

FEATURE SAFETY AND TECHNOLOGY

JR EAST GROUP SAFETY PLAN 2018

JR East Group places safety as its top business priority and has formulated and implemented five five-year safety plans as of fiscal 2014. The result has been a substantial decrease in railway accidents. However, there are still more than 100 railway accidents that occur within the Group each year.

Our new, sixth five-year safety plan, “*JR East Group Safety Plan 2018–Safety through Individual Development and Teamwork*,” (Fiscal 2015 to Fiscal 2019) was formulated out of our grave concern for the situation as it stands. This new plan will pick up from where the previous plans left off, as well as take into consideration recent changes in the Group’s environment, to steadfastly rise to the challenge of achieving “extreme safety levels.” Under the new plan, JR East will promote a systematic approach to safety, pass down the prioritization of safety to the next generation, share the burden of enhancing safety further with Group companies and business partners, and protect safety standards against the increasing outbreak of natural disasters, among other calls to safety.

See [IAI](#)

1 MAIN FEATURES OF “JR EAST GROUP SAFETY PLAN 2018”

A Plan Strongly Emphasizing “the Group”

Safety for us is a collective underpinning by each employee engaged in railway work at JR East, our Group and our business partners. This is why the new plan was formulated with a strong emphasis on “the Group.”

Clarifying Direction of Safety Measures

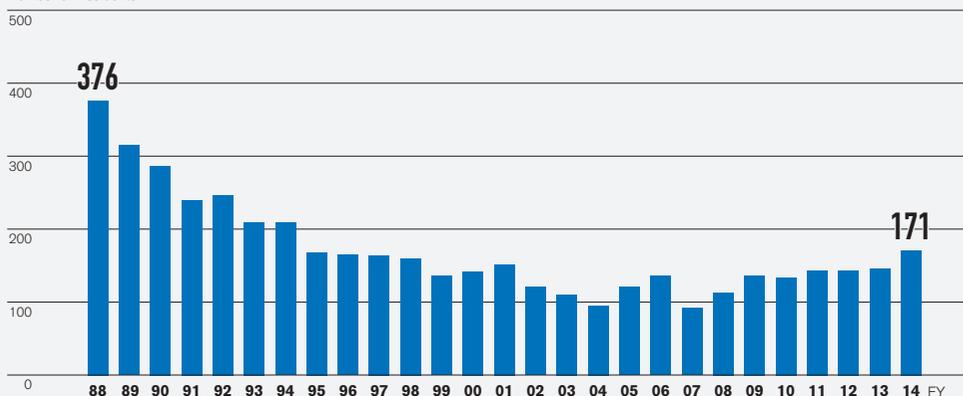
In continuation of the previous “*Safety Vision 2013*” plan, the goals for the *JR East Group Safety Plan 2018* include ‘zero passenger fatalities and injuries’ and ‘zero employee fatalities’ (including employees from Group and partner companies). To achieve these goals, we have clarified the following three directions, and have laid out specific initiatives for everyone to implement.

1 Completely eliminate “accidents due to internal causes”

We will work to eliminate all accidents resulting from passing stop signals recklessly, exceeding the speed limit, improper track-closure procedures and other causes that can be attributed to the Group by raising the level of our railway operation and maintenance.

IAI LOOK-BACK ON RAILWAY ACCIDENT FREQUENCY

Number of Accidents



2 Systematically reduce risk of “accidents due to external factors”

We will systematically upgrade our facilities to limit damage from natural disasters and other calamities to a minimum, and thereby reduce the risk of accidents posed by external factors.

3 Cooperating with communities at large to develop comprehensive countermeasures to “accidents closely related to society”

To preventing railway crossing accidents, people falling off train platforms, and the like, we will not only provide the main impetus for implementing steady countermeasures but will also cooperate with customers and communities to develop measures, such as reorganizing or eliminating level crossings, and carefully communicating hidden dangers of railways to the public.

2 CONCRETE INITIATIVES

Figure B provides an overall image of “JR East Group Safety Plan 2018.” We are implementing specific efforts based on the four pillars to achieve our goals and directions. **See |B|**

Pillar 1 Establish safety culture

By assigning all the safety approaches developed so far to our ‘safety cultures as a foundation to build on,’ we shall establish safety as ‘part of the DNA’ of each employee.

1 Five Cultures

JR East Group promotes a culture where employees take serious note of accidents that have happened and signs of potential accidents—a culture where employees discuss, learn from, and act on the issues based on information.

See |C|



A train protection drill at JR East general training center

2 Three principles of actualities

Actual location

Go to the actual location to understand the circumstances

Actual objects

Examine the actual objects (rolling stock, equipment, machine, tool, etc.) to understand their condition

Actual people

Meet face-to-face with the people actually involved to understand their situation

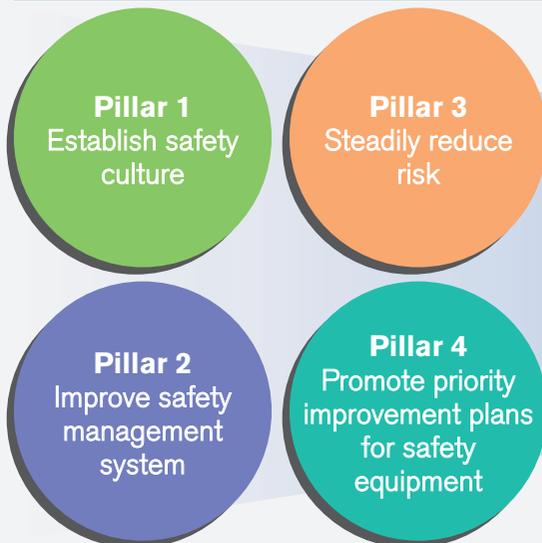
Safety problems always occur at actual locations, and solutions are also always at actual locations. Consequently, the Group pursues ‘three principles of actualities’ (actual location, actual objects, and actual people) that involve actually going to locations to see, hear, experience, and think about what has happened in order to see the reality as well as unearth the problems in the process of producing true solutions.

Pillar 2 Improve safety management system

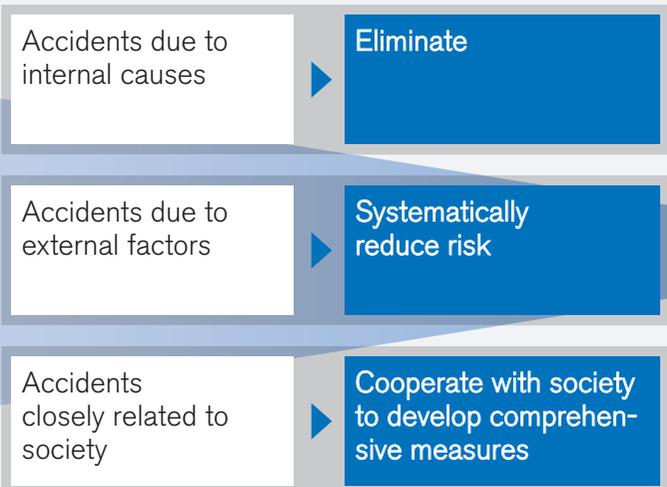
Amidst the rapid loss of skilled veterans retiring, the importance of nurturing younger employees who will be at the core of safety-related knowledge, technology, and leadership is growing greater. To meet this challenge, we will improve our management system in the area of safety based on personnel training and passing-on technical expertise.

|B| OVERALL IMAGE OF JR EAST GROUP SAFETY PLAN 2018

Four Pillars



Directions to aim for



IC| FIVE CULTURES

1 Culture of proper reporting

Swiftly and correctly report accidents and incidents to prevent further occurrences.

2 Culture of noticing

Be aware of potential accidents and incidents before they happen, and share information to prevent them happening.

3 Culture of direct confrontation and debate

When looking for causes, work through various opinions and engage in debate to pinpoint background factors to help develop truly effective countermeasures.

4 Culture of learning

Imagine an accident had happened to someone else not in your job and learn from it to help develop specific responses.

5 Culture of action

Finally, turn conclusions into specific actions to really ensure safety. Think and act yourself - these are the virtues that underpin safety.

Pillar 3 Steadily reduce risk

Objectives and initiatives for steadily reducing safety risks will be formulated according to a framework that sorts accidents into the three categories: 1) accidents due to internal causes, 2) accidents due to external factors, and 3) accidents closely related to society.

Even if certain issues are not presently seen as risks, JR East will continue to stay one step ahead by unearthing and counteracting potential risks that are emerging with the changing circumstances in the railway sector.

Pillar 4 Promote priority improvement plans for safety equipment

JR East has made safety-related investments of over ¥3,000 billion over the past 27 years since the Company was established. This effort will be continued by earmarking another ¥1,000 billion or so in safety investments over the five-year course of *JR East Group Safety Plan 2018*. The specifics will involve the continued enactment of countermeasures in preparation for a major earthquake, the installation of even more reliable safety equipment, and stepping up measures for preventing railway crossing accidents. In addition, we will complete the installation of automatic platform gates at 23 stations on the Yamanote Line while implementing plans in stages for expanding their use on other line segments. **See IDI**

As was mentioned, JR East Group Safety Plan 2018 is a five-year plan that seeks to improve safety at JR East both in terms of tangible and intangible measures. Particularly in retrospect of an accidental derailment at Kawasaki Station on the Keihin-Tohoku Line, all employees of the Group are determined to never repeat serious accidents, and will continue making efforts to achieve “extreme safety levels.”

Goal

0 Passenger fatalities/injuries
Employee fatalities*

*Also reduce injury-causing accidents

IDI



Measures for withstanding major earthquakes (seismic reinforcement of viaduct columns and embankments)



Automatic platform gates and obstruction warning devices for railway crossings

TECHNOLOGICAL INNOVATION FOR THE ADVANCEMENT OF RAILWAYS

JR East will rise to the challenge of achieving technological innovations in various fields as we pursue the Group's "Unlimited Potential." In the process, our R&D will not only be directed inward, but will also incorporate an Open Innovation concept for making the best of development capabilities and intellectual properties from outside sources. Steps have been taken to establish a Technology Innovation Development Committee, which is setting ambitious targets and clarifying issues and policies, while prioritizing R&D investments and propelling the Group's technological innovations forward. Particular emphasis has been placed on developing an energy and environmental strategy, using ICT in developing railway systems that are completely free from conventional thinking, and realizing the operation of Shinkansen at speeds of up to 360 km/h.

1 ESTABLISHING ENERGY AND ENVIRONMENTAL STRATEGIES

JR East has for many years engaged in a variety of environmental conservation initiatives, but partly because of concerns over long-term power shortages caused by the Great East Japan Earthquake, further innovation in environmental technology has become imperative. Toward the establishment of energy and environmental strategies, we are currently working on technological innovation in three key areas: utilization of renewable energies, promotion of energy conservation and establishment of smart grid technology for train power systems.

Catenary and Battery-Powered Hybrid Railcar Train System

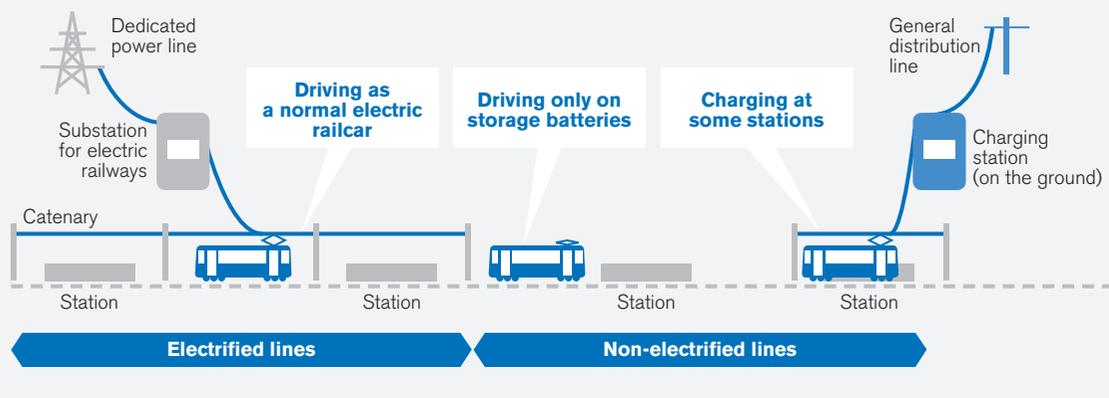
JR East has been developing a Catenary and Battery-powered Hybrid Railcar Train System as a new means of reducing the burden on the environment in

non-electrified sections, and confirming its commercial viability by running tests. These trains are equipped with large-capacity storage batteries. Electrical power is taken from overhead lines, as with ordinary trains, and is stored in batteries, which provide the power needed when the train is travelling through non-electrified regions. The batteries are charged at special charging facilities located at turnback stations. This train system eliminates emissions from diesel engines and also reduces CO₂ emissions and noise. Eventually, we will set out to eliminate the overhead power lines (transformer facilities and catenary lines) altogether. This can be expected to provide a range of benefits including improved transportation stability and lower maintenance costs.

The first of these railcars, named *ACCUM*, went into operation on the Karasuyama Line in March 2014.

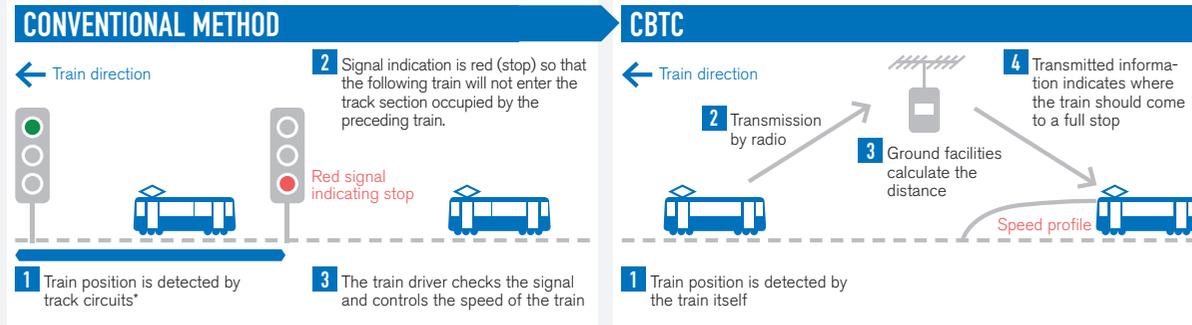
See [IAI](#)

IAI WORKING DIAGRAM OF THE CATENARY AND BATTERY-POWERED HYBRID RAILCAR TRAIN SYSTEM



B | EXAMPLES OF FUNCTIONS PROVIDED BY CBTC ON RAILWAYS WORLDWIDE

No track circuits are required and fewer cables are needed
Train positions are detected without using track circuits and transmitted by radio.



* A "track circuit" detects train positions electrically by sending electric current through the rails. (This method is used on many conventional railways.)

2 UTILIZING ICT

The ICT field has been undergoing rapid change, typified by the rapid popularization of smartphones and tablets. JR East is working to actively incorporate such widely used ICT into rail operations to further improve the quality of customer service. We are also actively applying ICT in transportation systems to move technological innovation forward.

Transportation System Innovation—CBTC and ATACS

JR East is aiming to drastically change and improve our Tokyo metropolitan area transport system through innovations that incorporate a conceptual breakthrough and are completely free from conventional ways of thinking. Our final objective is to achieve innovations in technology (such as elimination of the need for track circuits and reduction in the number of

cables), and operational innovations (such as bi-directional same-track operation). With these objectives, we have been moving forward to consider the introduction of the CBTC system on our Joban Local Line (a local line that runs between Ayase and Toride). We concluded a contract with Thales to commission the design work for CBTC introduction in May 2014. The design work is expected to take about one year. If we determine that our requirements for the CBTC system would be achievable based on the outcome of the design work, we are planning to ask the manufacturer to undertake the manufacturing and construction work for introduction of the CBTC system. If all goes well, we plan to introduce CBTC to the Joban Local Line by around 2020.

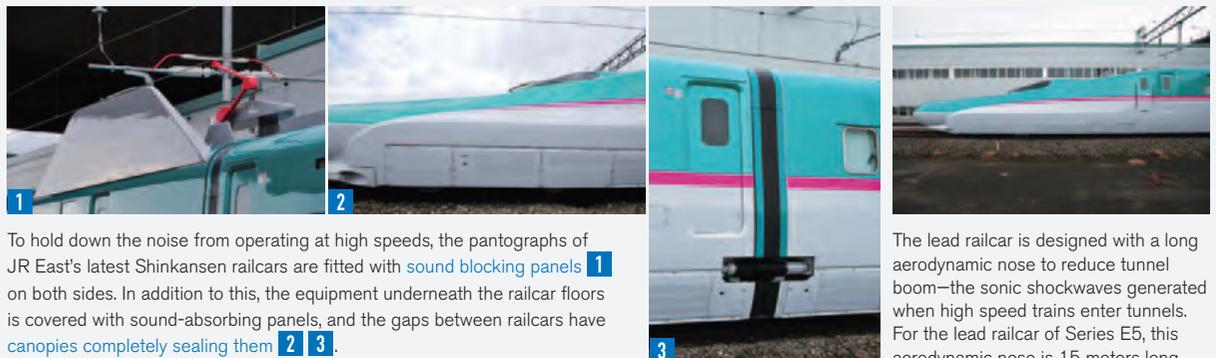
In addition the ATACS introduced to the Senseki Line has now been in stable operation for around two years. As a result, we now plan to introduce ATACS to the Saikyo Line as well in the fall of 2017.

See **B** |

3 OPERATING SHINKANSEN AT FASTER SPEEDS

We will continue to pursue R&D toward achieving an operational speed of 360 km/h for Shinkansen, while focusing on improving stability during high-speed operation and reducing the environmental impact to areas along Shinkansen lines. Also, we will feed back research achievements into operation of Shinkansen at 320 km/h, in order to upgrade safety and reliability, along with expanding segments where Shinkansen is operated at 320 km/h. To this end, we have enlarged our fleet of Series E5 and E6 Shinkansen railcars, and when the train schedules were revised in March 2014, we began operating all couplings of the *Hayabusa* and *Komachi* services at speeds of up to 320 km/h.

See **I** |

C | EXAMPLES OF TECHNOLOGY FOR ACHIEVING OPERATING SPEEDS OF 320 KM/H

To hold down the noise from operating at high speeds, the pantographs of JR East's latest Shinkansen railcars are fitted with **sound blocking panels** **1** on both sides. In addition to this, the equipment underneath the railcar floors is covered with sound-absorbing panels, and the gaps between railcars have **canopies completely sealing them** **2** **3**.

The lead railcar is designed with a long aerodynamic nose to reduce tunnel boom—the sonic shockwaves generated when high speed trains enter tunnels. For the lead railcar of Series E5, this aerodynamic nose is 15 meters long.