Night view of Passenger Terminal 2

Climate Change Initiatives

Global Warming Countermeasures

Targets

- **Reduce CO_2 emissions from the airport**
- **Reduce energy consumption**
- **Implement countermeasures to adapt to climate change associated with global warming**

To conserve the global environment, Narita International Airport is striving to reduce greenhouse gas (GHG) and air pollutant emissions caused by airport operations.

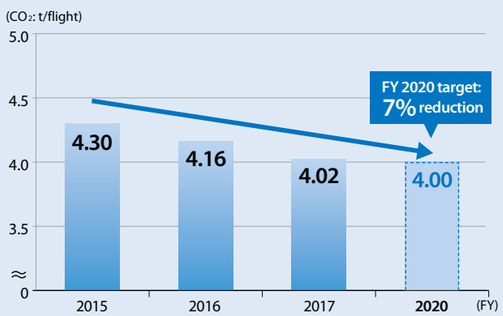
The Eco-Airport Master Plan (FY 2016–2020) has set the goal of cutting airport carbon dioxide (CO_2) emissions per flight by 7% of the fiscal 2015 level (4.30 t CO_2 per flight) by fiscal 2020.

A large percentage of total CO_2 emissions of the airport as a whole comes from aircraft operations. Emissions from aircraft operation are declining as a result of the increased introduction of fuel-efficient aircraft thanks to the efforts of airlines, installation of Ground Power Units (GPUs)*1 and limiting Auxiliary Power Unit (APU)*2 usage by parked aircraft. Additionally, a variety of energy conservation methods are underway to reduce CO_2 emissions from airport facilities.

CO_2 emissions in fiscal 2017 decreased to 4.02 tons per flight, a 6.5% reduction from fiscal 2015, as we are making steady progress in this area.

Goals and Performance

Reducing Airport CO_2 Emissions (per flight)

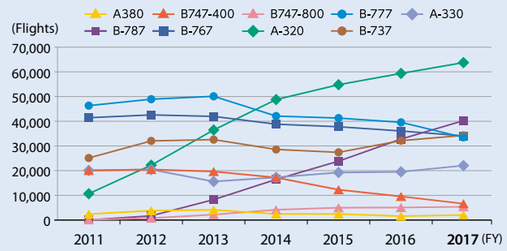


*1 **A Ground Power Unit (GPU)** is equipment for supplying necessary air conditioning and electrical power to aircraft parked on the ground. It can be either mobile or stationary.

*2 **An Auxiliary Power Unit (APU)** is used as a power source for air conditioning and electrical systems.

We will continue to promote the introduction of fuel-efficient aircraft, and work to reduce energy consumption at airport facilities as well.

Number of Flights by Aircraft Type



Encouraging GPU Usage

When aircraft are parked on the apron and engines are shut off, essential power and air conditioning can be provided by a small engine fitted to the aircraft known as an APU. APU operation, however, generates noise and emits substances that cause global warming and air pollution. Consequently, the use of APUs is restricted and the use of GPUs is encouraged at Narita International Airport.

GPUs enable us to reduce greenhouse gas and air pollutant emissions as they provide power and air conditioning from ground facilities.

Currently, GPUs have been installed at all fixed stands in Passenger Terminals 1 and 2. They are also installed at most stands in Passenger Terminal 3 and cargo area (power supply only).

Additionally, since state-of-the-art aircraft such as the B787 and A380 power requirements exceed the capacity of existing GPUs, we have been increasing their power output.

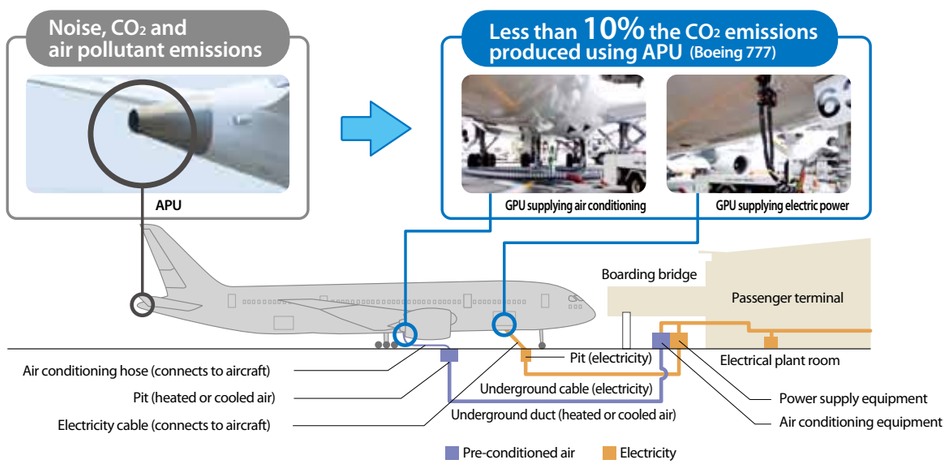
In recent years, the number of aircraft that do not use a GPU because of short turnaround time has been increasing, and GPU utilization has generally been declining. However, as the result of boosting the capacity of GPUs and encouraging their use by airlines, the GPU usage rate in fiscal 2017 was 85.8%. We will continue our efforts to improve the GPU usage rate.

Measures to Limit APU Usage

- APU usage is limited within 30 minutes of scheduled departure time at stands where GPUs are available.
- Aircraft must switch over to GPU shortly after arrival.
- APUs may only be used for the minimum length of time when required for aircraft inspection and maintenance.

Changes in GPU (electric power) Usage Rate (including portable GPUs)

GPU and Supply Channels



Introduction of Low Emission Vehicles

Narita International Airport promotes the introduction of low emission vehicles (LEVs)* for service vehicles. A survey conducted in June 2018 shows that 45.2% of the 6,700 vehicles owned by airport-related business entities are LEVs, an improvement from 35.4% in fiscal 2015.

In fiscal 2017, our LEVs accounted for 35.4% of service vehicles, an improvement from 26.0% in fiscal 2015. To promote the introduction of LEVs we are also introducing advanced eco-friendly vehicles such as fuel cell vehicles.

Also, we are developing our infrastructure for LEVs to encourage the introduction of LEVs and their use for travel to the airport. Currently, in addition to fast chargers for electric cars installed in two airport parking lots (in P1 and P2), a hydrogen station has been installed for fuel cell vehicles.

We will continue to develop infrastructure to facilitate the use of LEVs by visitors and airport-related business entities.

Location of Fast Chargers and Hydrogen Station

*** Low Emission Vehicles (LEVs):** Electric, hybrid, plug-in hybrid, natural gas, fuel cell, clean diesel, certified fuel efficient/low emission vehicles (gasoline, diesel, LPG)

Renewable Energy

Solar Power Generation

For efficient use of natural energy, we have introduced solar power generation systems since 1999. Solar panels with capacity of 120 kilowatts (kW) have been installed on the roofs of Passenger Terminal 1 and the NAA Head Office Building. These systems provide about 120,000 kilowatt-hours (kWh) of electricity per year, and the produced power is used for lighting and other purposes in passenger terminals and the NAA Building.

In addition, the approximately 2,000 kW Sanrizuka Solar Power Plant was constructed adjacent to the airport with a renewable energy feed-in tariff system in March 2015.

Outside of the company as well, solar panels have been installed on the rooftop of a government agency building in the cargo area for its power supply.

Solar panels on the NAA Head Office Building

Sanrizuka Solar Power Plant

Green Power Certificates

For the purpose of promoting the reduction of greenhouse gas (GHG) emissions and the introduction of renewable energy, we purchased a "Green Power Certificate" for wind power generation of 125,000 kWh in fiscal 2017. This amount is equivalent to the energy consumed for continuous real-time monitoring of aircraft noise, air quality, and water quality around the airport in one year.

Green power refers to electricity produced from renewable energy such as hydroelectric, wind, solar, biomass, and geothermal. It is environmentally friendly as it produces little to no emissions unlike fossil fuel energy.

The Green Power Certification scheme promotes the spread and expansion of renewable energy use through the issue of tradable certificates certifying the environmental value of clean power.

Narita International Airport also uses Green Power Certificates at events within the airport. We will continue to promote the introduction of renewable energy and reduce GHG emissions through various initiatives.

Certificate of Green Power

LED Lighting

LED Taxiway Lighting

We have been promoting the shift of taxiway lights to navigate aircraft from halogen lamps to LEDs (light emitting diodes).

LED lamps have a longer life than halogen lamps and reduce the replacement frequency of lighting components. LEDs consume 1/10 of the power of halogen bulbs and are four times more energy efficient even when including the lighting device. As of the end of fiscal 2017, LED lighting accounted for 57.9% of all the lighting used for taxiways.

LED taxiway lighting

Use in Passenger Terminals

LEDs are also used for the backlights in advertising boards and information signs in passenger terminal buildings. LED backlighting offers a distinct display and provides many other advantages in terms of convenience, running cost, and the environment such as lower heat emission, significantly less power consumption, and longer life. In conjunction with renovation of the international arrival lobby in Passenger Terminal 2, which was completed in March 2016, we replaced lighting fixtures with LED lighting. As a result, about 1,270 LED lights were installed, cutting annual power consumption by approximately 40% compared to before the renovation.

Moreover, traditional lighting at the passenger terminal buildings is gradually being replaced with LED lighting.

We will expand the introduction of high-efficiency lighting fixtures such as LED lighting in conjunction with future facility renovation plans.

LED lights on the ceiling of international arrival lobby in Passenger Terminal 2

COLUMN

Switching to LEDs for Neon Signs in Passenger Terminal Buildings

In December 2017, Narita International Airport switched to LED lighting for the neon signs at nine locations outside Passenger Terminals 1 and 2.

As a result, we achieved a reduction in power consumption of about 50%.

The neon signs installed on the outer walls of the terminals are welcoming everyone ever more brightly with less power than before.

Energy Conservation Measures in Passenger Terminal Buildings

Due to its immense facilities, Narita International Airport consumes a large amount of energy. Including aviation fuel facilities in the Port of Chiba and Yotsukaido, the electricity and gas consumption of fiscal 2017 amounted to 4,705 TJ (terajoules)*, when converted to thermal energy.

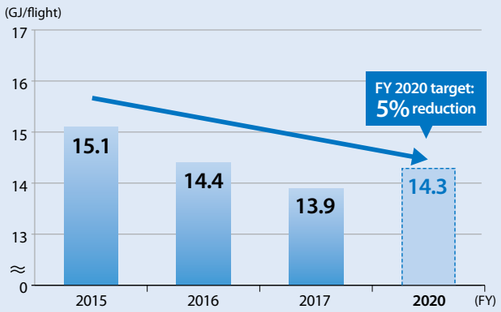
More than half of the electricity consumed at the airport is for the operation of air conditioners, and other equipment used in the passenger terminals. We strive to save energy through fine control of lighting and air conditioning according to the conditions in each area, including areas for passengers, office areas, and retail areas. For example, boarding gate areas are divided into zones based on flight schedules, and air conditioning is run in each zone only when necessary. Further, daylight sensors have been installed in various parts of the terminal buildings, and the lighting is turned on and off automatically according to the light level in those areas. Motion sensors in restrooms reduce lighting when no one is present for a certain period.

In addition to these measures, a Building and Energy Management System (BEMS) was introduced in Passenger Terminal 2. The system monitors the operation of the air conditioning, power, and heating/cooling systems across a wide and complex area. The data are collected for analysis to visualize and optimize the operation of these systems.

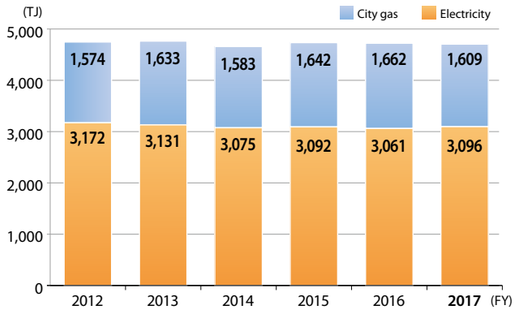
Also, energy-saving measures such as optimizing the amount of outside air brought in by air conditioning units, adjusting the output of air conditioning unit fan inverters, and reconsidering the running time of ventilation supply/exhaust fans are implemented on a large scale. In large spaces such as passenger terminals departure lobbies, we have implemented all-return control to reduce the volume of outside air introduced by heating/cooling systems. Also, the air conditioning operation load has been reduced while maintaining the interior environment by measurement of temperature, humidity, CO_2 concentrations, and so on. These measures achieve both energy savings and comfort.

Goals and Performance

Reducing Airport CO_2 Emissions (per fligh



Energy Consumption (TJ) at Narita International Airport (Electricity & Gas)



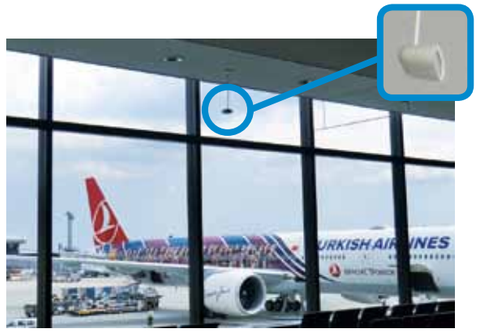
Another measure to reduce energy consumption is the use of geothermal heat, which maintains a constant temperature throughout the year. It is used for the air conditioning facility of the connecting corridor between the Passenger Terminal 2 main building and satellite.

The Eco-Airport Master Plan (FY 2016–2020) has set a target of cutting energy consumption (per flight) in the airport facilities managed by NAA by 5% of fiscal 2015, by fiscal 2020. As energy-saving measures have progressed throughout all airport facilities, energy usage in fiscal 2017 was 13.9 GJ (gigajoules)* per flight, a reduction of 7.9% from 15.1 GJ per flight in fiscal 2015.

CO_2 emissions at NAA-managed facilities were 0.67 tons per flight, a decrease from 0.72 tons per flight for the previous fiscal year, thanks to the process of energy consumption reduction.

We will continue to pursue further efficiency of air conditioning, electricity, and heating by implementing energy-saving strategies.

*** TJ (terajoule) and GJ (gigajoule):**
1 TJ = 10^{12} J (joules) ; 1 GJ = 10^{9} J. Joule is the SI unit of work or energy.


Sanrizuka Solar Power Plant


Sanrizuka Solar Power Plant

Cogeneration System

Generally, thermal power stations burn fossil fuels such as oil or coal to generate electricity. However, the process wastes large amounts of energy in the form of unused waste heat and electrical transfer losses. If this wasted heat can be recovered and used for hot water supplies and heating and cooling requirements, energy efficiency can be greatly increased. Our cogeneration system has made this possible.

It was introduced at the Central Heating and Cooling Plant of the airport in 2000. Fueled by low emission gas, it provides approximately 20% of the power used in the airport and 50% of the steam for heating and cooling requirements.


Cogeneration System