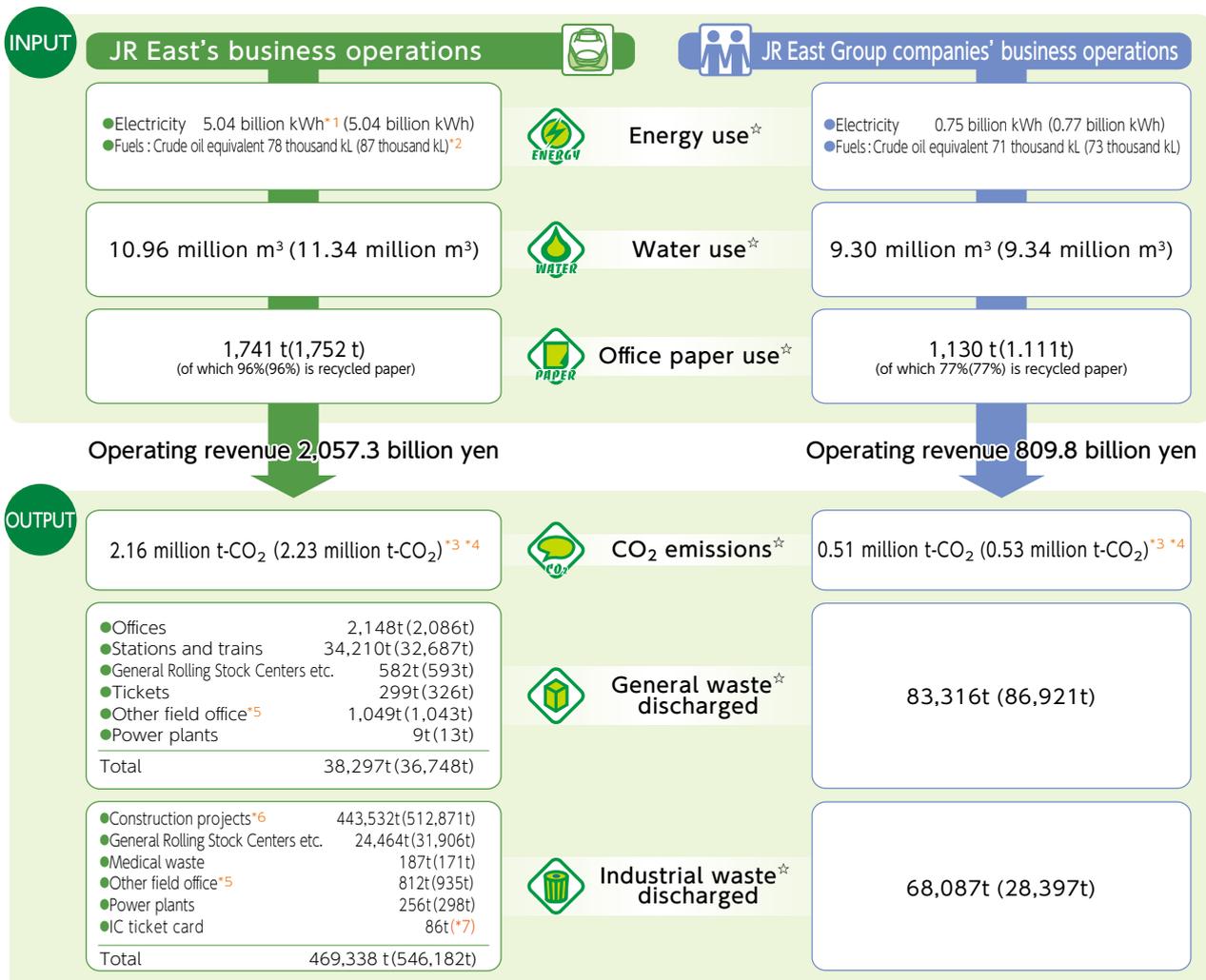
III -2-1 JR East Group's environmental impact

Note: External assurance on environmental performance and environmental accounting data:

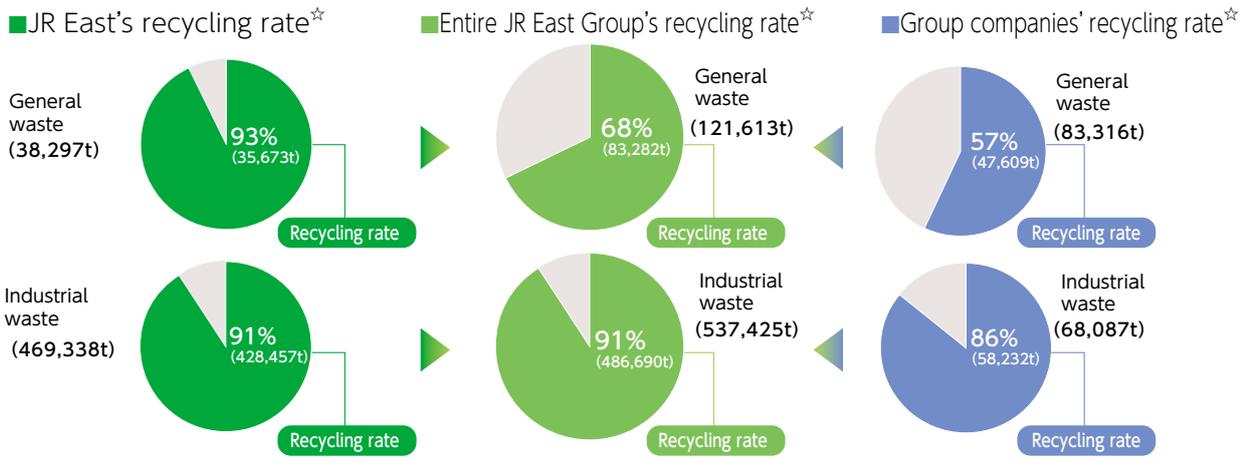
KPMG AZSA Sustainability Co., Ltd. has been engaged to provide external assurance on a set of selected environmental performance and environmental accounting indicators so that the reliability of the data is ensured. The particular indicators that are assured are marked with ☆ for clarity.

■ FY2016 Results

(quantities in parentheses are for FY2015)



*1 Electricity: Both electricity generated in JR East's power plants and used internally and electricity purchased from electric companies are included. Please refer to the "JR East Energy flow map" on page 94 for details about electricity generation and use.
 *2 Fuels: Natural gas and other fuels used for generating electricity in JR East's thermal power plants are not included.
 *3 CO₂ emissions by Scope: Scope 1 emissions of the entire Group is 1.19 million tons CO₂ and Scope 2 emissions 1.78 million tons CO₂. (please see P95)
 *4 CO₂ emissions attributable to electricity purchased from external suppliers are calculated based on the adjusted emissions coefficient.
 *5 Other field office: Technical centers, equipment maintenance centers, and other locations such as train crew depots.
 *6 Construction projects: Waste generated by our construction projects, but for which contractors legally become the waste-discharging entities, is included in industrial waste.
 *7 discharge amount of industrial waste such as "IC ticket card" are counted from FY2016.



Waste disposal
 •Waste includes salable waste.
 •Recycling includes thermal recycling* where general and industrial wastes are incinerated with heat recovery.
 *Thermal recycling is a recycling method in which the heat arising from the incineration of waste is used to create steam and hot water, which in turn are used to generate electricity and to produce heat.

III-2-2 Environmental goal

►FY2031 goals

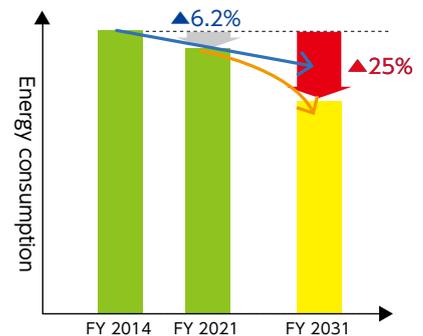
Since 1996, JR East has been conducting environmental conservation activities with a focus on specific goals. Because the latest Conference of the Parties to the United Nations Framework Convention on Climate Change (COP) adopted the Paris Agreement which will be a new international framework for global warming countermeasure after 2020, we set environmental goals which plan to be achieved in FY2031.

Category of environmental conservation activities	Performance indicators	Targets to be met by FY2031
Measures to prevent global warming	Energy consumption from railway business activities	25% reduction (compared to FY2014)
	CO ₂ emission volume from railway operations	40% reduction (compared to FY2014)

►Concept for goals determination

■ 25% reduction of energy consumption for railway operations (compared to FY2014)

To achieve FY2021 goals which aim to reduce energy consumption for railway operations by 6.2% when compared to those of FY2014, we have promoted activities such as the introduction of energy saving trains and LED lighting. Towards realizing FY2031 goals, we pursue achieving a reduction of 25% energy consumption for railway operations (compared to FY2014) by accelerating reduction pace up to FY2021 through activities such as installation of power storage facilities, self-consumption of renewable energy, increasing the introduction of E235 series trains. In addition, energy saving automated driving and also further system innovation such as adoption of high performance battery is to be achieved.



■ 40% reduction of CO₂ emission volume from railway operations (compared to FY2014)

Until now we did not set CO₂ emissions goals because CO₂ emissions goals fluctuate greatly by the increase and decrease of CO₂ emission factors of power companies which purchased carbon emission allowances. In July, 2015 as efforts for low carbonization activities by power companies, targets were announced that emission factors of FY2031 will be 0.37kg-CO₂/kWh. Consequently, we set goals which convert a 25% reduction of energy consumption into CO₂ emission volume including power generated by JR East.

► State of progress toward FY2021 goals

Energy consumption of the railway business has been steadily reduced by conducting activities such as the introduction of energy saving trains and others. Until now the base year was FY2011, but in accordance with the nation's FY2031 goals, the baseline year was changed to be FY2014.

Category of environmental conservation activities	Performance indicators	Targets to be met by FY2021	Results for FY2016
Measures to prevent global warming	Energy consumption from railway business activities	6.2% reduction (compared to FY2014) 51.7⇒48.5 (billion MJ)	1.7% reduction (compared to FY2014) 50.8 (billion MJ) [☆]

Incidentally, FY2021 goals which we set regarding CO₂ emission factor for power generated by JR East have already been achieved. This time, we set the total reduction target for CO₂ emission volume and so we did not set a new target for CO₂ emission factor for power generated by JR East.

With respect to the other targets, to date we had set the targets which were to be achieved in FY2017, but some of them were achieved by FY2015. Accordingly we revised them upward and we modified the baseline year for all targets to be FY2014 and targets' achievement year to be FY2021.

Category of environmental conservation activities	Performance indicators	Targets to be met by FY2021	Results for FY2016
Measures to prevent global warming	Electricity used for railway operations per unit of transport volume	Shinkansen: 5.1% Reduction (compared to FY2014) 2.49⇒2.36 (kWh/car-km) Conventional Lines: 8.3% Reduction (compared to FY2014) 1.59⇒1.46 (kWh/car-km)	Shinkansen: 1.4% Reduction (compared to FY2014) 2.45 (kWh/car-km) [☆] Conventional Lines: 5.8% Reduction (compared to FY2014) 1.50 (kWh/car-km) [☆]
	Energy consumption per unit of floor area at branch offices, etc.	10.0% Reduction (compared to FY2014) 0.0407⇒0.0366 (kL-crude oil equivalent/m ²)	6.6% Reduction (compared to FY2014) 0.0380 (kL-crude oil equivalent/m ²) [☆]
	Implementation of more ecoste Model Stations	Total of 12 Stations	Total of 5 Stations
	Change to LED for Platform and concourse Illumination (FY2015 - FY2021)	Introduction of LED 36 thousand units in the 244 thousand units (reduction of 83 million MJ)	Total of 9 thousand units (reduction of 18.5 million MJ)
	Optimization of Large-scale Air-conditioning Systems (FY2015 - FY2021)	10 Locations (reduction of 82 million MJ)	Total of 1 Location (reduction of 1.46 million MJ)
	Reduction Rate of Energy Consumption Intensity of Each JR East Group Company	Every year 1% reduction in Each group company	2.0% reduction by all group companies (compared to FY2015)
Measures for resource circulation	Recycling rate for waste generated at stations and on trains	94%	95% [☆]
	Recycling rate for waste generated at General Rolling Stock Centers, etc.	96%	93% [☆]
	Recycling rate for waste generated in construction projects	96%	91% [☆]
	Implementation Rate of Recycling by Group companies	100%	100%
Environmental management	Setting of numeric targets by Each JR East Group Company	Targets to be revised continually	Established

■ Targets for Group companies

The previous targets of "less than 75 dB: noise control for the Tohoku and Joetsu Shinkansen (regarding the noise control target area)" were achieved in FY2016.

III-2-3 Environmental accounting and management indicators

In FY2016, our environmental conservation costs amounted to approximately 11 billion yen in investments and 15.2 billion yen in expenses. By introducing these new cars, we estimate we will reduce CO₂ emissions by about 17 thousand tons per year.

JR East has its own Environmental Management Indicator to assess the relation between our business activities and environmental impacts. These are calculated by dividing CO₂ emissions, which are a major factor in our environmental impacts, by operating profits, which represent our economic value added. A smaller value of the indicator means that we are making a smaller impact on the environment to create the same economic value added. For FY2016 the value of the indicator was 5.27t-CO₂/million yen, compared to 9.45t-CO₂/million yen for FY1991.

Environmental accounting for fiscal year ended March 2016*

():FY2015

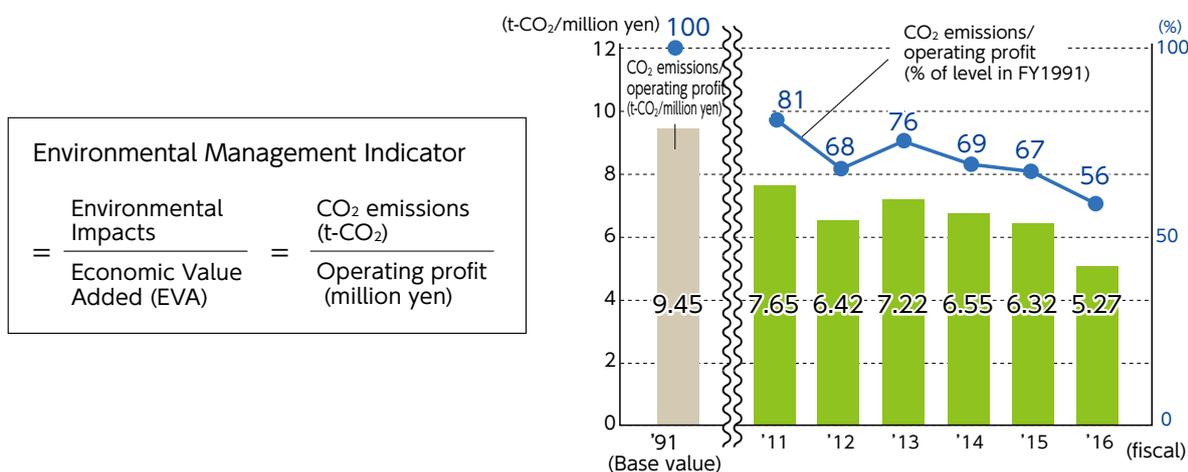
Category	Environmental conservation costs (billion yen)		Environmental conservation benefits in relation to environmental targets	Economic benefit of environmental conservation activities (billion yen)
	Investments	Expenses		
Environmental conservation (pollution prevention) activities along railway lines	5.17(6.03)	8.40(6.66)	—	—
Global environmental conservation activities	5.87(90.17)	—	Energy consumption from railway business activities Electricity used for railway operations per unit of transport volume Energy consumption per unit of floor area at branch offices, etc.	50.8 billion MJ Shinkansen 2.45kWh/car-km Conventional Lines 1.50kWh/car-km 0.0380kL-crude oil equivalent/m ²
Resource circulation activities	—	5.01(4.78)	Recycling rate for waste generated at stations and on trains Recycling rate for waste generated at General Rolling Stock Centers, etc. Recycling rate for waste generated in construction projects	95% 93% 91%
Environmental management	—	0.38(0.42)	—	—
Environmental research & development	—	1.40(1.91)	—	—
Social activities	—	0.03(0.04)	—	—
Total	11.04(96.20)	15.23(13.81)		14.51(22.31)

Notes
Capital investment for the period: 442.2 billion yen
Total R&D costs for the period: 16.9 billion yen (Consolidated)

The above table's relations with the table for Targets and Results are as follows:
"Environmental conservation activities along railway lines" = "Environmental activities along railway lines" and "Chemical substance management"
"Global environmental conservation activities" = "Measures to prevent global warming" and "Chemical substance management"
"Resource circulation activities" = "Measures for resource circulation"
"Environmental management" = "Environmental management" and "Environmental communication"
"Environmental research & development" = "Research & development"
"Social activities" = "Environmental communication"

(Notes on calculation of environmental conservation costs and benefits)
Environmental conservation costs
○Data are for East Japan Railway Company only (i.e., non-consolidated data).
○Environmental conservation costs are mainly based on data available in the current management system.
○To date, we have declared the total amount of investments in energy-saving rolling stock, but starting from FY2016, we will not declare amounts corresponding to upgrades of aging rolling stock.
○Expenses do not include depreciation charges.
○In the costs for resource recycling activities, expenses for treating waste generated at stations and on trains are calculated by multiplying the allocations by the expenses for cleaning stations and train cars, based on a model for cleaning stations and trains.
○In the costs for resource recycling activities, the expenses for treating waste generated through construction projects are calculated by multiplying waste volume for FY2016 by standard unit costs for the type of waste in that region.
Environmental conservation benefit
○Environmental conservation benefits are calculated based on figures set as our environmental targets.
Economic benefit of environmental conservation activities
○Economic benefit of global environmental conservation activities is calculated by multiplying annual savings (estimates are used in some cases) in electricity and repair costs resulting from the introduction of energy-efficient trains by the expected useful life, to determine useful-life economic benefit.
○Income from the sales of waste generated at General Rolling Stock Centers and through construction projects is included in economic benefit of resource circulation activities.

JR East's Environmental Management Indicator*

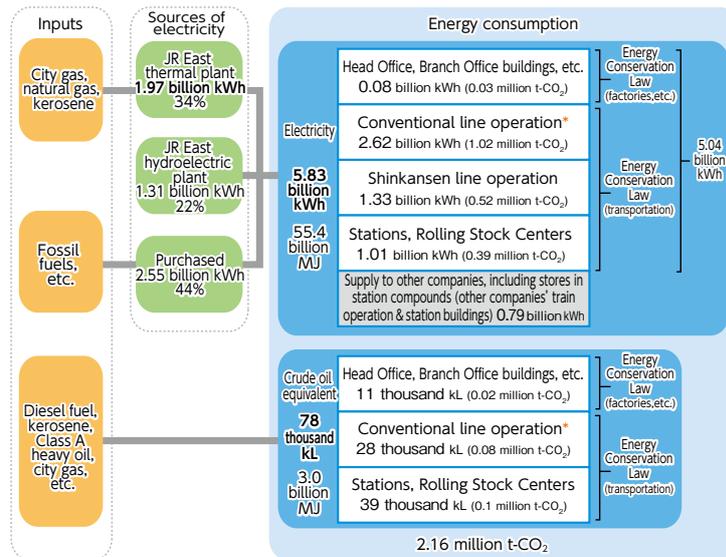


III-2-4 Measures to Prevent Global Warming

► Energy conservation and CO₂ reduction☆

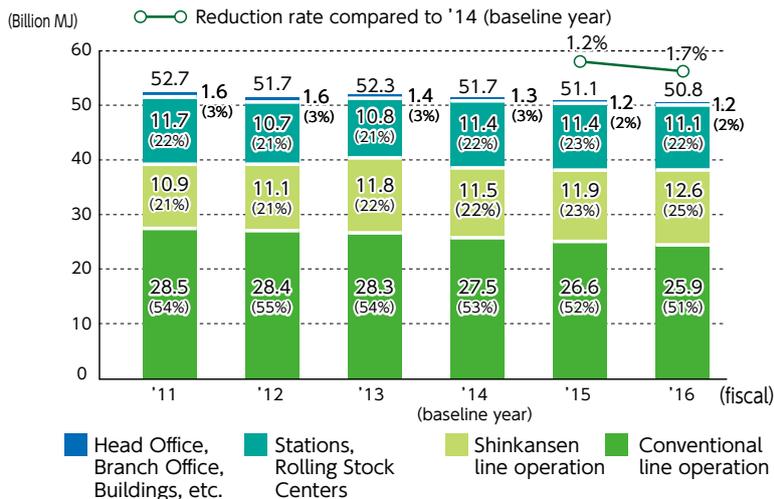
The electricity consumed by JR East for train operations as well as for lighting and air conditioning at stations and in offices is supplied by JR East's own power plants and by electric power companies. Besides electricity, we also use diesel fuel and kerosene for diesel train operation and for air conditioning at stations and in offices. We will strive to save energy for train operation, which accounts for about 80% of our total energy consumption, and furthermore will conduct a variety of energy saving activities even in offices and others.

■ JR East Energy flow map



(CO₂ emissions are the amount calculated with 'adjusted' emission coefficients that reflect the credits purchased by electric power companies.)
 * Including BRT (Bus Rapid Transit)

■ Composition of energy consumption by JR East



●Boundary

Though, in principle, the boundary for energy consumption is only JR East, it nonetheless includes energy consumption for the applicable operations of the companies with whom we entrust station operations. On the other hand, the energy consumption of shops on station premise which are operated by group companies is not included in the boundary. Thus, we match the boundary for the energy consumption for the entire JR East business with that of transportation, plants and others defined by the Act on the Rational Use of Energy (Energy Conservation Law)

●Calculation method

Energy consumption was calculated by the method defined by the Energy Conservation Law.

●Hydraulic power generated by JR East

The foregoing energy consumption is calculated by the idea of the Energy Conservation Law, but hydraulic power generated by JR East is calculated by multiplying by 9.76MJ/kWh. As for hydraulic power generated by JR East, reports required by the Energy Conservation Law are reported by the OMI.

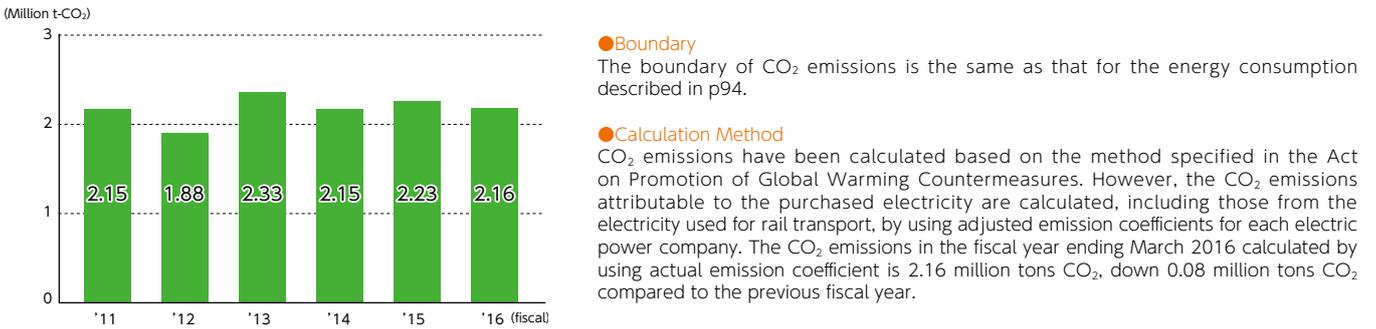
► Trends in CO₂ Emissions of JR East[☆]

Our CO₂ emissions in the fiscal year ending March 2016 totaled 2.16 million tons, a decrease of 0.07 million tons over the previous fiscal year. This is due to an improvement in the CO₂ emission coefficient of electric power companies and a reduction in the amounts of kerosene, etc., that were used. As we did in last fiscal year, we are also reporting CO₂ emissions in Scopes 1 and 2 in accordance with the definition of the GHG Protocol*. From now on we start activities to reduce all CO₂ emissions resulting from our business activities by calculating CO₂ emissions* in Scope 3 and identifying supply chain emissions.

*GHG protocol The standard for calculation and reporting of greenhouse gas emission which was formulated by the organization which was established mainly by the WRI (World Resources Institute) and WBCSD (World Business Council for Sustainable Development)

*Supply chain CO₂ emission Sum of Scope 1, 2 and 3 which is the CO₂ emissions resulting from the whole organization activities of business operations such as raw material procurement, production, capital investment goods, business trip and commuting.

■ Trends in JR East's total CO₂ emissions



Item	Scope 1	Scope 2
FY2016 Emission Volume	1.06 million tons CO ₂	1.45 million tons CO ₂

Scope 1... CO₂ emissions directly attributable to fuel consumed in the operation of diesel railcars and the operation of JR East's thermal electric power plant.

Scope 2... CO₂ emissions indirectly emitted from the use of electricity purchased from electric power companies.

Scope 3... CO₂ discharged by the other companies which are related to our business activities

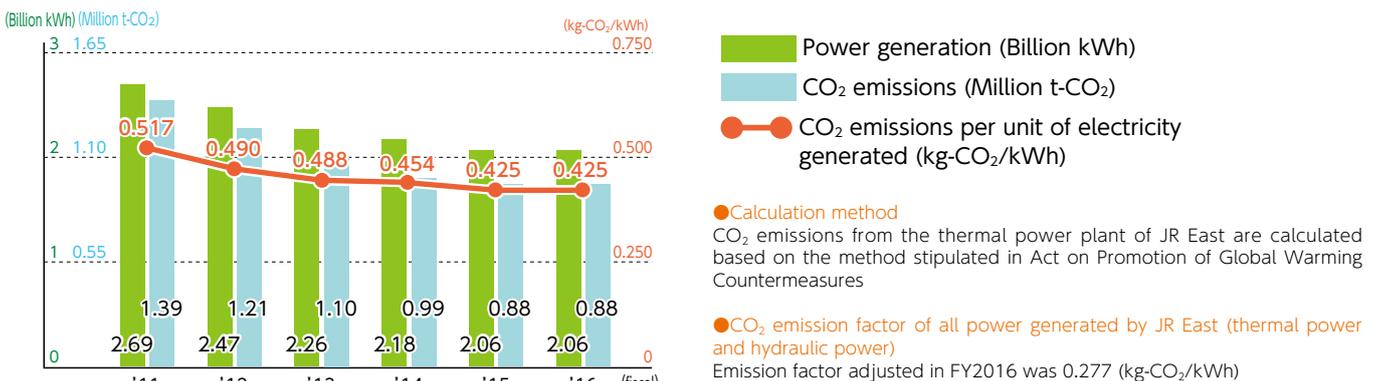
*The sum of the Scope 1 and Scope 2 emissions and the total CO₂ emissions do not match, since the former includes emissions associated with the production of electricity supplied to other companies.

► Thermal Power Plant of JR East[☆]

JR East operates a thermal power plant in Kawasaki City, Kanagawa Prefecture, with a total capacity of 741 MW. The plant uses combined-cycle power generation units* with improved efficiency and switched fuel from oil to natural gas when the plant was renovated to reduce CO₂ emissions. In addition to the start of operation of No. 4 plant in April 2014, investigation and designing for renovation of No. 1 plant are underway for commencement of operations in 2021.

*A combined-cycle power generation unit is a power generation unit that combines gas turbines propelled by combustion of gas with steam turbines driven by steam from the exhaust heat.

■ Power generation and CO₂ emissions at thermal power plant of JR East



▶ Reducing energy consumed for train operations☆

We are putting into service more new-generation energy efficient railcars, with features such as regenerative brakes, which can convert kinetic energy during deceleration into electric energy, and Variable Voltage Variable Frequency (VVVF) inverters, which control motors without wasting electricity. In the fiscal year ending March 2016, JR East had 11,755 energy-efficient railcars in operation. This accounts for 94.5% of our railcar fleet.



E235 series: New rolling stock models equipped with state-of-the-art train information management system were introduced on the Yamanote Line



E7 series: The Hokuriku Shinkansen that incorporates the highest level of cutting-edge technology



E233 series: VVVF inverter cars for commuter and suburban transportation

▶ Diesel-powered, electric-motor-driven hybrid railcars and the accumulator railcar train

The Kiha E200 type cars, which entered service on the Koumi Line in July 2007, are the world's first diesel-powered, electric-motor-driven hybrid railcars. Compared with the previous trains, fuel consumption rate has been reduced by about 10% and the noise level of the trains idling at stations and accelerating on departure has been lowered by 20–30 dB. Also, starting from October to December 2010, we began operating the HB-E300 Series, a new type of resort train equipped with a hybrid system similar to the Kiha E200 type, in the Nagano, Aomori and Akita areas, and in May 2015, we began operating HB-E210 Series on the Senseki-Tohoku Connecting Line. Additionally, as a new measure toward reduction of the environmental burden in non-electric zones, we are proceeding with the development of an accumulator system, which debuted in March 2014 with the EV-E301 ACCUM railcar train, put into service on the Karasuyama Line. The introduction of the EV-E301 has enabled an elimination of emissions, as well as a reduction in CO₂ and noise emissions associated with diesel engines. On top of that, in the spring of 2017 we plan to introduce the accumulator railcar train of the "EV-E801 series" which is aimed for usage on the alternating current(AC) section between Akita station and Oga station.



HB-E210 series: Diesel-powered, electric-motor-driven hybrid railcars

▶ Proactively adopting LED lighting for all new cars

On our conventional lines, LED lighting has been introduced on E233-series cars on the Saikyo Line (310 cars in 31 trainsets), the EV-E301-series prototype train on the Karasuyama Line (2 cars in 1 trainset), E233-series cars on the Yokohama Line (224 cars in 28 trainsets), HB-E210-series cars for the Senseki Tohoku Connecting Line (16 cars in 8 trainsets) and the E235-series prototype for new commuter trains (11 cars in 1 trainset). E233-series cars with LED lighting are now replacing older cars on the Nambu Line, and LED lighting is also used on new E129-series cars in the Niigata area. The first Shinkansen cars with LED lighting are the E7 series trains (192 cars in 16 trainsets). Future production of more E5 series trains will also include LED lighting. In summary, at the end of FY2016, over 10% of cars owned by JR East, including newly manufactured cars and renovated cars, have LED lighting. We are determined to continue making efforts for further energy saving in railway operations.



LED railcar lighting



LED lighting in use sticker

► Utilization of renewable energies

We also promote use of renewable energies, including solar and wind power. Solar panels have been installed on our own buildings at Takasaki Station, the General Education Center, the R&D Center, and elsewhere. In February 2011, we installed 453 kW of solar panels above the entire platform for tracks 9 and 10 at Tokyo Station, which serve Tokaido Line trains. In February 2014, we began using a 1,050 kW mega-solar power generation facility for the first time at JR East, inside the Keiyo Rolling Stock Center; in addition to reducing costs at the Rolling Stock Center, the generated electricity is being used to operate railways via our own distribution lines.

As a result of such initiatives, solar panels generated about 1.9 million kWh of electricity (for JR East's own use) in FY2016. Meanwhile, we are also steadily moving forward with the introduction of mega-solar generation facilities using the feed-in tariff (FIT) scheme. Use of a solar power generation facility began between Tomobe and Uchihara on the Joban Line in February 2015 and in Izumi, Akita City, in March 2016.

► Creation of Renewable Energy Hub in Northern Tohoku

With the aim of developing northern Tohoku into a renewable energy hub, we are actively promoting the introduction of renewable energies including solar, wind, geothermal, and biomass energy. With regard to wind power, we are moving forward with the installation of generation facilities on a JR East site between Michikawa and Shimohama on the Uetsu Main Line, which is scheduled to start operation in the fall of 2016. Going forward, we will continue our efforts to introduce technology that makes efficient use of renewable energies.

Solar light

Akita Izumi solar power plant
Power generation output Approx. 1.3 MW
(Began use in March 2016)

Hanamaki Atago solar power plant
Power generation output Approx. 0.3 MW
(Began use in February 2015)

Biomass

Abundant forest resources and railway forest of the Tohoku region

Hachinohe biomass power plant
Power generation output Approx. 12 MW (Use scheduled to begin in December 2017)

Wind

Abundant wind resources along shorelines, etc.

Between Michikawa and Shimohama on Uetsu Main Line
Wind power generation facilities: Power generation output approx. 2 MW
(Use scheduled to begin in fall 2016)

Geothermal

Abundant geothermal resources in the Tohoku region's volcanic areas

Hakkoda northwest region geothermal resource development survey
JOGMEC: project adoption and surface study currently underway

► Development of the "Eco-station" model station

We have developed model stations for the "eco-station" which introduce various environmental conservation activities into stations such as energy saving and renewable energy. In March, 2012, Yotsuya station started full-scale operation as a first model, and as a second model, Hiraizumi station started its operation in June, 2012. These stations utilize power generated by solar panels realizing local production for local consumption, and started operation as a "zero emission station" which aims for no CO₂ emission on fine weather days. In September, 2013, as a third model station of "eco-station", Kaihinmakuhari Station introduced a small-sized wind power generation facility.

In March, 2015, the fourth ecostate, Yumoto station of the Joban line, started its ecostate operation by positively utilizing local resources such as hot spring heat, wood produced in Fukushima Prefecture and solar power. In the waiting room, a floor heating and radiant type heating device which utilizes hot spring heat were installed, and also on the platform, a foot warming facility which utilizes hot spring water which was already used for heating.

Next, the Fukushima station of Tohoku line promotes "Renewable energy promotion vision of Fukushima Prefecture" developed by Fukushima Prefecture in cooperation with the local community.

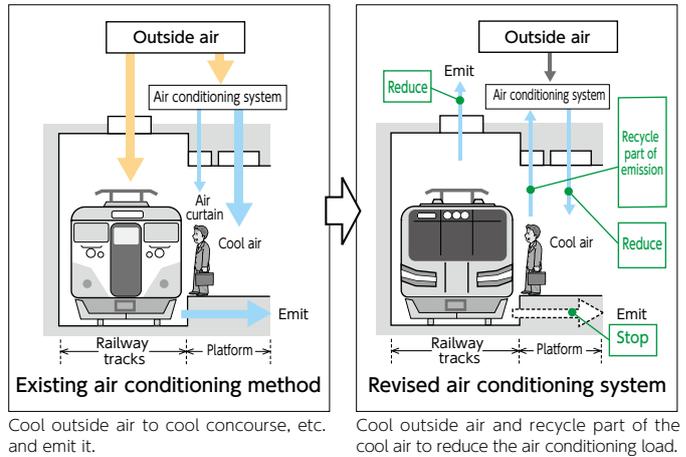
In April, 2015, "eco-station" activities were started by introducing ecological measures such as light weight solar panels installed on the roof of the Shinkansen platform, organic thin layer solar cells for transfer over pass and heat pumps using geothermal energy.



Solar power generation facility installed in Fukushima station

▶ Saving energy at stations

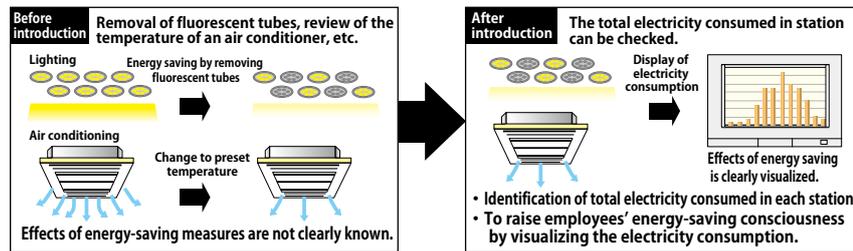
As we have done for office buildings, we have promoted energy conserving initiatives at stations, such as revision of air conditioning systems in line with the upgrading of facilities and replacing platform lighting into LED lighting. Since Great East Japan Earthquake, we are replacing mainly station platform lighting into LED lighting. In FY2016, we replaced a total of about 4 thousand platform lights with LED lighting and by this replacement, we were able to reduce annual power consumption by about 0.9 million kWh. The air conditioning system for the Sobu Line underground platform at Tokyo Station had been bringing in outside air, cooling it, and then sending that cooled air up to the concourse and emitting the air to the outside. With the upgrading of the air conditioning system since 2015, we now recycle and reuse the cooled air to reduce the air conditioning load, which reduces CO₂ emissions by 60% combined with the effects of renewing air conditioning facilities.



▶ Visualizing power consumption in stations

JR East is introducing monitors that display the energy consumed in stations to encourage employees to be more conscious of energy saving. The visualization system measures the total electricity consumed in the station at the power-receiving location and displays it on a monitor every hour. It was introduced in about 200 stations in the fiscal year ending March 2016, and is utilized for continuous energy saving initiatives.

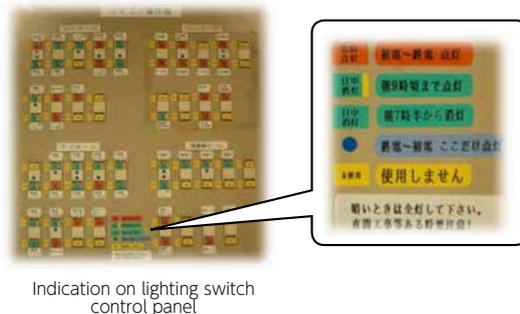
■ Mechanism of visualization



Specific Examples of Energy-Saving Initiatives Based on Visualization

Here are some examples of station-specific initiatives based on JR East's eco-activities, My Project, and so forth that have lead to energy savings:

- Indicating switch usage times on the operating panel for platform lights that were turned on and off at different times during operating periods depending on the employee. The results of this initiative are quantitatively demonstrated through visualization.



- Indicating the contracted electricity amount on the display monitor and issuing an alert that the contracted electricity rate will increase when the consumed electricity exceeds this amount over a given period of time.
- Preventing staff from forgetting to turn lights off by using a simple timer.
- Maintaining the waiting room at an appropriate temperature through frequent temperature checks.

► Environmentally friendly and energy efficient office buildings

We have pursued energy saving initiatives by hardware measures such as introducing LED lighting and high efficiency devices into office buildings and also by software measures such as implementation of "cool-biz" initiatives, thermal control of air conditioners and scrupulous shutting off lights by employees.

The environmentally friendly and energy-efficient JR Minami Shinjuku Building, JR Kanda Manseibashi Building, and JP Tower opened in FY2013 and the JR Shinjuku Miraina Tower in FY2016. The JR Kanda Manseibashi Building, JP Tower, and JR Shinjuku Miraina Tower have acquired a class S rating, the highest rating under the CASBEE environmental labeling system, an initiative of the Ministry of Land, Infrastructure, Transport and Tourism. Moreover, the JR Kanda Manseibashi Building earned both LEED-CS Gold (Core & shell) of LEED (Leadership in Energy and Environmental Design) and LEED-CI Gold certification (commercial interior), widely recognized green building performance standards in the U.S., in FY 2014.



JR Kanda Manseibashi Building, LEED-certified, ranked "S," in the CASBEE



GranTokyo South Tower, recognized as a top-level establishment

In addition, thanks to their superior performance as office buildings reducing CO₂ emissions, Gran Tokyo South Tower, GranTokyo North Tower, JR Shinagawa East Building, and Sapia Tower earned recognition as Offices Taking Excellent Specific Global Warming Countermeasures (top-level office building or quasi top-level office building) under the Tokyo Metropolitan Ordinance on Environmental Preservation. During the first planning period under the ordinance (FY2011 to FY2015), we were able to reduce CO₂ in the amount largely exceeding the obligatory amount. We will use the exceeded amount of reduction for emission trading within the Group and others as stipulated in the ordinance.

As part of our efforts to take a leading role in addressing climate change at the global level, the project to develop the former site of Shinagawa Depot Railway Yard, with the support of the Tokyo Metropolitan Government, joined the Climate Positive Development Program*¹ run by C40*², which recognizes low-carbon urban development projects, in FY2016. Going forward, we will continue to contribute to the creation of a sustainable society.

*1 C40 (C40 Cities Climate Leadership Group) Established in 2005 as a network of cities around the world that work together to reduce greenhouse gas emissions. As of August, 2016, there are 85 participating cities, including Tokyo, which joined in 2006.

*2 Climate Positive Development Program A program that creates models for highly sustainable urban development. Its purpose is to be a leader for global society as a whole by widely promoting examples of pioneering development models around the world.



▶ Greening rooftops

We have been promoting the planting of greenery on JR East station and office building rooftops with the aim of reducing the heat island effect and decreasing the need for air conditioning. By taking advantage of its location on a station rooftop, "soradofarm", membership rental farms placed next to the garden, provides services such as agricultural, environmental education and creates local community through vegetable cultivation experiments and earns a positive favorable reputation from many customers. At present, these services are implemented at Shinjuku, Ebisu, Ogikubo, Hachioji, Takasaki and others. As of the end of March, 2016, we had completed 89 greening projects (including some cases of moss planting) encompassing a combined rooftop area of 33,221m².



Rooftop greenery at the Chiba branch building



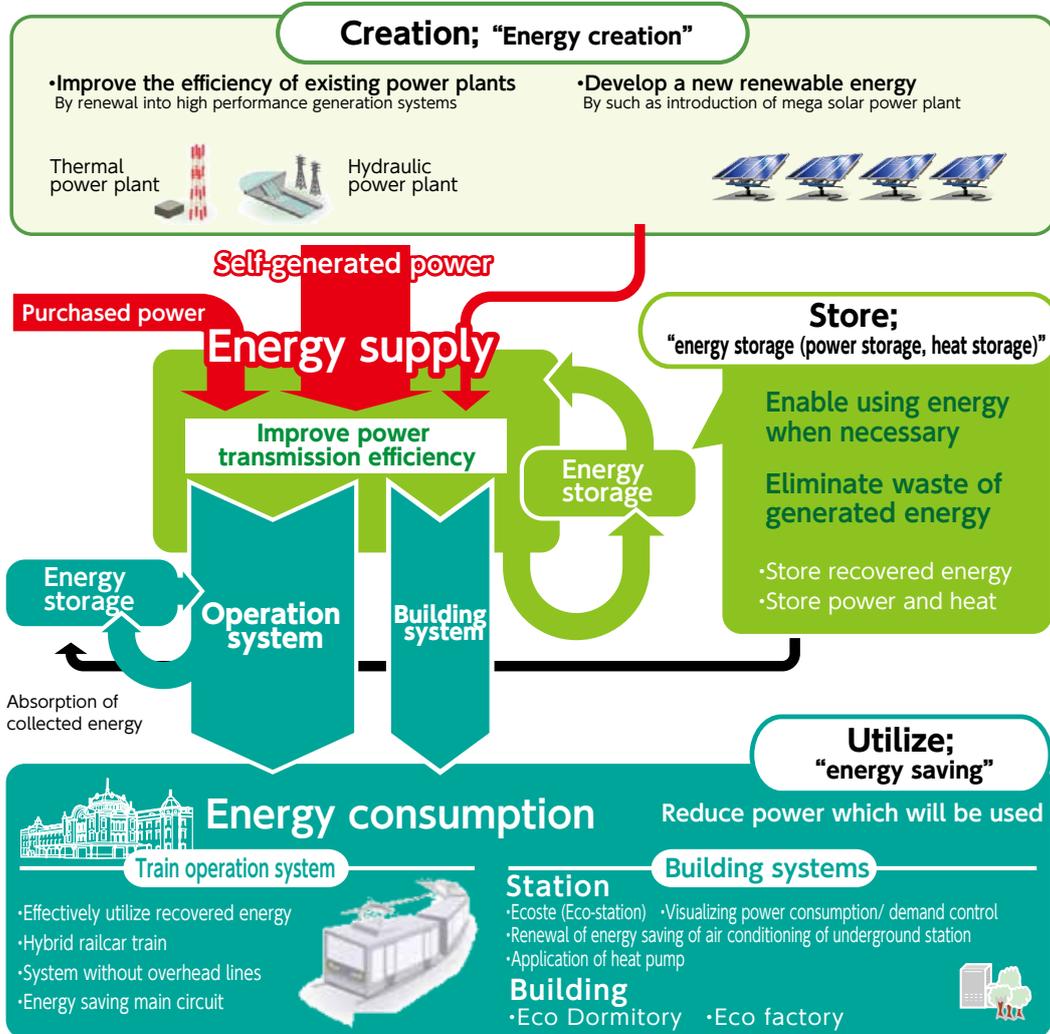
Atrium Ebisu



Takasaki Monterey

► Research and development for reduction of environmental loads

We pursue establishing "energy management" by adoption of the power grid owned by JR East and renewable energy. With respect to "application of energy saving technologies for railways", we have promoted research and development setting three targets of creation; "energy creation", utilization; "utilization of energy saving" and the accumulation; "energy storage".



Special Topic

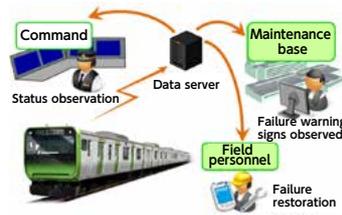
Opening Up a New Era through Technological Innovation

State-of-the-Art Technology Installed on E235-Series Yamanote Line Trains

The E235 series is equipped with INTEROS (Integrated Train Communication Networks for Evolvable Railway Operation System), a next-generation train information management system which communicates data throughout the train at 100 Mbps and sends information to above-ground systems in real time via WiMAX. These functions make it possible to monitor the status of on-board devices, which helps to ensure stable operation. Other distinctive features of the E235 series include the use of digital signage for advertisements adjacent to the ceiling, the deployment of a power semiconductor device using SiC in the main controller, and an increase of around 3% in energy efficiency compared to the previous train model.



E235 series digital signage

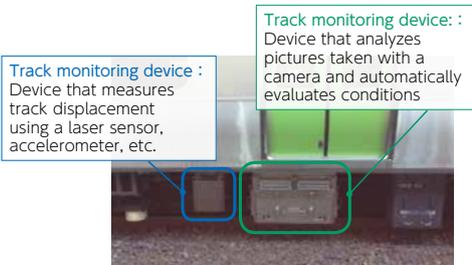


Status monitoring diagram

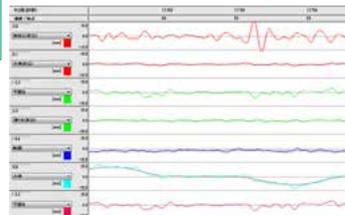


Main controller (VVVF inverter system)

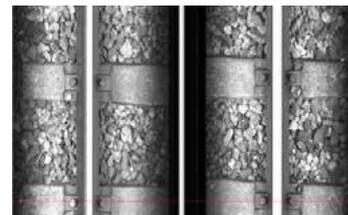
In pursuit of further IT-based technological innovation, track facility and power equipment monitoring devices are mounted on Yamanote Line E235-series rolling stock. Previously, track warping and the condition of parts securing rails and trolley wires supplying power to trains were verified by means of visual inspection or measurement by East-i electricity and track inspection trains. Mounting this equipment on trains in service makes it possible to capture changes in track and trolley wire conditions on a highly frequent basis. Through the practical application of these new technologies, JR East aims to further improve safety and stability.



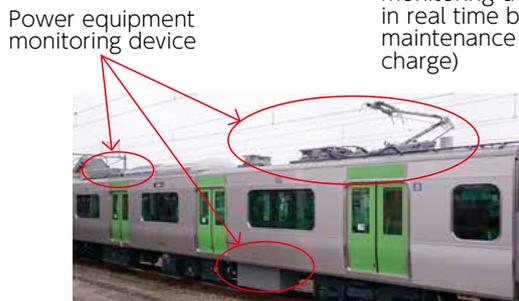
Equipment mounted on Yamanote Line E235-series train



Track displacement (warping) conditions captured with a track monitoring device (viewable in real time by the track maintenance technical center in charge)



Actual image taken by track monitoring device (viewable by the track maintenance technical center in charge)



Monitoring of power equipment on Yamanote Line E235-series train



Actual image taken by power equipment monitoring device (viewable by the track maintenance technical center in charge)

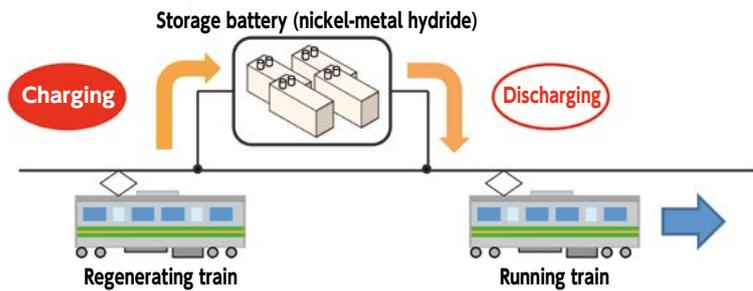
Power Storage System

In February 2016, we began using a power storage system employing a nickel-metal hydride battery at the Kuki substation on the Tohoku Main Line (Utsunomiya Line). As part of the promotion of our energy and environment strategy, this system is designed to make effective use of regenerative power generated when a train stops by storing it in the battery to be used when needed. The power storage system at the Kuki substation is the third of its kind, following the Haijima substation on the Ome Line (lithium-ion battery) and Okegawa substation on the Takasaki Line (lithium-ion battery). The results of trials at the Kori substation on the Ome Line confirmed that operation was stable with nickel-metal hydride batteries, which led to this type of battery being introduced in actual operations for the first time at JR East at the Kuki substation.



Kuki substation power storage system

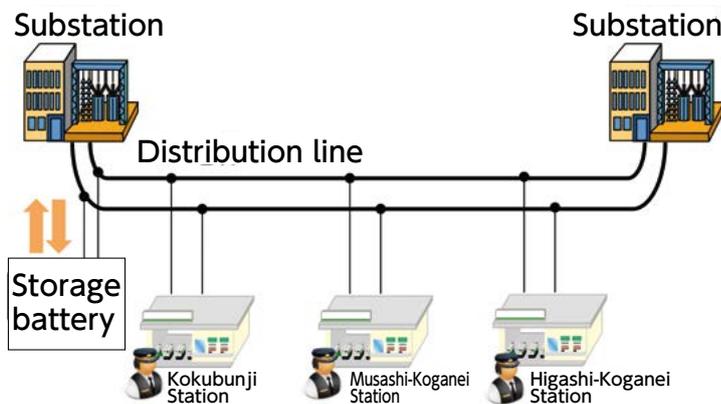
Image of Efficient Use of Regenerative Power



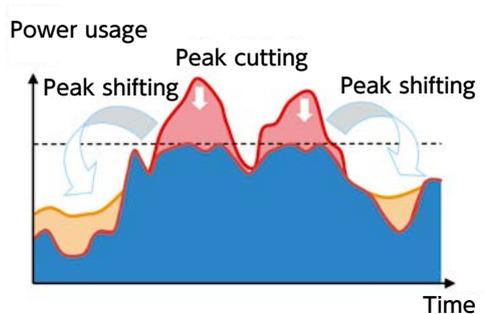
Introduction of Energy Management System at Stations

JR East is aiming to achieve better energy management at stations through the introduction of demand control, which automates air-conditioning and lighting and optimizes power use. In FY2016, it was first introduced at Ebisu Station, Kokubunji Station, and Nishi-Funabashi Station, and the results showed that it had the effect of reducing power usage at peak times by approximately 12% for equipment controlled by the system, such as lighting and air-conditioning. Controlling power use at peak times helps not just to save energy but also to streamline the equipment needed at stations and other facilities. At the end of FY2017, we plan to begin trialing a "cooperative demand control" system that will regulate all power use for three stations on the Chuo Line (Higashi-Koganei Station, Musashi-Koganei Station, and Kokubunji Station). By integrating management of power consumption across multiple stations, it is expected that demand control will become even more effective. Furthermore, in addition to "peak cutting" based on demand control, we plan to implement "peak shifting," which discharges power accumulated during the night at peak times, by incorporating storage batteries into the system.

Cooperative Demand Control Configuration Diagram



Effect of Cooperative Demand Control



III-2-5 Measures to create a sound material cycle

▶ Waste reduction and recycling

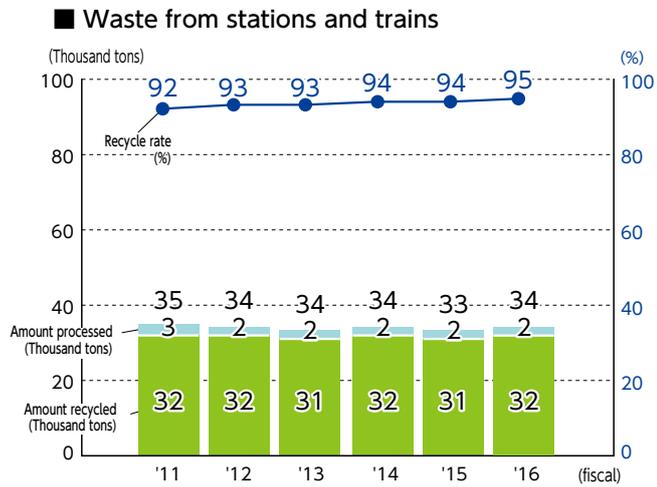
JR East generates many kinds of waste through its railway operations, including daily general trash removed from trains and stations and industrial waste from our General Rolling Stock Centers. Restaurants and retail stores in our life-style businesses also produce garbage and general waste. In order to reduce all these various forms of waste, JR East actively supports the approach known as "reduce, reuse, and recycle." For recycling in particular, goals are set for each type of waste.

▶ Recycling waste collected from stations and trains☆

Since trash from stations and trains contains recyclable materials, we placed separation bins in stations to have customers cooperate in separating trash. In October 2010, to further improve recycling rates by implementing thorough separation of trash, we built the JR East Tokyo Materials Recycling Center (operated by East Japan Eco Access Co., Ltd.) and started its operation.



JR East Tokyo Materials Recycling Center



■ Recycling trash within the company

JR East promotes in-company recycling of trash generated at stations. Magazines, newspapers and similar paper items collected from our segregated trash boxes at stations and trains are being recycled into coated paper and stationery and used in our offices.



Newspapers and other papers collected in stations and elsewhere are recycled into office paper used by our company.

■ Recycling waste PET bottles into civil engineering materials

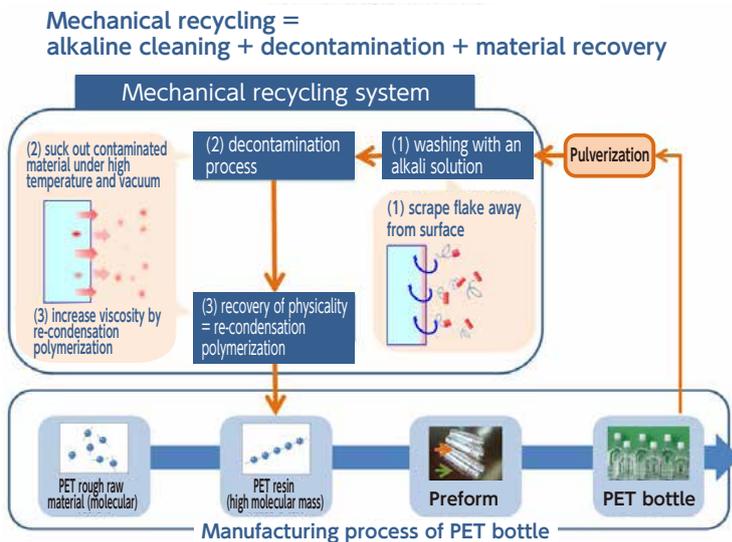
JR East has constructed a recycling system that produces resin weed-barrier sheets (product name: Nakusa R-PET) by recycling the PET (polyethylene terephthalate) bottles discarded in stations and trains. The main ingredient for resin weed-barrier sheets used to be polyethylene, but JR East has developed and commercialized a weed-barrier sheet composed mainly of waste PET bottles after tests were successful and in 2009 put it into practical use.

■ "Bottle to Bottle" Recycling Initiative

At some stations in the Omiya and Urawa areas, for the first time, we have starting supplying PET bottles collected from garbage cans attached to "acure" vending machines for mechanical recycling* within the station since August 2015.

In addition, with the aim of helping customers in sorting garbage and making the overall recycling process more efficient and sophisticated, we have started introducing improvements to "acure" garbage cans, such as making the storage section transparent.

* Mechanical recycling The method which selects, pulverizes and washes collected used PET bottles and removes stains and foreign matter from the surface, followed by processing under high temperature.



(Source: Kyoei Sangyo Co., Ltd.)

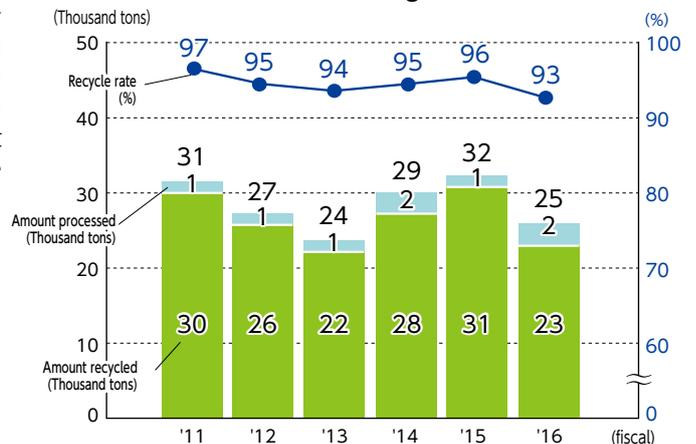


Garbage can with transparent storage section

▶ Recycling at General Rolling Stock Centers☆

JR East Group is recycling waste generated during the manufacture and maintenance of rolling stock. At our regional General Rolling Stock Centers, waste is sorted into 20 to 30 categories to reduce waste generation and promote recycling. Starting in FY2006, we have been collecting data on the volume of retired railcars that are sold as scrap to be recycled so as to monitor the progress.

■ Waste from General Rolling Stock Centers



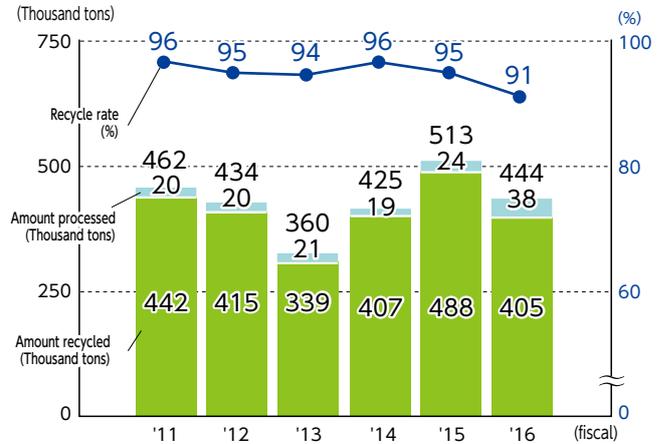
▶ Reducing construction waste☆

JR East endeavors to reduce waste from construction by standardizing design and construction methods that help to properly dispose of construction byproducts and to minimize waste.

JR East generated approximately 444 thousand tons of waste through construction and maintenance projects at our stations and other structures, including approximately 50 thousand tons of waste through work entrusted to JR East.*

*Work entrusted to JR East: Construction work contracted to JR East by local governments etc., to be done at non-JR East facilities, for such purposes as to ensure safe train operations.

■ Waste from construction projects



▶ Reducing waste at offices☆

In departments at the Head Office and Branch Offices, we strive to reduce waste by promoting elimination of paper and by recycling, including the use of creative, employee designed trash cans. In FY2016, we recycled 1,841 tons out of a total of 2,148 tons of waste (86%).



Separate trash bins for different types of trash (inside Chiba Branch Office)

▶ Efficient use of water resources☆

As a consumer of 10.96million m³ of water annually, JR East actively promotes the use of recycled waste water*, using, for example, rainwater and water already used for washing hands to flush toilets. At the Head Office building, 26thousand m³ out of 31thousand m³ of water was reused in FY2016.

*Recycled waste water: Defined as water of a quality level between clean water and sewage water. It is used for limited purposes as a recycled resource.

▶Reducing and recycling tickets☆

Collected used tickets are sent to a paper mill. After the iron powder has been separated from the backs of the tickets, the paper is recycled to make toilet paper and corrugated cardboard. In FY2016, all of the 299 tons of collected tickets were recycled. Collected magnetic season tickets were recycled into solid fuel.

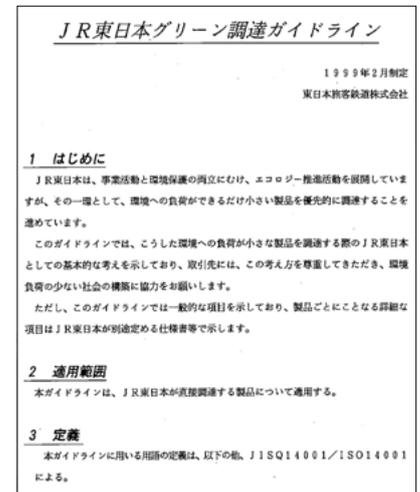


Used tickets collected at stations are recycled into toilet paper.

▶Promoting green procurement

JR East is developing ecological promotion activities compatible with both business activities and environmental preservation, including procurement of products with lower environmental impact. As part of those efforts we formulated the "JR East Green Procurement Guidelines" in 1999. Outlined in these guidelines is our philosophy with regard to materials, conservation of resources, and packaging.

We also are promoting the procurement of environmentally friendly office supplies. Through such green procurement, JR East will further deepen our efforts to work toward a recycling-oriented society.



JR East Green Procurement Guidelines

▶CSR Procurement

With regard to selecting suppliers for material procurement, we have published a Code of Conduct Regarding Material Procurement of JR East on our website, which states that we focus on the fulfillment of our corporate social responsibilities when procuring materials by considering factors such as legal compliance and environmental preservation. We also request that all our suppliers comply with the relevant laws and regulations and seek to reduce their environmental footprint.

In addition, we seek to understand the current status of all material-related suppliers by conducting a survey of their CSR initiatives once a year, as a rule, which indicates whether or not they are implementing initiatives relating to green procurement and environmental footprint reduction, initiatives that consider employees' human rights, other compliance initiatives that have an impact on society, and so forth. The results of these surveys are used as one of our decision-making criteria when selecting suppliers.

Reference: Code of Conduct Regarding Material Procurement of JR East (on our corporate website)
https://www.jreast.co.jp/e/data/procurement/code_of_conduct.html