

Prevention of Global Warming

Due to the fact that the level of CO₂ emissions from railways is low in comparison to cars and other means of transportation and that electric trains do not directly emit any CO₂ during operation since their power source is electricity, railways are considered a relatively environmentally friendly means of getting from one point to the next. The whole of the JR East organization, however, consumed 56.4 billion MJ of energy (equivalent to 1.46 million kL of crude oil) in fiscal 2001 in the course of providing services to about 5.9 billion customers on an annual basis. Accompanying this enormous consumption of energy, we emitted 2.29 million tons of CO₂, an amount equivalent to 0.2% of Japan's total emissions. For this reason, by stepping up our efforts to reduce energy consumption and CO₂ emissions, JR East is contributing to the prevention of global warming.

Item	Target value (to be met by fiscal 2005)	Fiscal 2001		Reference value (figure from fiscal 1990)
		Actual achievement	Value achieved	
CO ₂ emissions in general business activities	▲20%	▲17%	2.29 million t-CO ₂	2.76 million t-CO ₂
CO ₂ emissions in proportion to unit electric power generation at company-run thermoelectric power plant	▲30%	▲26%	539 g-CO ₂ /kWh	726 g-CO ₂ /kWh
Ratio of energy-saving railcars	80%	63%	—	—
Energy consumption for train operations in proportion to unit transportation volume	▲15%	▲ 9%	18.8 MJ/car-km	20.6 MJ/car-km

Energy supply and consumption by JR East

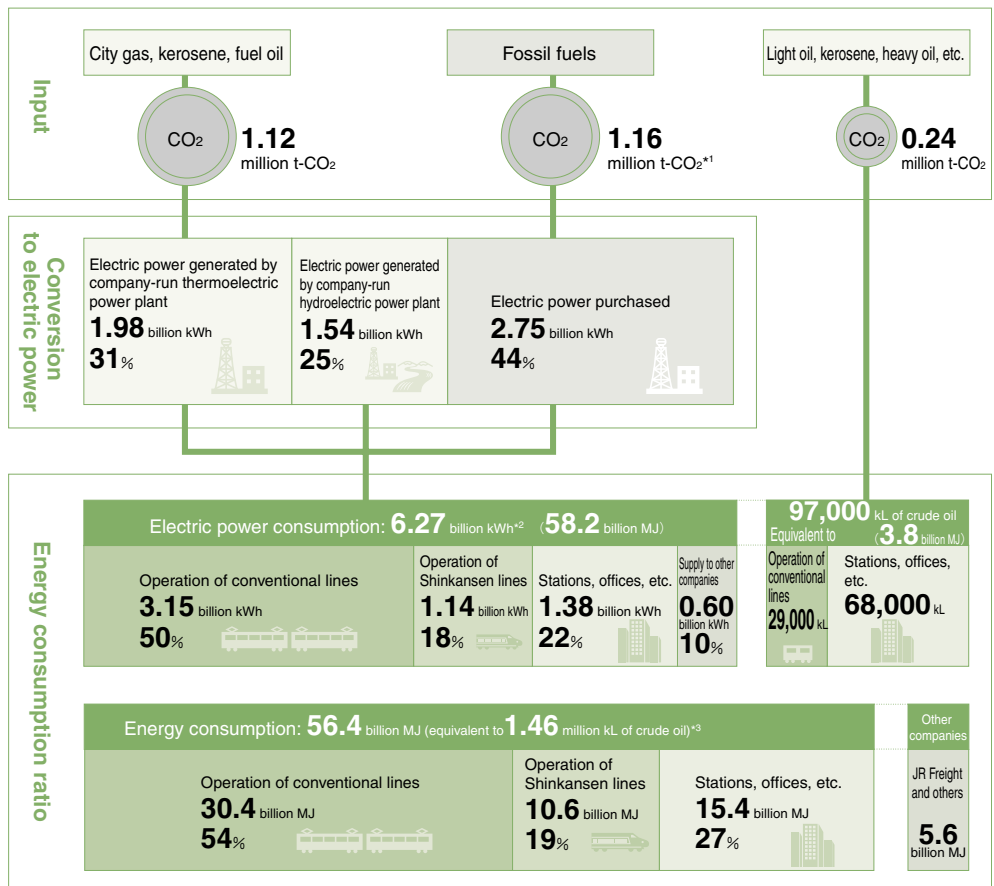
JR East's energy supply consists of electric power and other energy such as light oil. The electricity is generated by company-run thermoelectric power plants and hydroelectric power plants, along with electric power

purchased from power companies with energy requirements augmented by other types of fuel. The former energy is used for the operation of electric trains and the lighting and air conditioning of stations and offices, while other forms of energy such as light oil and kerosene are consumed in the operation of diesel cars and air conditioning of stations and offices.

*1 As figures represent a historical comparison, the Federation of Electric Power Companies Japan CO₂ emission coefficient for fiscal 1990 is used; substitution of the fiscal 2000 coefficient would result in a figure of 1.02 million tons.

*2 Equivalent to the annual electric power consumption of 1.73 million households. ("Electric Power Annual" issued by the Federation of Electric Power Companies Japan)

*3 Equivalent to 1.18 times the estimated capacity of the Tokyo Dome stadium.



Energy map for JR East

Achieving efficient use of energy

Volume of energy consumption and CO₂ emissions

Mainly because of the reduction of energy consumed through train operations and the increase in efficiency of our company-run thermoelectric power, energy consumption in fiscal 2001 was 56.4 billion MJ, while CO₂ emissions amounted to 2.29 million tons, a 6% reduction from fiscal 2000. The percentage reduction in CO₂ emissions from fiscal 1990 was 17%, a 5-point increase from fiscal 2000.

Reduction of energy for train operations

In order to reduce energy for train operations, which accounts for 73% of the total energy consumed by JR East, we actively employ energy saving trains. As a result, in fiscal 2001, the number of energy-saving railcars (7,842) as a percentage of the total railcars (12,369) was 63%, while the energy required to move one railcar one kilometer (energy consumed in proportion to unit transportation) declined to 18.8 MJ.

Currently, our conventional railcars include three models, a rheostatic control model, a regenerative brake model and a VVVF model. On a regenerative brake model, by reducing

weight and using regenerative brakes*¹, the regenerative brake cars reduce operating power consumption to 66% of older models such as the rheostatic control model (103 series, etc.). VVVF cars likewise reduce operating power consumption to just 47% of older models through the use of VVVF inverter control*². Regenerative brake cars include the 205 series operated on the Saikyo and Keiyo Lines. In addition, VVVF cars include the 209 and E231 series that have already been operating on the Keihin-Tohoku, Sobu, Utsunomiya, Takasaki, and Joban Lines. We started to introduce this series into the Yamanote Line in fiscal 2002. We also have introduced new types of VVVF cars into express cars. In fiscal 2001, we employed the E257 series for "Kaiji" and "Azusa" railcars operated on the Chuo Line.

On our conventional rail lines, we have introduced new types of diesel railcars such as the Kiha 110 series, featuring lighter bodies and clean, fuel-efficient new engines. We also refitted older railcars with new engines.

- *1 Regenerative brake: A brake that uses a motor to generate electric power that is sent back to overhead wires for subsequent use.
- *2 VVVF inverter control: VVVF stands for "variable voltage variable frequency," an inverter that can efficiently control motor revolutions without electrical resistance.



E231 series

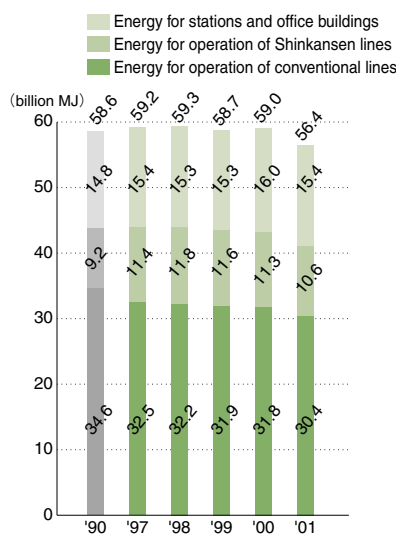


E257 series



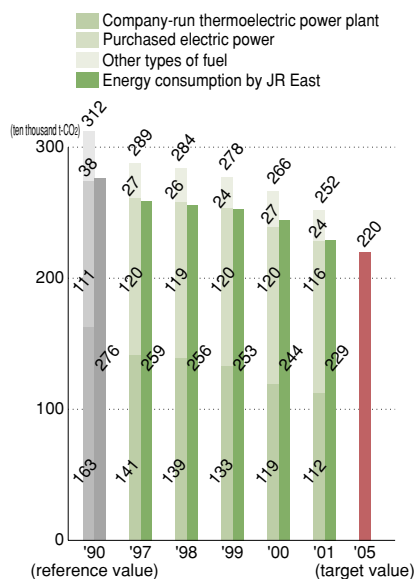
E2 series

● Energy consumption volume



*Purchased electric power and electric power generated by the company-run hydroelectric plant were calculated based on 9.42 MJ/kWh. The electric power generated by the company-run thermoelectric power plant and other fuel types were calculated based on the figures for actual consumption of fuel.

● Total CO₂ emission volume



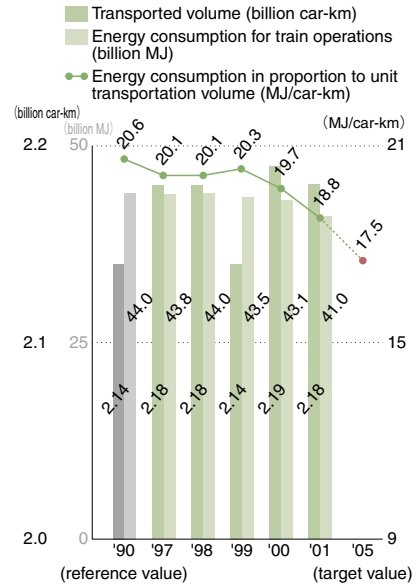
*Calculation of CO₂ emission factor from fuel and purchased electric power was based on the emission factor set forth in the Voluntary Action Plan established by Japan Business Federation and by the Federation of Electric Power Companies Japan.

We also have introduced lighter bodies, regenerative brakes and VVVF inverter control into new types of railcars for Shinkansen lines, and have enhanced energy-saving effects; for instance, the realization of flat, smooth bodies to reduce air resistance generated during high speed travel.

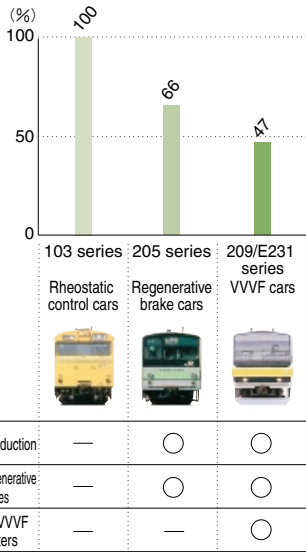
In addition, we have been trying to improve the efficiency of air conditioning systems. In some railway sections, by introducing an open/shut system for several of the doors or a semi-automatic door system (where customers open and close only those doors required to board or alight from the train by pushing a door button), we are endeavoring to prevent unnecessary temperature fluctuations in railcars.

Tokyo Monorail Co., Ltd., which joined the JR East Group in fiscal 2001, has introduced a new type of VVVF inverter control-based energy-saving car (2000 series) into monorail services for the first time in fiscal 1997. At the end of fiscal 2001, 18 out of a total of 114 cars were the 2000 series. Like JR East's VVVF cars, the 2000 series uses regenerative brakes and also reduces weight.

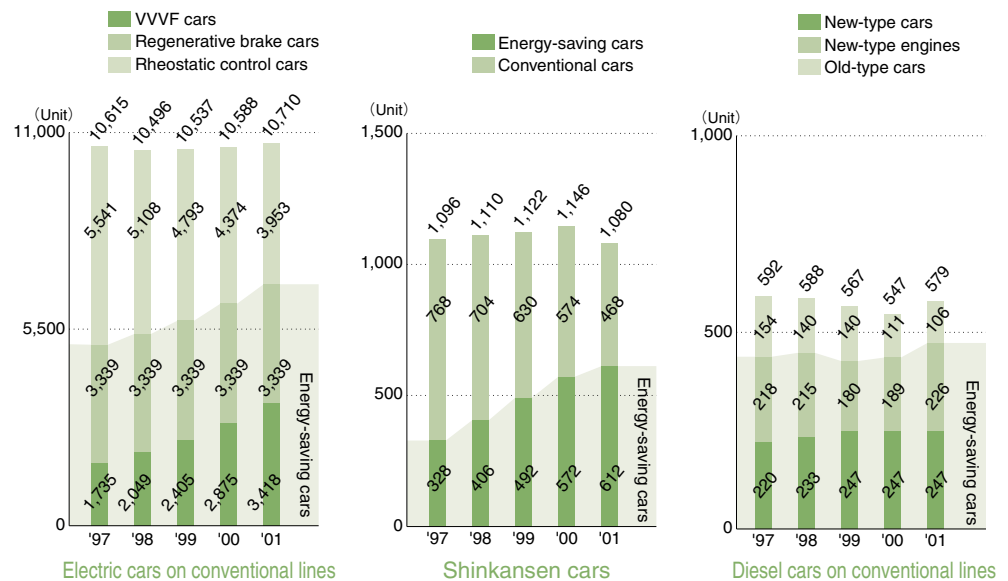
Energy consumption during train operations and unit transportation volume



Comparison by car type of energy consumption during train operations



Introduction of energy-saving cars



Door open/shut button



Tokyo Monorail 2000 series

Energy saving in motor vehicle operations

JR East uses 3,300 service vehicles to maintain facilities and transport equipment and materials. We have started to introduce low-pollution vehicles such as fuel-efficient automobiles and hybrid cars, and owned 5 hybrid cars at the end of fiscal 2001.

JR Bus Kanto Co., Ltd. and JR Bus Tohoku Co., Ltd., which operate the buses, are implementing eco-driving practices such as the introduction of one hybrid vehicle and 32 idling stop cars, strict observance of fuel-saving speeds and enforcement of idling stop. JR East Logistics Co., Ltd., which operates transportation and home delivery businesses, started to introduce motor trucks powered by natural gas in fiscal 2001, and 11 out of a total of 213 vehicles used natural gas at the end of this fiscal term. We will continue to actively introduce more natural gas vehicles in the future. In addition, by equipping all vehicles with digital tachographs, we are promoting detailed eco-driving practices based on the data collected by the tachographs. JR East Rental & Lease Co., Ltd. also introduced hybrid vehicles for use as station rental cars and had 13 hybrid cars at the end of fiscal 2001. Moreover, East Japan Eco Access Co., Ltd., which operates cleaning and maintenance businesses, is replacing older types of engines in their road sweepers (automatic floor cleaner) with battery-powered ones, and has so far converted 238 out of 248 units.



Battery-powered road sweeper

Energy savings at stations and office buildings

We are working to reduce energy consumption at JR East's stations and station buildings. We have already installed cogeneration systems - using power generation and exhaust heat for hot-water supply and heating/cooling - at Sendai Station, Machida Station Building, and the General Training Center (Shirakawa City, Fukushima Prefecture), and started to operate similar systems at Morioka Station in June 2002. Furthermore, we have introduced 102 gas heat pump air-conditioners mainly at stations and offices in the Tohoku district in order to provide efficient air-conditioning.

Energy saving in houses built for sale

The JR East Group has introduced double-glazed windows and total heat exchange ventilation systems into some condominiums of the View Parc series to help customers save energy after purchasing their condominium.



Hybrid bus



Natural gas truck



Efficient supply of energy

Utilization of networks

JR's demand for electric power fluctuates throughout the day, reaching a peak during the rush hour. For this reason, we control electricity production and the network of transmission lines and transformers to efficiently incorporate thermoelectric, hydroelectric and purchased power based on demand variation. We do this through a central load-dispatching command facility.



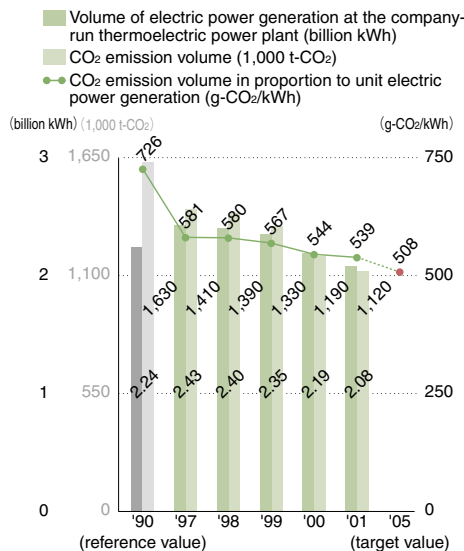
Load-dispatching command facility

Achieving greater energy efficiency at our thermoelectric power plant

Our Kawasaki Thermoelectric Power Plant, located in the Keihin industrial belt, has four power-generating units on a 6.6 ha site with a total power output of 655,000 kW. Currently three of these generating units operate as an efficient combined-cycle power-generating unit*. By optimizing the operation of these power-generating units and operating them efficiently, CO₂ emissions generated from the Kawasaki Power Plant in fiscal 2001 totaled 1.12 million tons while the ratio of emission volume to unit electric power generation was 539 g-CO₂/kWh.

*Combined-cycle power-generating unit: A power-generating unit that combines gas turbines (turbines are rotated by gas combustion) and steam turbines (heated steam is used to rotate turbines).

Electric power generation and CO₂ emission volume at the company-run thermoelectric power plant



Effective use of hydropower generation

Hydropower generation can produce clean energy without emitting greenhouse gases and toxic substances. JR East's Shinano River Power Plant consists of the Sente Power Plant (Kawanishi-cho, Niigata Prefecture), Ojiya Power Plant and Shinojiya Power Plant (Ojiya City, Niigata Prefecture), and has a maximum power output of 449,000 kW while annually generating 1.5-1.6 billion kWh, depending on annual rainfall. All these power plants have regulating reservoirs since they focus on generating power during the morning and evening rush hours. We have been cooperating with the Shinano River Construction Office of Ministry of Land, Infrastructure and Transport to improve water environments in the middle reaches of the government-controlled Shinano River since fiscal 2001, and have increased the discharge volume from a dam on a trial basis during the summer, the period in which water temperature rises, and during the fall, the salmon-running period.



Shinano River Power Plant

Use of natural energy

In addition to these power sources, we use new forms of natural energy. Photovoltaic generators have been installed on the roof of the Shinkansen platform at Tokyo Station, on the roof of the training building at the General Training Center and on the roof of the Shinkansen platform at Takasaki Station. A photovoltaic generator has been integrated into the material of the roofs over the Shinkansen platforms, particularly at Takasaki Station.



Photovoltaic generators in Takasaki Station

Reduction of CO₂ emissions through the transportation system

Railway environmental priority

Considering energy consumption per unit transportation volume and CO₂ emission volume per unit transportation volume, there is clear evidence showing that railways impose less burden on the environment than other modes of transportation in Japan. JR East has consistently implemented measures to reduce stress on the environment. It has exceeded the average for the total railway system throughout Japan in this regard.

Railway access

In order to utilize railways' greater environmental advantages, we are working to improve railway systems by which customers can travel directly to their destinations without automobiles. For example, utilizing the Shinkansen we provide direct access to the Gala-Yuzawa ski resort (Yuzawa-cho, Niigata Prefecture), allowing customers to start skiing without having to transfer to other modes of transportation after alighting from the train.

In addition, we have been operating the Narita Express that starts from various points in the Tokyo metropolitan area since 1991. By using this train, customers can reach Narita International Airport without having to change trains.



Gala-Yuzawa ski resort

Intermodal transportation

Since customer travel is restricted to fixed routes on railways, we have to make further efforts to completely satisfy the requirements of individual users. JR East is therefore promoting intermodal transportation that integrates other transport modes such as automobiles before and after using rail services.

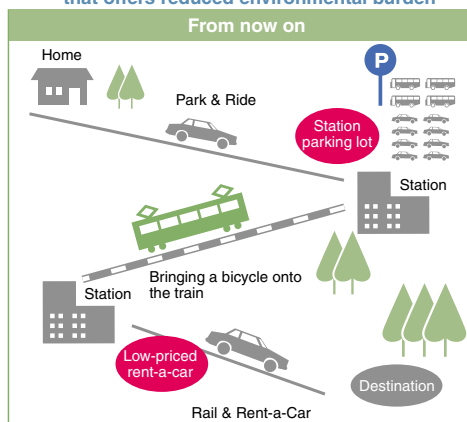
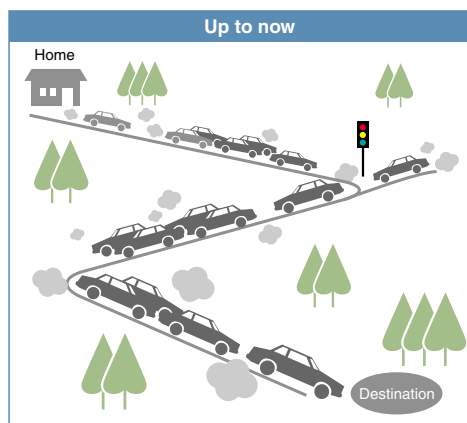


Image of intermodal transportation

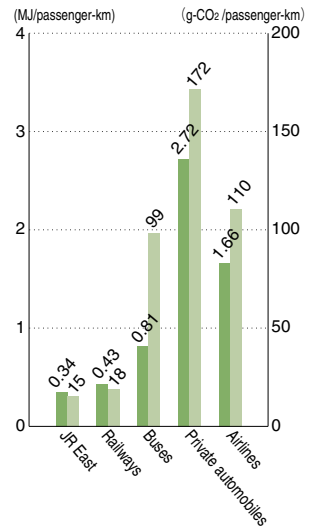
<Automobiles>

● Park & Ride

JR East is promoting the Park & Ride concept of having users drive to their local rail stations in their own automobiles, park, then ride trains to their final destinations. Park & Ride parking lots are available for use free of charge, or at a discount, by customers with express tickets. In fiscal 2001, 760 parking spaces for ten stations were established by JR East and municipalities along rail lines, bringing the total to 59,000 parking spaces for 520 stations.

● Energy consumption and CO₂ emissions by transportation mode

■ Consumed energy (MJ/passenger-km)
■ CO₂ emission volume (g-CO₂/passenger-km)



National transportation volume and energy consumption in fiscal 2000, CO₂ emission volume in fiscal 1999

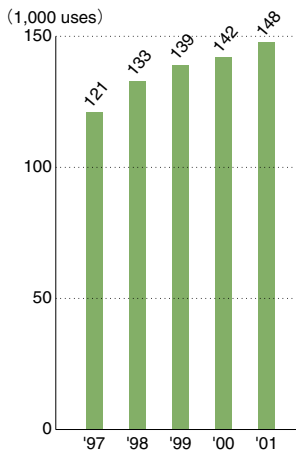
Passenger-km: The number of passengers transported multiplied by distance traveled.

Note: Based on "The Survey on Transport Energy 2001-2002" except for the data of JR East

● Rail & Rent-a-Car

JR East is promoting a Rail & Rent-a-Car program in which customers can rent cars at their arrival stations and travel everywhere. Customers who buy JR tickets and rent-a-car tickets at the same time, and who satisfy certain distance requirements, are offered discounts on both the rail and car rental portions. In 1995, JR East began offering its Torenta-Kun discount car rental service that was priced at roughly half the typical market price. Thereafter, the level of usage for this program, about 51,000 in fiscal 1994, was significantly increased. In addition, we are promoting relocation and renewal of the offices so that customers can change to rent-a-cars more easily and swiftly.

● Use of Rail & Rent-a-Car



Rent-a-car office entrance



Hybrid-type rent-a-car

● Switching from bus to train tours

In fiscal 2000, JR East began to organize bus tours starting from the Tokyo metropolitan area avoiding traffic jams in the area by partly using Shinkansen or express trains in the first 100 to 150 km from central Tokyo. This reduces CO₂ emissions from vehicles that would otherwise be stuck in traffic jams and ensures tour punctuality.

<Bicycles>

JR East is also promoting train trips with the use of bicycles. In 1998, we developed the Traincle bicycle that is the lightest in the world among collapsible bicycles. Furthermore, we revised our business regulations concerning the charge for carrying bicycles onto trains. This means our customers can fold or disassemble bicycles in bags to bring them onto the trains for free.

In addition, we offer bicycle rentals, mainly at stations at tourist spots. In 2001, we operated a special train with a bicycle-only car as a new program for bringing bicycles onto the train. This was done in conjunction with a cycling event held along the Koumi Line.



Traincle



Bicycle rental

Eliminating traffic jams

JR East contributes to reduction of CO₂ emissions generated from traffic jams by replacing grade crossings with overpasses, with the cooperation of municipalities. We are currently constructing continuous overhead crossings to allow removal of grade crossings at 3 points. Based on the ongoing construction project of continuous overhead crossings between Mitaka and Tachikawa on the Chuo Line, we plan to remove 18 grade crossings on a 13.1 km section of track.



Continuous overhead crossing