

JR East Efforts to Prevent Global Warming

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JR East's Basic Stance

The JR East group announced its *JR East 2020 Vision—Challenge* in March 2008 outlining one of the group's basic management policies of meeting corporate social responsibilities, which includes global environmental issues. In summary, the policy recognizes that taking action on these issues can no longer be put off, and we must act now to find a solution for the future. Consequently, JR East has set a target of halving CO₂ emissions from its railway business by fiscal 2030 compared to fiscal 1990 and is working on meeting that target.

Achieving Environmental Targets

Achievements

In 1992, JR East established a basic philosophy and guidelines for balancing environmental protection with business activities. Based on this philosophy, the company formulated an action

plan and environmental targets for environmental protection. In the field of preventing global warming, JR East set five numerical targets described below and the fiscal 2007 results met four of these targets (Table 1).

Setting new environmental targets

The *JR East 2020 Vision—Challenge* sets long-term reduction of CO₂ emissions from the railway business as a global warming countermeasure. It specifies numerical targets for electric power for train traction, power consumption per unit of transport volume, and energy conservation at stations, offices, and other facilities. Furthermore, it reviews the ratio of energy-efficient rolling stock (Table 2).

Reducing CO₂

Current emissions

JR East generates electricity for traction, station and office lighting and air conditioning using its own power stations

Table 1 Fiscal 2008 Environmental Targets (For Global Warming Prevention)

Item	FY 2008 Target	FY 2006 Results	FY 2007 Results
CO ₂ emissions in business activities	22% reduction	28% reduction*	24% reduction*
CO ₂ emissions per unit of electricity generated at company thermal power plants	40% reduction	41% reduction*	40% reduction*
Ratio of energy-saving rolling stock	82%	82%	85%
Train operating power consumption per unit transport volume	19% reduction	17% reduction*	14% reduction*
Number of large coolers using CFCs	100% reduction	91% reduction	100% reduction

Note: Reduction targets based on 1990 levels

* Figures from fiscal 2006 use coefficients stipulated in the revised Energy Saving Law and Law to Promote Countermeasures to Global Warming. However, figures here are calculated using traditional coefficients to show the level of target achievement.

and also purchases electricity from electric utilities. Other than electricity, it also uses diesel and kerosene to run diesel locomotives and railcars and to heat stations, offices, and other facilities. The company's total energy consumption is showing a downward trend due to efforts to increase generation efficiency. CO₂ emissions in 2007 were 2.12 million tonnes and about the same as in fiscal 2006. Efforts were made to improve the efficiency of company power plants and to switch to energy-saving carriages, but low river levels cut hydroelectric power generation in fiscal 2007 compared to fiscal 2006. The resultant increased usage of substitute thermal power plants increased total emissions to the level of the previous year. In light of these results, the company is making reduction of energy consumption for train operations (73% now) a priority, and is working on various measures to reduce CO₂ emissions (Figure 1).

Reducing CO₂ emissions from rolling stock and stations

To reduce the 70% of energy used by JR East for operating trains, by the end of fiscal 2007 the company has introduced 10,428 energy-saving carriages, which now make up 85% of all rolling stock. Energy-saving carriages use regenerative braking to convert kinetic energy at deceleration into electrical energy as well as variable voltage variable frequency (VVVF) inverters for more efficient motor control. The company is also working on reducing energy consumed (and CO₂ emissions) by air conditioning, which forms the largest part of energy consumption at large stations. During rebuilding of Ueno Station and the Keiyo underground part at Tokyo Station,

air-conditioning equipment using CFCs was removed and the capacity of coolers was reviewed and inverter control introduced. Efforts are also underway to optimize energy conservation by monitoring operations using IP networks and managing building energy use. As a result, energy consumption by coolers at Ueno Station has been cut by 40% (Figure 2).

Reducing CO₂ emissions from electric power plants

To reduce CO₂ emissions from its power plants, JR East is replacing inefficient equipment and increasing the ratio of renewables in its energy mix.

In addition to generating its own power from thermal and hydroelectric power stations, the company also purchases electricity from commercial utilities, adjusting the proportion of each in the total to match demand. This load balancing is controlled by a central load dispatch command function that monitors and controls overall power supply in real time to maximize efficiency.

JR East's thermal power plant in Kawasaki City outputs up to 655 MW using four generators, three of which have been switched to the more efficient combined cycle. As a result, CO₂ emissions per generated kWh have been cut by 37% compared to 1990. In June 2006, the company switched the No. 3 generator from light fuel oil to natural gas to further cut CO₂ emissions.

Renewable energy is produced at the company's hydroelectric plant in Ojiya and Tokamachi in Niigata Prefecture on the Shinano River. The 449 MW output of the

Table 2 Revision of Environmental Targets (For Global Warming Prevention)

Item	Previous Target	FY 2010 Target
Train operating power per unit transport volume	19% reduction*	—
Train operating power (New)	—	2% reduction
Train operating power per unit transport volume (New)	—	2% reduction
Energy conservation for stations, offices, etc. (New)	—	4.5% reduction
Ratio of energy-saving rolling stock (Revised)	82%	86%

Note: 2010 targets based on 2006 levels

* Previous targets based on 1990 levels

Figure 1 Change in CO₂ Emissions

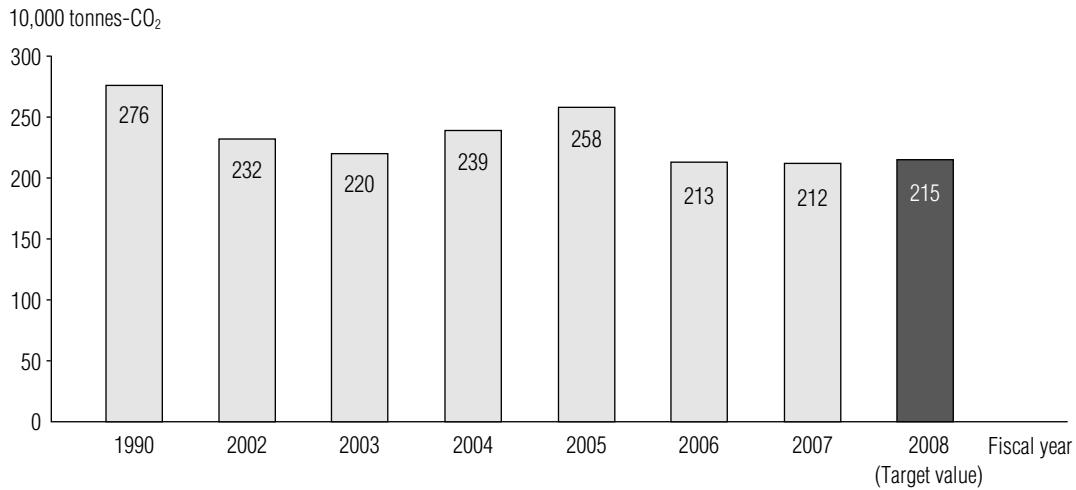


Figure 2 Change in Energy-saving Rolling Stock

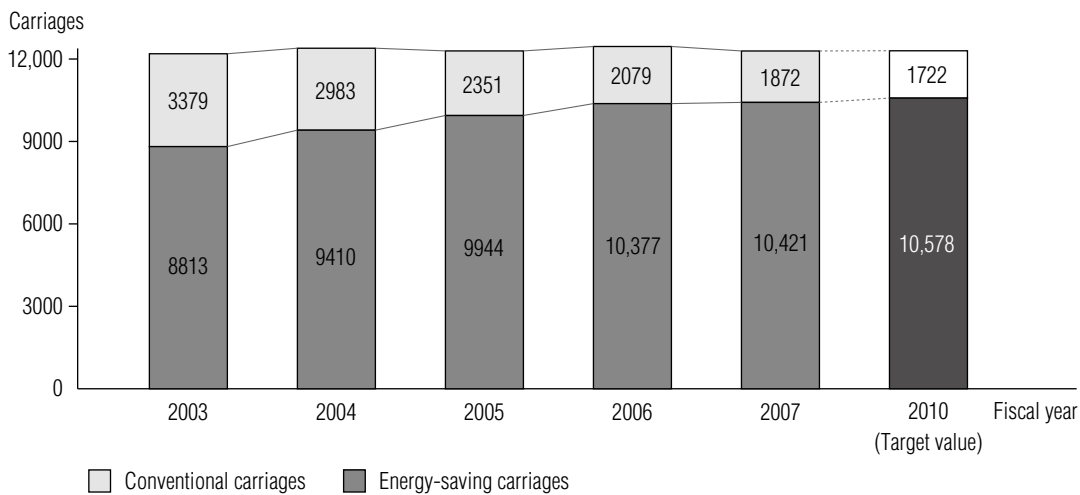
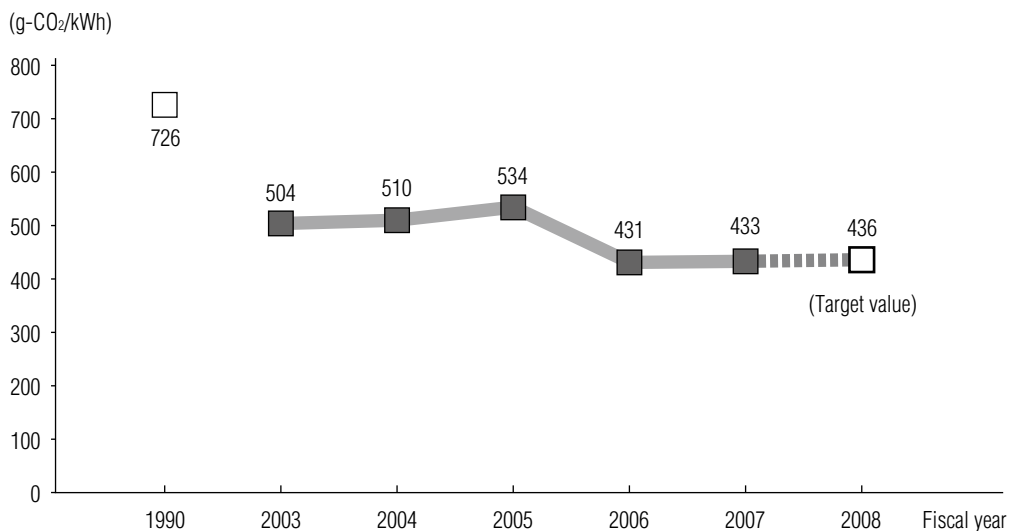


Figure 3 Change in CO₂ Emissions at JR East's Thermal Power Plant per Generated Electricity Unit



plant produces 1.4 to 1.8 million MWh of electricity annually. Efforts to use solar and wind power are also underway. Photovoltaic panels have been installed at Tokyo and Takasaki stations, the JR East General Education Center, and JR East Research and Development Center. Photovoltaic panels integrated into the roofing material are also scheduled for installation in fiscal 2010 at Tokyo Station over the Tokaido Line platform (Figure 3).

Reducing CO₂ emissions throughout transport system

The rail transport mode generally has a lower environmental impact than other modes, but railways cannot meet the needs of every customer. Consequently, JR East is working to reduce transport CO₂ emissions as a whole by promoting intermodal transport, combining railways with other modes. Promoting intermodal transport requires improvements in convenience and amenity to increase the number of railway passengers. Specifically, JR East is working to provide easy access to more destinations by various means, such as adding more trains on the Shonan Shinjuku Line, and building new lines such as the Tohoku Through Line connecting Tokyo and Ueno stations. Also, national and local governments are helping in efforts to make stations and carriages barrier free.

Emphasis is focused on seamless passage using the 20 million+ Suica IC cards now in circulation through expanded interoperability with PASMO IC cards used by other private railways and buses (*JRTR 50*, pp 6–17). Some taxis in greater Tokyo now accept Suica payment and more buses are using

Suica too. The company is also promoting combined rail and car travel by offering easy-to-use car rental services such as *Train-ta-kun* with lower rental rates. Park-and-ride schemes are being developed too and JR East now (March 2008) has 11,000 parking spaces at 123 stations.

Environmental Protection

Forestation is a well-known way of storing released carbon emissions and JR East has vast areas of railway forests planted to protect lines from snowdrifts, avalanches, and landslides (*JRTR 51*, pp 12–15). Although railway forests originated in the late 19th century as a source of timber for ties and construction and to protect lines against wind and snow, today they contribute to protecting the natural environment. The company's 6 million trees on some 4200 ha absorb 17,000 tonnes of CO₂ annually or about 0.8% of JR East's CO₂ emissions, helping the effort to battle global warming.

In addition to railway forests, JR East branch offices and community residents have been planting trees near tracks and stations as part of the Railway Line Forestation Programme since 1992. About 38,000 people have participated in planting 260,000 trees.

Furthermore, the Adataro Hometown Forestation Programme has been ongoing since 2004 using national forest land in the Adataro district of Fukushima Prefecture; 45,000 saplings of the 22 native tree species were planted



Solar panels to be installed on platform roofs as part of major renovation works of Tokyo Station



Adatarata Hometown Forestation Programme

in Otama village, Adachi-gun over 3 years. After the fourth planting in 2007, the location was changed to Nihonmatsu City in Fukushima Prefecture also at the base of Mt Adatarata where 50,000 trees of 17 species will be planted in the next 3 years. The plan is to plant various trees in a natural mixed stand to develop hometown forests. In 2008, 1200 people including JR East group employees, local residents, and others participated in tree planting.

Railway forests owned by JR East on the Shimohama Coast in Akita City along the Uetsu Line consist mainly of Japanese Black Pine. However, over the past few years, damage from acid rain and pine weevils has caused dieback and the JR East Akita Branch Office co-organized the Akita Shimohama Coast Forestation Programme with the AEON Environmental Foundation. In a 5-year plan from 2005, the programme will work to protect the natural environment along railway lines by replanting forests. Efforts to recruit programme volunteers started in April 2008 at major stations and AEON group stores in Akita Prefecture. As a result, 2100 volunteers, planted 10,000 Daimyo Oak and Japanese Black Pine saplings. Another planting will be made next year.

Greening of rooftops has also been promoted since fiscal 2004 by JR East group companies who own many station and office buildings. By March 2008, the roofs of 20 buildings

with a total area of about 6900 m² had been greened, helping mitigate the heat-island effect in cities, absorbing CO₂, and reducing energy use by air conditioning.

R&D in Environmental Technologies

JR East has established environmental protection as one of its key R&D goals. In the future, it will establish the Environmental Technology Research Center (provisional name) to heighten the environmental advantages of rail using leading environmental technologies. Current efforts include the Kiha E200 series, which entered service on the Koumi Line in 2007 as the world's first diesel hybrid railcar. It uses a battery to store power from the diesel engine and from regenerative braking and achieves 20% greater fuel efficiency than standard diesel railcars while being 30 dB quieter when standing at stations, and emitting 60% less hazardous exhaust materials, such as NO_x.

Fuel cells also show promise as a next-generation railway technology and JR East started operational testing of the world's first fuel-cell hybrid railcar on lines in spring 2007. Current test speeds have reached about 100 km/h with ongoing progress in advancing control and safety issues for expected commercial operation within a few years.



World's first diesel hybrid railcar running on Koumi Line

Even stations cannot escape the need for environmental friendliness and the company has started designing model 'eco stations' using various environmental technologies. There are plans to build one of these stations in each branch area over the next 10 years.

Environmental Efforts in Workplace

Future environmental protection depends on raising the consciousness of each and every employee in the JR East group. The company is using its JR East Eco Activities so everyone will think about environmental protection in their day-to-day work. In this way, environmental activities will spread through all group companies—not just at the parent—and each company will proactively spur on environmental protection. ■



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Mr Hirokazu Inoue is Manager of the Management Planning Department, and Leader of Environment Management Group at JR East. He joined the company in 1994, after graduating from Kobe University Graduate School of Civil Engineering. Prior to his current position, he was Acting Section Manager of the Barrier-Free Department at JR East's Tokyo Construction Office.