CONCEPT

Achieving Carbon Neutrality for a Sustainable Society

Hitachi's Environment Strategy and its Work in Mobility

The United Nations formulated the SDGs in 2015 with the aim of resolving challenges that confront the global community as a whole. Achieving these goals will require specific action, not only by national governments, but also from the corporate sector. As expressed in Goal 13, "Take urgent action to combat climate change and its impacts," there is pressing need for measures to combat climate change as it inflicts increasingly severe natural disasters in many parts of the world. This has seen the beginnings of a shift to a decarbonized way of life that combines carbon neutrality with economic growth, including an increase in investment by many nations aimed at greater use of renewable energy, hydrogen, and other clean technology. While this has been happening, Hitachi has been accelerating action on resolving environmental problems as it seeks to achieve a sustainable society and improve people's QoL through its Social Innovation Business, which operates in a wide range of areas. Hitachi's Mobility Sector builds, operates, and maintains both railway systems and building systems, the former having attracted attention in recent years for their potential to provide transportation in ways that do not have a large impact on the environment while the latter are essential to urban living. This article presents examples of action on the environment being taken in this sector, also describing Hitachi's environmental strategy and specific measures it is taking across the entire group.

Hitachi's Strategy and Commitment to Action on Environmental Issues

The United Nations Sustainable Development Summit held in September 2015 formulated the Sustainable Development Goals (SDGs) as targets for the international community as a whole, developed nations included. The SDGs are made up of 17 goals and 169 targets that address universal issues relevant to modern society and have led to ongoing global action aimed at achieving these by 2030, with nobody left behind.

Alongside this, Hitachi's 2021 Mid-term Management Plan set a target of improving social, environmental, and economic value through its Social Innovation Business. The aim is to create a sustainable society and improve people's quality of life (QoL) by combining the latest digital technologies with the experience and expertise Hitachi has built up over its long history in operational technology (OT), IT, and products. Taking action on climate change and other environmental issues has been a focus of particular effort.

Acknowledging the SDGs as well as the 2015 Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and the subsequent adoption of the Paris Agreement negotiated at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), Hitachi formulated its Environmental Vision and its Hitachi Environmental Innovation 2050 long-term targets in September 2016. These established specific goals aimed at achieving decarbonization, an advanced circular economy, and a society in harmony with nature, with environmental action plans to be formulated every three years to plan out short-term actions.

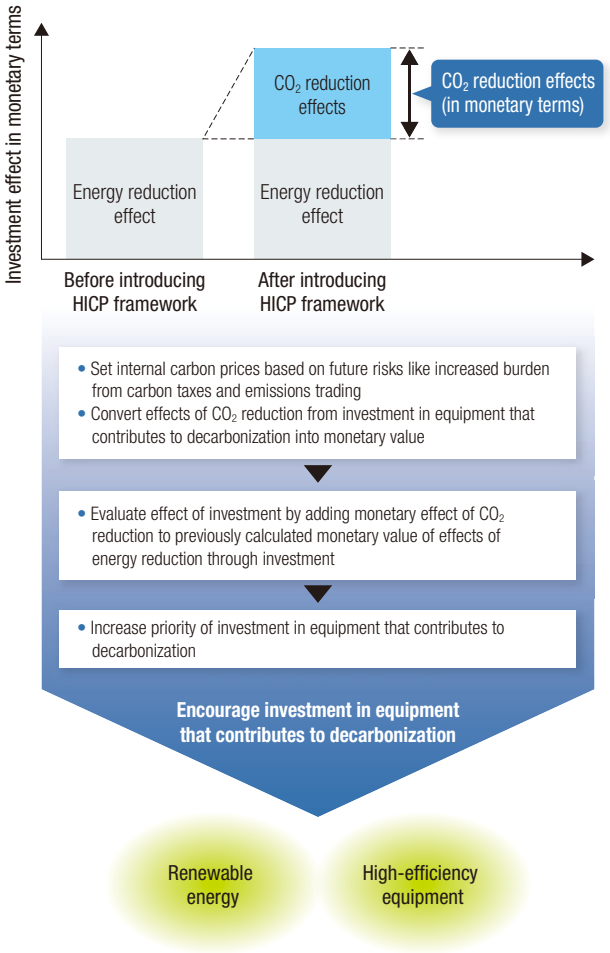
Table 1 | Key Actions for Reducing CO_2 Emissions by Factories and Offices

Factories	• Increased plant efficiency achieved through upgrades and installation of more efficient equipment • Reduced use of energy in production through efficiency gains achieved via Lumada and expertise built up over many years • Redesign of products and processes
Offices	• Construction of new energy-efficient buildings • Consolidation of existing premises • Work with building owners to install energy-efficient equipment and optimize equipment operation
Factories and offices	• Installation of renewable energy infrastructure • Use of electric power from renewable sources • Use of non-fossil certificates* • Off-balance-sheet funding for installation of in-house photovoltaic generation schemes • Adoption of internal carbon pricing framework to encourage capital investment in carbon reduction

CO_2: carbon dioxide

* The environmental value of electricity generated from renewable energy that has been certified or accredited. By acquiring credits, companies can be deemed to have made reductions (offsets) instead of reduction measures it implements itself.

Figure 1 | Hitachi Internal Carbon Pricing (HICP) Framework



HICP: Hitachi Internal Carbon Pricing

With regard to the particular concern of reducing carbon dioxide (CO_2) emissions, Hitachi Carbon Neutrality 2030 was announced in 2020 and set a target of reducing net CO_2 emissions from Hitachi's business operations (factories and offices) by 100% by FY2030 (against a baseline of FY2010). Wide-ranging work on reducing CO_2 emissions is currently proceeding at Hitachi operations in Japan and elsewhere (see Table 1).

A particular feature of these efforts is how they utilize the Hitachi Internal Carbon Pricing (HICP) framework launched in 2019 (see Figure 1). This internal scheme was devised with reference to global emissions trading and carbon taxation arrangements and is intended to increase capital investment in CO_2 emission reduction by setting an in-house carbon price that can serve as an incentive. When assessing an investment decision, for example, the price can be used to translate the resulting emission reductions into a monetary amount that can be added to the associated energy savings. The scheme has enabled additional investment in projects that would not have proceeded in the past due to performing poorly in financial terms despite having high energy efficiency. The 35 such energy efficiency projects in FY2019 had a total investment value of JPY260 million and delivered annual emissions savings of 1,356 t of CO_2.

This strategy was debated by a sustainability strategy committee chaired by the CEO and its rollout across Hitachi was led by Executive Vice President Alistair Dormer, who was appointed Chief Environmental Officer in April 2021.

As Dormer explained, "The shift from fossil fuels to renewable energy is accelerating, with electrification advancing across a range of fronts that include transportation and manufacturing. Bold action by companies is essential to bolster this trend and to take action against climate change on a global scale. This means that the amount of effort they are putting into reducing CO_2 emissions has been an important consideration over the past few years in our choice of supply chain and investment partners. As

a company that produces environmental value, Hitachi is working toward the achievement of a carbon-neutral society both through our own economic activity and by delivering solutions that reduce the load on the environment."

In December 2020, Hitachi's ambitious goal of achieving carbon neutrality in FY2030 was certified as compatible with the goal of limiting global average temperature increase to no more than 1.5°C above pre-industrial levels, and this certification was granted by Science Based Targets (SBT), an international initiative for certifying that corporate targets for reducing greenhouse gas emissions

Alistair Dormer
Executive Vice President and Chief Environmental Officer, Hitachi, Ltd.

COLUMN

First Japanese Company to become Principal Partner for COP26

Since the 2015 Paris Agreement of COP21, national governments have been taking action on climate change, having set their various targets for reducing CO_2 emissions based on the common goal of limiting global average temperature increase to no more than 1.5°C above pre-industrial levels. It is against this background that COP26 will take place in November 2021. The five key themes are adaptation and resilience, protection of natural habitats, clean energy, achieving zero emissions in transportation, and financial systems that will deliver green jobs*.

The world is coming to accept the importance of reducing CO_2 emissions and the need for investment in measures for dealing with climate change. One example is the UK, the COP26 host nation, which has put its target of reaching net-zero by 2050 into law and announced a ten-point plan for a green industrial revolution that directs investment toward 10 specific areas, including the promotion of renewable energy and electric vehicles (EVs) and the decarbonisation of transportation. However, achieving these targets in practice will require more urgent action and more effective measures.

In March 2021, Hitachi became the first Japanese company to be appointed a Principal Partner for COP26. Based on its corporate mission of "contributing to society through the development of superior, original technology and products," and in its role as an innovator for action on climate change, Hitachi will contribute to the global goal of creating sustainable societies by supporting CO_2 emission reductions by national and local governments as well as the private sector across mobility and a wide range of other areas.

"Partnering with COP26 and playing our role in tackling climate change is a source of great pride for Hitachi. We are actively orienting our business towards the sustainable technology of the future. We see IT, Smart Energy, Industry and Mobility as having a major role to play in decarbonisation and believe we can use our many businesses and the power of digital innovation, to help governments, cities and businesses reduce their environmental impact."

Alistair Dormer

* Jobs that are economically viable while also reducing the burden on the environment to a sustainable level.

are scientifically based. On this basis, Hitachi has committed itself to Business Ambition for 1.5°C[*1], which is led by the SBT initiative and the United Nations Global Compact, among others, and has signed up to the United Nations' Race to Zero Campaign[*2]. Similarly, in March 2021, Hitachi was the first Japanese company to become a Principal Partner for the COP26 Climate Summit to be held in Glasgow, UK this November.

What Hitachi is Doing to Reduce CO_2 Emissions

Hitachi is pursuing actions in a wide range of areas aimed at reducing CO_2 emissions to bring about a decarbonized way of life.

One example involving the use of digital technology is the development of the Powered by Renewable Energy system. This uses smart meters and blockchain technology to provide information on whether individual buildings, equipment, or services are using electricity generated from renewable energy (see Figure 2). The system improves corporate environmental awareness by providing the ability to certify that the power being consumed by specific equipment or services is 100% renewable. In the future, it is anticipated that the system will also facilitate the provision of services with high added value that can be promoted on the basis of their environmental performance. The system commenced operation on February 1, 2021 at the *Kyōsō-no-Mori* facility for open innovation located at Hitachi's Central Research Laboratory in Kokubunji, Tokyo.

Activities in Mobility Sector

The transportation and mobility sector is one area where work on reducing CO_2 emissions is raising particularly high expectations. Transportation in its various forms, whether by land, air, or sea, makes up a large proportion of CO_2 emissions, accounting for more than 20% of the total as of February 2021. While aircraft and shipping are largely powered by fossil fuels, railway systems, and building mobility systems (elevators and escalators) are for the most part electrically operated. As such, they are recognized as forms of transportation with an inherently low impact on the environment. This is because electrical machinery can achieve carbon-free operation by drawing its power from renewable energy sources. Likewise in this modern world of rising urbanization, pursuing energy efficiency by improving the electrical efficiency of clusters of office and other commercial buildings will be essential for urban sustainability and development into the future.

Hitachi is working to further reduce CO_2 emissions in these areas as well.

Figure 2 | **Screen Showing Powered by Renewable Energy Certification Symbol and Electricity Usage**

Railway Systems Providing Transportation with Low Impact on the Environment

As the world becomes increasingly concerned about environmental issues, railways are once again attracting attention as a sustainable means of transportation. According to the Ministry of Land, Infrastructure, Transport and Tourism, a private passenger car emits 130 g of CO_2 to transport one person one km, while a railway emits only 17 g of CO_2 per passenger-km traveled. As well as contributing to greater use of railway transportation around the world through its extensive involvement in the manufacture and operation of rolling stock and systems, Hitachi's Railway Systems Business Unit is also developing a range of solutions intended to make railways even more energy efficient.

*1 A campaign to get companies to set emission reduction targets for greenhouse gases that are scientifically based in order to limit global temperature increase due to climate change to no more than 1.5°C above pre-industrial levels and reduce greenhouse gas emissions to net-zero by 2050.

*2 An international campaign launched by the United Nations Framework Convention on Climate Change on June 5, 2020 (World Environment Day). The campaign recognizes that action by companies and other non-state actors will be crucial to keeping warming to no more than 1.5°C and achieving carbon neutrality throughout the world by 2050.

Figure 3 | Hitachi Battery-equipped Hybrid Rolling Stock in Use Globally

(1) Dynamic headway on Copenhagen Metro

In 2018, Hitachi undertook a demonstration project for dynamic headway on the Copenhagen Metro that serves Denmark's capital city. This world-first solution offered new value in railway transportation by adjusting the interval between trains in response to passenger demand. It worked by automatically optimizing service frequency depending on the level of demand, which was determined using data from sensors located in stations and trains. Passengers benefitted from reduced congestion and more comfortable travel, while the value for the railway operator came through improved operational efficiency.

(2) Battery-equipped hybrid rolling stock

In December 2020, Hitachi entered into a contract with Eversholt Rail Ltd., a rolling stock leasing company in the UK, to supply battery-equipped hybrid rolling stock for that nation's intercity railway services. The objective was to reduce fuel consumption by 20% or more by using batteries to replace existing diesel generators for some of the traction power supply on intercity rolling stock operating between London and Penzance, a city in the southwest of the UK. It is estimated that replacing the rolling stock for one train with battery-equipped hybrid units will contribute to saving 240 t of CO_2 annually. Elsewhere, the company is expanding its business globally with battery-driven trams being trialed in the city of Florence and a recent order from Italy for battery-equipped hybrid rolling stock. In Japan, Hitachi is developing a hybrid (fuel cell) test vehicle jointly with East Japan Railway Company and Toyota Motor Corporation (see Figure 3).

Building Systems that Underpin Comfortable Urban Living

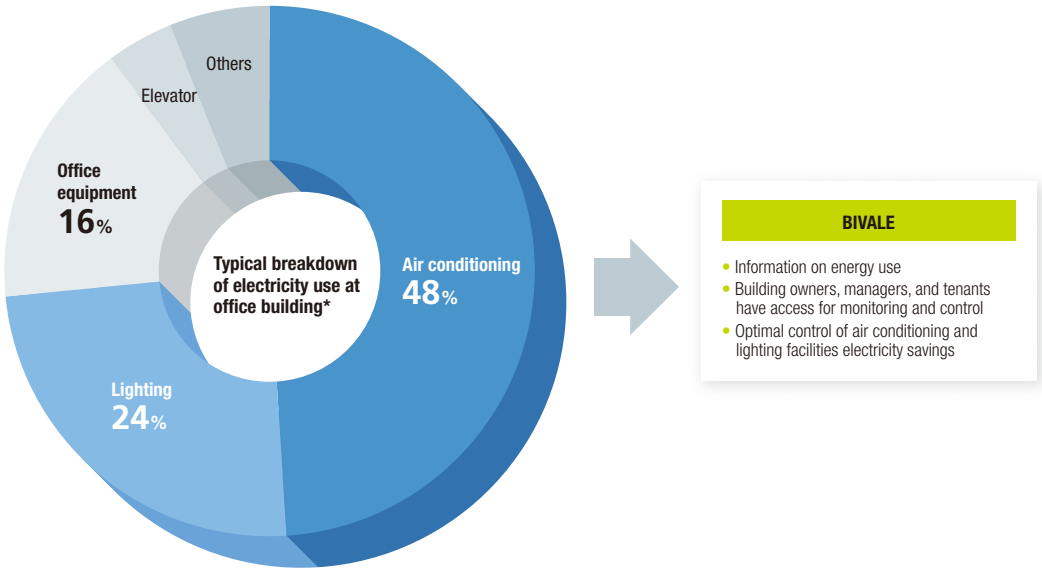
More than 60% of total global energy consumption takes place in cities, resulting in the emission of large amounts of CO_2. Buildings are responsible for a large proportion of these emissions. At present, 55% of the world's population is urban, a figure that is expected to rise to 68% by 2050. Given this ongoing urbanization taking place around the world, reducing the load on the environment will require efficiency improvements in the energy use and operation of building systems such as those that provide air conditioning and move people around these buildings.

As the trend toward high-rise buildings continues, Hitachi's Building Systems Business Unit supplies the elevators, escalators, and other equipment needed to move people around inside these buildings together with solutions that support energy efficiency in office buildings and shopping malls.

(1) Eco-factory designation for manufacture of elevators and escalators

In its building mobility business that includes elevators and escalators, Hitachi is striving to improve not only the efficiency and performance of its products, but also the

Figure 4 | **Hitachi's BIVALE Integrated Facilities Management Solution**



Source: Profile of 2-PM electricity demand in an office building from the Energy Conservation Guidebook for Buildings published by The Energy Conservation Center, Japan

energy efficiency of its manufacturing processes. Hitachi is installing photovoltaic panels at the sites where it manufactures elevators and escalators. In conjunction with its energy efficiency measures, the ultimate goal is to reduce use of electric power in the production process by 50% compared to 2010.

In particular, as a certified site under the Hitachi Eco-factories and Offices program, the Guangzhou plant of Hitachi Elevator (China) Co., Ltd., Hitachi's largest elevator manufacturing facility outside Japan, has taken a variety of steps to reduce the load on the environment since acquiring ISO 14001 certification in 2000. In addition to the CO_2 emission reductions achieved by measures such as the above installation of photovoltaic panels, these also include a wastewater recycling system for the reuse of water.

(2) BIVALE integrated facilities management solution

Hitachi also supplies its BIVALE facilities management solution for sites such as office buildings and shopping malls, using cloud computing to provide integrated management of energy, security, and equipment across multiple buildings or other sites. This cloud service provides integrated energy, security, and building management to overcome the challenges of building administration and operation. It supports energy efficiency and helps reduce power consumption at buildings managed by customers, providing detailed information on electricity use and control of air conditioning and lighting while also keeping up-front investment to a minimum (see Figure 4).

Role of Mobility in a Sustainable Future

Railways that provide transportation with a low load on the environment and building systems that help make cities more energy-efficient play a major role amid the wide range of actions being undertaken around the world aimed at achieving sustainable societies. Executive Vice President Alistair Dormer, whose responsibilities also include managing the railway business and building systems business, had the following to say about the future of Hitachi's Mobility Sector.

"We can expect an acceleration in efforts to decarbonize our way of life, including greater installation and use of renewable energy, a shift toward carbon-free transportation, and measures to reduce CO_2 emissions at all steps along the value chain. The two business units in Hitachi's Mobility Sector are helping to achieve the SDGs and carbon neutrality through products and solutions that combine both green and digital technologies. We intend to continue in our efforts to create sustainable societies while also deepening our collaboration with customers and other corporate partners in our role as a mobility system integrator."