

► Measures to Prevent Global Warming

What is the JR East Group Doing to Prevent Global Warming?

In an effort to reduce its CO₂ emission levels, the JR East Group promotes greater energy efficiency and the use of renewable energy. It also is promoting intermodal transportation, aimed at reducing CO₂ emissions of the country's entire transportation system.

Measures to Prevent Global Warming

Energy supply and consumption

The energy consumed by JR East consists of electrical and non-electrical power. Electrical power comes from electrical utility companies and JR East's own power plants, and is used to operate our trains, as well as powering light and air conditioning in stations, offices, and elsewhere. Non-electrical energy comes from diesel oil, kerosene, etc., and is used for diesel vehicles as well as air conditioning at stations and in offices.

In fiscal 2004, we continued efforts to increase efficiency and reduce energy consumption. The Niigata-Chuetsu Earthquake in October 2004 forced a shut-down of the Shinano River Hydraulic Power Plant, which supplies electricity to the Tokyo metropolitan area; the necessary replacement by generation from fossil fuels resulted in an increase in CO₂ emissions by 190,000 tons over the previous fiscal year.

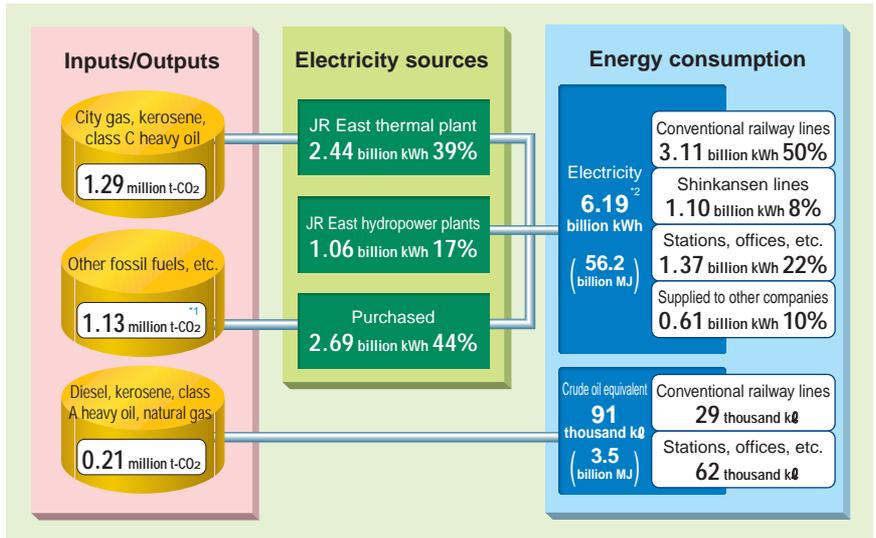
Efforts to Boost Energy Efficiency

Changes in energy consumption

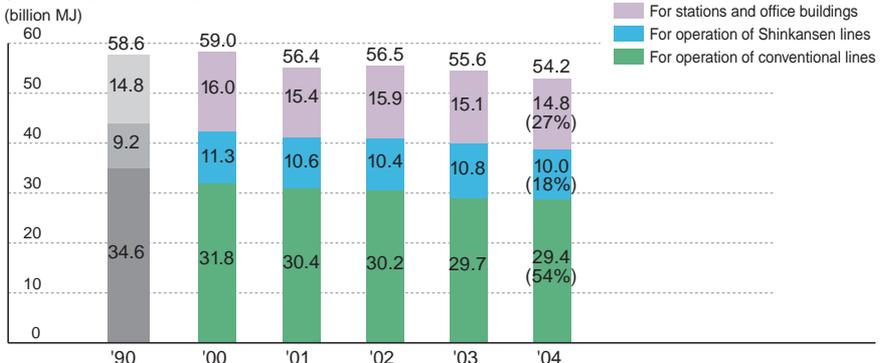
In fiscal 2004, JR East consumed 54.2 billion megajoules (MJ) of energy. Resulting CO₂ emissions amounted to 2.39 million tons-CO₂, an increase of 7 percentage points from the previous fiscal year.

In this context, we will be completing repairs on the earthquake-damaged hydropower plant by the spring of 2006; we will also continue to introduce energy-saving railcars in order to reduce the amount of energy used to operate our trains, which currently accounts for 73% of total energy consumption.

► Energy flows of JR East

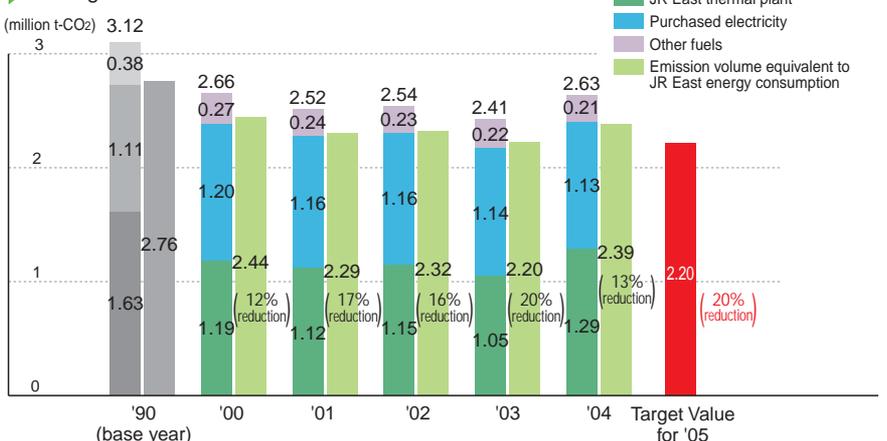


► Changes in energy consumption



Note: Energy consumption for electricity purchased from outside and generated at JR-East hydropower plants was calculated from the constant 9.42 MJ/kWh. Energy consumption by JR East thermal power plant and "other fuels" was calculated from actual fuel consumption.

► Changes in total CO₂ emissions



*CO₂ emission factors for fuels and purchased electricity are from the Japan Business Federation (in its "Voluntary Action Plan on the Environment"), and the Federation of Electric Power Companies of Japan.

*1 1.13 million t-CO₂:

To facilitate comparisons over time, we use the CO₂ emission factors for fiscal 1990 from the Federation of Electric Power Companies of Japan to arrive at this figure. It is worth noting that even if the emissions factor for fiscal 2004 is used, the calculation produces the same outcome.

*2 6.19 billion kWh:

Equivalent to the annual electrical consumption of 1.71 million households

Reducing energy consumption in train operations

By the end of fiscal 2004, JR East had 9,410 energy-saving railcars in operation. This amounts to 76% of the entire railcar fleet.

We are steadily replacing railcars on conventional lines with energy-saving railcars equipped with regenerative brakes and VVVF inverter controls.^{*1} For Shinkansen lines, as well, besides making railcars that are lighter and more energy-efficient, we are working in other ways such as to reduce air resistance with more streamlined designs.

These energy-saving measures affecting the operation of railcars reduced energy consumption per unit of transport by 13% in fiscal 2004 compared to fiscal 1990.

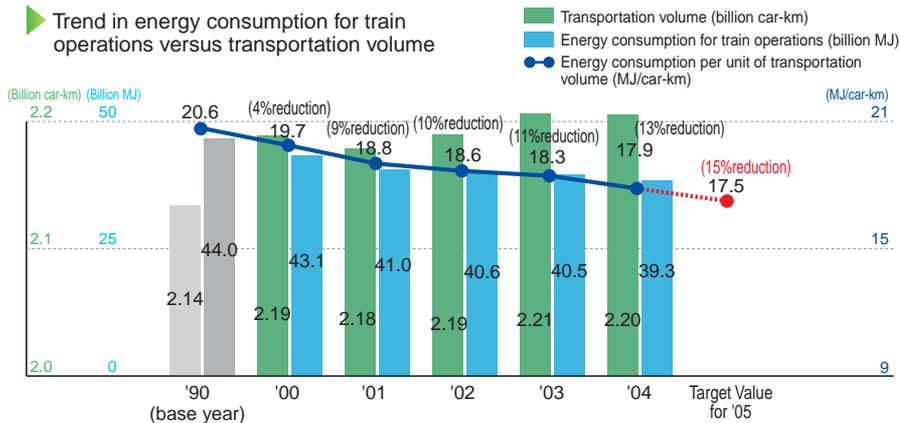
Developing the NE Train

In the pursuit of further improvements in railcar energy efficiency, we have developed a prototype "New Energy (NE) Train," the world's first hybrid railcar system,^{*2} and started test runs in May 2003. This new system is expected to reduce energy consumption by about 20% compared to conventional trains. Future development plans include the use of fuel cells for this system.



The NE Train, equipped with improved storage batteries for even better performance, being tested in winter conditions.

Trend in energy consumption for train operations versus transportation volume



E231 series: VVVF railcars that are the new standard cars for commuter and suburban train routes



E2 series: VVVF railcars for Asama and Hayate Shinkansen trains.

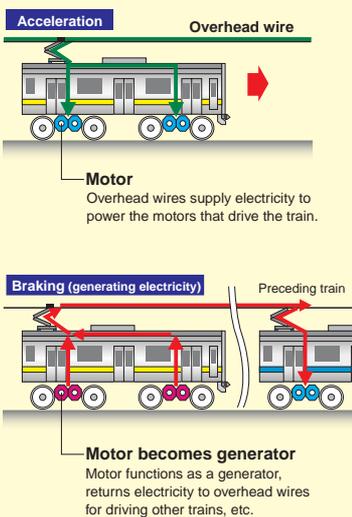


E531 series: New trains also use VVVF system (e.g., newly operating on the Joban Line in July 2005).

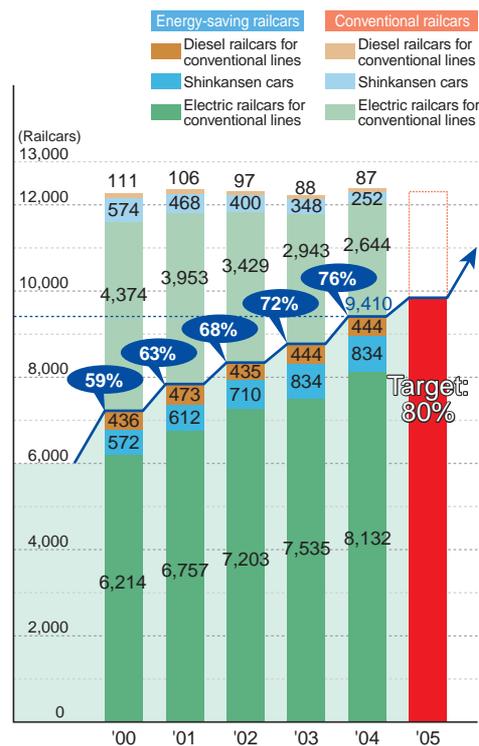
Regenerative brakes

Electricity is generated during braking

In energy-saving trains, this system makes motors function as electrical generators when brakes are applied. Electricity generated is returned to the overhead wires. (In conventional trains the energy generated during braking is simply dissipated as heat.)



Energy-saving railcars: Growing in number



^{*1} VVVF inverter

The variable voltage variable frequency design (VVVF) for inverters enables efficient control of motors without the use of electrical resistance.

^{*2} Hybrid railcar system

During normal operation, the driving motor is powered by electricity generated by a diesel engine. During deceleration, electricity generated by regenerative brakes is stored in a battery, and then can be used during acceleration.

Measures to Prevent Global Warming

Reducing CO₂ Emissions of Japan's Entire Transportation System

Intermodal transportation

Rail transport is a highly energy-efficient mode of transportation with low environmental impacts, but rail alone cannot completely satisfy the transportation needs of customers. Thus, JR East is working to reduce the CO₂ emissions of the entire transportation system by promoting intermodal^{*1} transportation – combining rail with other modes of transportation.

Park-and-ride schemes

We are promoting park-and-ride schemes, which provide parking space near train stations, so that users can drive their cars from home to the station and continue from there by train. By the end of March 2005, 118 JR East stations had a total of 11,000 parking spaces.^{*2}

With this scheme, we are making an effort to enable users who until now were using only the car as their means of transport to shift from car-only to

rail for a segment of their travel.

Rail and car rental

Since 1995, JR East has offered a product named "Train-ta-kun" with car rental charges about half the normal amount, as a means of transport from train station to the final destination. We are also selling a product named "Rail & Rent-a-Car," which offers discounts on both train fares and car rentals. We are engaging in other efforts to provide services that facilitate a shift from car-only travel to combinations of car and train, such as offering a class of compact cars, offering attractive rates, and installing car navigation systems as standard equipment in rentals.

Smart transport options for travel and tours

In collaboration with travel agencies, we have modified some bus tours so that they leave the Tokyo area by Shinkansen instead of bus – in an effort to avoid traffic congestion as well as to reduce environmental impacts.

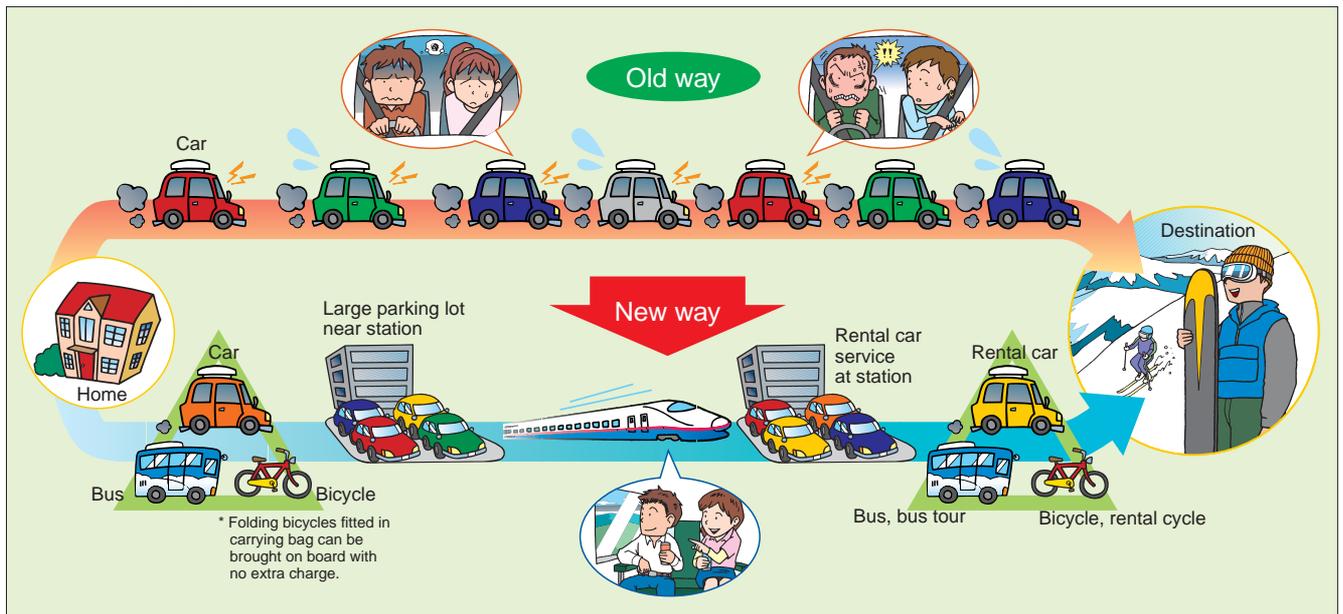
Travel packages and rail

While emphasizing the rich natural and tourist resources of areas away from the big cities, JR East is making an effort to recommend trips that use the train, with its lower environmental impacts. We present travel options that do not depend completely on automobiles. Examples include car rental plans that combine the enjoyment of train travel with the convenience of a car at the destination, and the enhancement of tourist-taxi plans in cooperation with local businesses.



A park-and-ride parking lot near the Takasaki Station. Discount on parking fees is available upon displaying specified train ticket before riding the train.

Intermodal transportation



*1 Intermodal transportation

The term refers to transportation systems that allow people to get from any given point to their destination by smooth linkages between different modes of transport. This differs from the term "multi-modal," which simply indicates that there are multiple options for means of transport.

*2 118 stations, 11,000 parking spaces:

This figure represents the total number of parking space, including those owned by JR East, those operated by Group companies, and those operated in collaboration with local municipalities. If other parking lots near stations are counted, the total available is 61,000 parking spaces at 527 stations.

CO₂ Emissions Reductions in JR East Electrical Sources

A 'load dispatch command function'

JR East's electrical demand fluctuates throughout the day, reaching a peak during rush hours. To obtain electricity efficiently under varying conditions, we adjust to demand fluctuations by efficiently combining the electricity from our sources of supply^{*1} (JR East's thermal and hydropower plants and purchased electricity) and controlling the amount of electricity we generate. Our 'load dispatch command function' plays a vital role by monitoring and controlling the supply of electricity in real time to optimize our use of energy.

Improving thermal electric power generation

JR East operates a thermal electric power plant with an output of 655,000 kW, located in Kawasaki, Kanagawa Prefecture. Since fiscal 1990, the plant has reduced its CO₂ emissions per kilowatt-hour by 30%, by gradually converting its four generating units to combined-cycle power generation units,^{*2} and by optimizing plant operations.

In the summer of 2006, we are planning to convert Unit No. 3 from kerosene as fuel to natural gas, in the effort to further reduce environmental impacts and CO₂ emissions.

Hydroelectric power generation

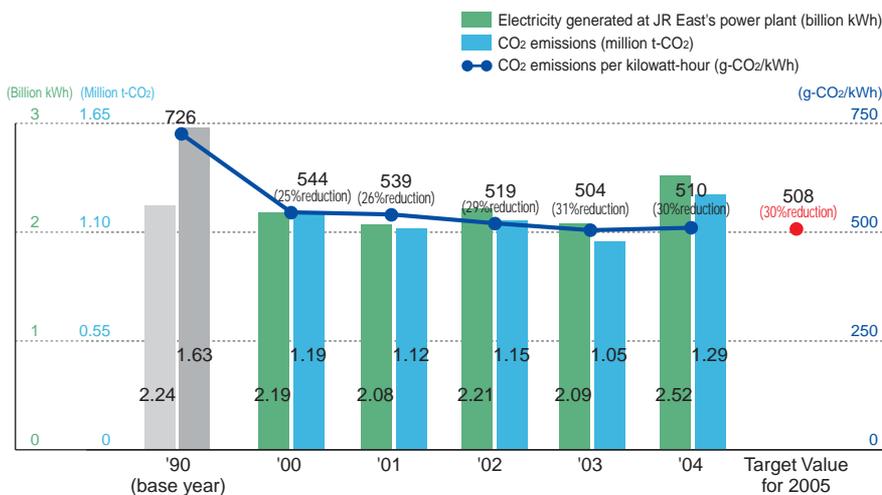
Hydropower is recognized as a clean energy source that does not emit greenhouse gases. JR East has a hydroelectric power plant on the Shinano River (Ojiya City, Niigata Prefecture) with total output of 450,000 kW, generating 1.4 to 1.8 billion kWh per year.

All units stopped generating as a result of major damage from the Niigata-Chuetsu Earthquake, but repair work has restored generation to 55% of capacity (as of 10 April 2005). Work will continue toward complete restoration.

Renewable energy

JR East is promoting the use of renewable energy such as solar and wind power. Photovoltaic (PV) panels have been installed at Tokyo station, Takasaki station, the JR East General Education Center, and the JR East Research and Development Center. In fiscal 2003, we doubled the area of PV panels at Takasaki station. Group companies have also made progress in this area: In fiscal 2003 the "Kokubunji L" Terminal Building (Kokubunji, Tokyo) installed a windpower and PV system to produce electricity for lighting.

Power generation and CO₂ emissions from JR East's thermal power plant



There are plans to convert Unit No. 3 at the Kawasaki power plant from kerosene as fuel to natural gas.



Shinanogawa Power Station, damaged by earthquake. Repairs are underway.



PV panels on roof of the Shinkansen platform at Takasaki station provide electricity for lighting and air conditioning.



Wind power generator on the roof of Kokubunji L Terminal Building. A display screen inside the building indicates how much power is being generated at any given time.

*1 Electricity sources for JR East in fiscal 2004

JR East's thermal power plant: 39% (31%)
 JR East's hydropower plants: 17% (25%)
 Purchased electricity: 44% (44%)
 (In parentheses: FY 2003)

*2 Combined-cycle power generation unit

A power generation unit that combines *gas turbines* propelled by gas combustion with *steam turbines* propelled by steam from the exhaust heat of combustion.