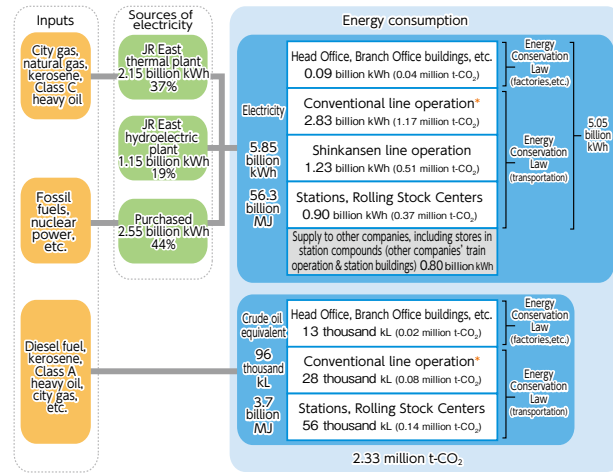


# Measures to Prevent Global Warming

## Energy conservation and CO<sub>2</sub> 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 reduce CO<sub>2</sub> emissions in various ways.

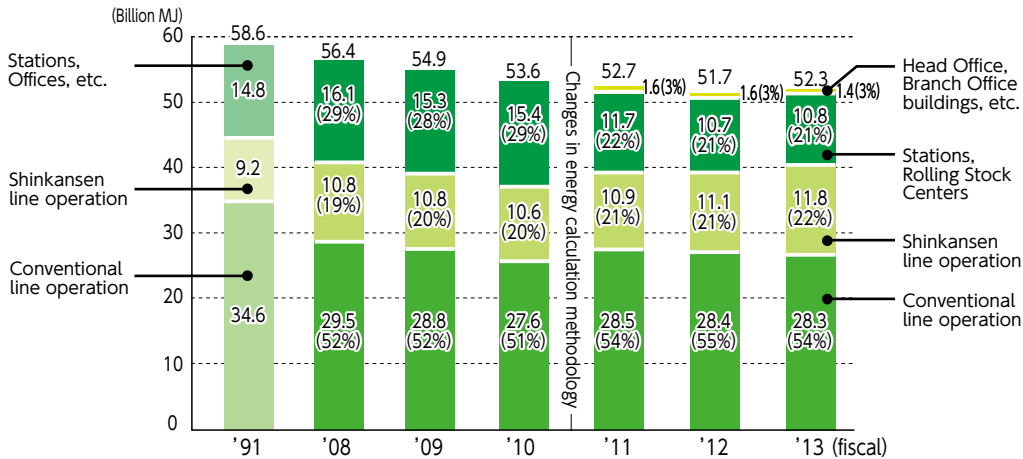
■ JR East Energy flow map



(CO<sub>2</sub> 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



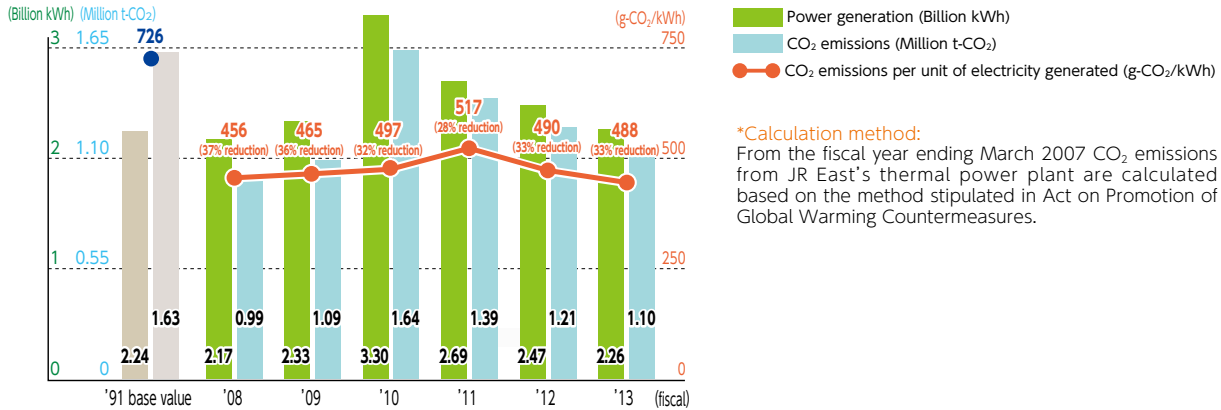
\* The energy consumption is converted in Joules according to the Act on the Rational Use of Energy, except for the electricity generated by JR East's own hydroelectric plant, which is converted in Joules using 9.76 MJ/kWh as the conversion factor. JR East uses 0 MJ/kWh as the conversion factor for our own hydroelectric power in our report submitted to the government, as required by the Act.

### JR East's own thermal power plant<sup>☆</sup>

JR East operates a thermal power plant in Kawasaki City, Kanagawa Prefecture, with a total capacity of 655 MW. The plant replaced three units (out of four) with combined-cycle power generation units\* with improved efficiency and switched fuel from oil to natural gas when the plant was renovated to reduce CO<sub>2</sub> emissions.

\* 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 CO<sub>2</sub> emissions at JR East's thermal power plant

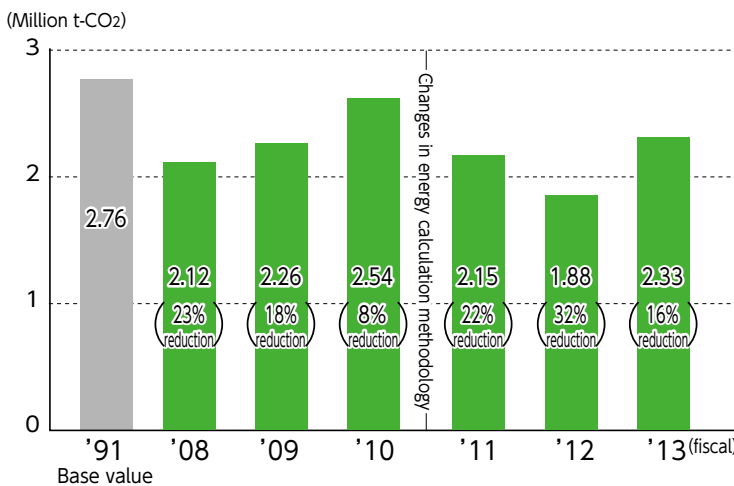


**\*Calculation method:**  
From the fiscal year ending March 2007 CO<sub>2</sub> emissions from JR East's thermal power plant are calculated based on the method stipulated in Act on Promotion of Global Warming Countermeasures.

### Trends in JR East's total CO<sub>2</sub> emissions<sup>☆</sup>

Our CO<sub>2</sub> emissions in the fiscal year ending March 2013 totaled 2.33 million tons, an increase of 0.45 million tons over the previous fiscal year. This was due to an increase in the CO<sub>2</sub> emission coefficient (CO<sub>2</sub> emitted per unit of electric power generated by power companies). It was also attributable to the rebound effect of energy-saving and other measures taken after the Great East Japan Earthquake.

#### ■ Trends in JR East's total CO<sub>2</sub> emissions



**\*Boundary:**  
Energy consumption and CO<sub>2</sub> emissions have been calculated for JR East alone, in principle. Beginning with FY 2011, however, the energy consumption by, and its associated CO<sub>2</sub> emissions from, companies to whom JR East outsources its station operations and other services are calculated as JR East's own energy consumption and CO<sub>2</sub> emissions. Meanwhile, the energy consumption by, and its associated CO<sub>2</sub> emissions from, stores in station compounds operated by group companies are excluded from those of JR East. These changes have been made to calculate the energy consumption and CO<sub>2</sub> emissions associated with JR East's business as a whole more accurately in line with the idea of setting organizational boundaries for transportation and factories in the Act on Rational Use of Energy (Energy Conservation Law). No revision was made to the past data of energy consumptions and CO<sub>2</sub> emissions.

**\*Calculation Method:**  
CO<sub>2</sub> emissions have been calculated based on the method specified in the Act on Promotion of Global Warming Countermeasures. However, the CO<sub>2</sub> emissions attributable to the purchased electricity are calculated, including those from the electricity used for rail transport, by using adjusted emission coefficients. The CO<sub>2</sub> emissions in the fiscal year ending March 2013 calculated by using actual emission coefficient is 2.34 million tons, an increase of 0.32 million tons over the previous fiscal year.

<sup>☆</sup>Total CO<sub>2</sub> emissions in FY2013, when calculated with the same calculation methodology (category and boundary) as that used until FY2010, are 2.43 million tons of CO<sub>2</sub>.

### Reducing energy consumed for train operations<sup>☆</sup>

As of the end of March 2013, JR East had 11,607 energy-efficient railcars in operation. This accounts for 90.4% of our railcar fleet. 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.



E233 series: State-of-the-art cars introduced on the Chuo Line in December 2006



E5 series: new high-speed Shinkansen railcars that incorporate the highest level of customer service and cutting-edge technology



E231 series: VVVF inverter cars for commuter and suburban transportation

### Diesel-powered, electric-motor-driven hybrid railcars and new resort trains

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 current 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, in 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.



HB-E300 series: A hybrid resort train

### Utilization of renewable energies

We also promote use of renewable energies, including solar and wind power. Solar panels have been installed at Tokyo Station, Takasaki Station, the General Education Center and R&D Center. In March 2004, the number of panels at Takasaki Station was doubled. Panels on the largest scale in JR East were installed at Tokyo Station in February 2011 above the platform for tracks 9 and 10, which serve Tokaido Line trains.

Starting full operations as the first ecoste –“eco-station” – Yotsuya Station on the JR Chuo Line began use of solar panels in March 2012. Hiraizumi Station on the JR East Tohoku Main Line, the second ecoste, began to use solar panels in June 2012, to “generate and use energy locally” and to achieve “zero emissions,” i.e., no CO<sub>2</sub> emissions on fine-weather days. We will continue to endeavor to introduce technology using renewable energies efficiently.



Solar panels on the main building at the Akasaka Exit of Yotsuya Station



Solar panels at Hiraizumi Station

### Greening rooftops

We have been promoting the planting of greenery on JR East-owned station and office building rooftops with the aim of reducing the heat island effect and decreasing the need for air-conditioning. As of the end of March 2013, we had “greened” a combined rooftop area of approximately 24,231 m<sup>2</sup> in 71 projects.



Rooftop greenery at Chiba branch building

### Rooftop greening by JR Group companies

We have been promoting rooftop greening to make station buildings in the metropolitan area a place of relaxation for the residents of the community as well as for office workers. The “Soradofarm”, which is a vegetable farm rented to subscribers and built alongside the gardens, serves to create a local community, and provides education in farming and environment through people’s experience in cultivating vegetables. These are popular among many customers and have also been built in Ebisu, Ogikubo, Takasaki and Hachioji.



atre Kawasaki



Soradofarm Ebisu

### Saving energy in office buildings

In response to revisions to laws and regulations, saving energy in office buildings has become increasingly important. We work hard on reducing energy consumption through physical measures, including the introduction of highly efficient equipment and facilities, and operational measures, including temperature management of air conditioning and diligently turning off lights.

In addition, given the concerns about energy supply and demand since the Great East Japan Earthquake, we have been actively introducing LED lighting apparatus, which is particularly effective as a physical measure.

### Recognition as global warming countermeasures establishments

Six buildings, including GranTokyo South Tower, GranTokyo North Tower, JR Shinagawa East Building, Sapia Tower, JR Tokyu Meguro Building and Tokyo Building, are recognized as Global Warming Countermeasures Establishments (commonly referred to as top-level establishments or quasi-top-level establishments) under the Tokyo Metropolitan Environmental Preservation Ordinance in recognition of their highly efficient facilities, active management efforts for energy conservation, and commendable CO<sub>2</sub> reduction results.

GranTokyo South Tower was certified to be upgraded to a top-level establishment from a quasi-top-level establishment in February 2013. As a result, all three buildings in Tokyo Station City (GranTokyo South Tower, GranTokyo North Tower and Sapia Tower) have been designated as Global Warming Countermeasures Establishments.

The JP Tower, the JR Minami-Shinjuku Building and the JR Kanda-Manseibashi Building, all of which were completed in the fiscal year ending March 31, 2013, are also environmentally and energy friendly. The JP Tower and the JR Kanda-Manseibashi Building were ranked "S," the top rank in the Comprehensive Assessment System for Built Environment Efficiency (CASBEE), a system put forward at the initiative of the Ministry of Land, Infrastructure and Transport (MLIT).



GranTokyo South Tower, recognized as a top-level establishment



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

#### ■ List of top-level establishments

Top-level establishments	Quasi-top-level establishments
Sapia Tower (certified FY2011)	Tokyo Building (certified FY2011)
GranTokyo North Tower (certified FY2012)	JR Tokyu Meguro Building (certified FY2011)
GranTokyo South Tower (certified FY2012 as quasi-top-level establishment, upgraded FY2013)	
JR Shinagawa East Building (certified FY2011 as quasi-top-level establishment, upgraded FY2012)	

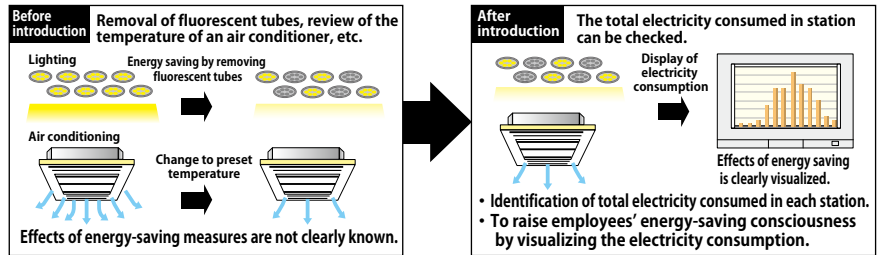
### Saving energy used by information systems

As part of our effort to save energy in office buildings since FY2010, we have been turning off power for certain information systems equipment during non-use hours. The resulting savings were about 128,000 kWh of power in FY2013. We also reduced the number of servers by combining equipment, worked to introduce energy-saving products and set our business-use PC terminals to power saving mode. We will continue our efforts to reduce energy consumption further.

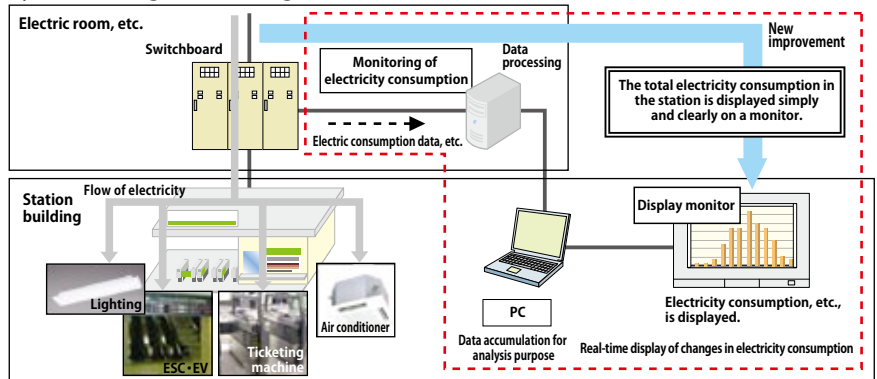
### Visualizing the power consumption in stations

JR East is introducing monitors that display the energy consumed in stations to encourage the employees to have stronger consciousness of energy saving. The visualization system measures the total electricity consumed in station at the power-receiving location and displays it on a monitor every hour. It had been introduced in about 30 stations by the year ended March 2013, and will be introduced in 170 stations during the fiscal year ending March in 2014.

#### Mechanism of visualization



#### System configuration diagram



### Case Report: Environmental Measures

#### LED lighting installed on all Yamanote Line trains

In December 2010, LED lighting was installed on the 11-car configuration Yamanote Line trains on an experimental basis. As the gathered data confirmed reductions in both energy usage and CO<sub>2</sub> emissions, in summer 2013, we began introducing LED car lighting to all Yamanote Line cars and will complete the changeover (572 cars in 52 configurations) by spring FY2015. By doing this, JR East will reduce Yamanote Line electricity consumption by approximately 40% compared to that of fluorescent lighting. We also expect to reduce CO<sub>2</sub> emissions by approximately 624

tons per year across all 52 Yamanote Line configurations. Stickers will be displayed on the windows of cars equipped with LED lighting. From FY2014, we will also introduce LED lighting on the E233-series cars that will be introduced on the Saikyo, Yokohama and Nambu lines, on the E129-series cars that will be introduced in the Niigata area and on the HB-E210-series cars that will be introduced on the Senseki and Tohoku lines. Our intention, furthermore, is to adopt LED lighting for all new cars servicing the Tokyo metropolitan area.



LED railcar lighting



LED lighting in use sticker

**Intermodal Transportation = Reduction of CO<sub>2</sub> emissions by the entire transportation system**

**Promoting Park-and-Ride**

JR East promotes “Park-and-Ride” services. Customers with tickets for the Shinkansen or limited express trains can drive their cars from home to nearby stations and use the railway network from there. By the end of March 2013, 81 JR East stations had parking spaces for eight thousand cars\*. This not only spares customers the delays of traffic congestion, but conveys them reliably to their destination through a more environmentally friendly form of travel.

\* **Parking spaces for eight thousand cars at 81 stations:** Parking spaces include those developed by JR East and those managed by JR East Group companies or in cooperation with local municipalities.



At 10 stations between Tomobe and Iwaki on the Joban Line, parking charges are free for express train customers going farther than a specified distance.

**Enhanced rental car service at stations**

Rental car service is available in major stations, and we suggest travel plans to our customers that use a combination of railways and automobiles to visit places distant from the station. Environment-friendly hybrid cars with car navigation systems and electronic toll collection as standard equipment were introduced last year. JR East also offers intermodal travel packages such as Rail-and-Car tickets with discounted rental charges.

\* **Intermodal transportation:** Intermodal transportation refers to a transportation system which allows a person to get from an origin point to a final destination by connecting between different modes of transportation.

**■ Intermodal transportation**

