9.Infrastructures

1. Introduction

Facility management is focused on securing the safety, stability, and reliability of equipment and systems at each experimental facility. It must provide an efficient and effective delivery of support services not only to domestic academia, research institutes, and industry, but also to foreign entities because SPring-8/SACLA offers world-leading, highly brilliant X-rays. We efficiently control and provide 24/7 support to all facilities.

We manage the construction and maintenance of the facilities and their systems, such as electrical equipment, cooling units, experimental drainage, telephones, and hygienic air conditioning, on a five-year plan. This plan includes daily systematic monitoring and periodic inspections. In addition, we have implemented a plan to improve the overall research environment through initiatives to address aging equipment and improve energy savings.

2. Management of utilities (lighting, heating, and water)

2-1. Electricity

Electricity is provided by Chubu Electric Power Miraiz Solution's duplicate lines. The receiving voltage is 77 kV. The total contracted power is 31,500 kW. (The industrial power for facilities is 30,000 kW and the nonindustrial power for administrative/sitting rooms is 1,500 kW.) The electric power consumption in FY2024 was 173 GWh. Figure 1 and Table 1 show the trends of electric power use over the past five years.

For the periods of peak electric power demand, measures are implemented to ensure that the total consumed power remains below the contract limit. These measures include the increased monitoring of overall use, the adjustment of air-conditioning settings, and the implementation of energy conservation measures.

Additionally, facility management was responsible for supporting researchers' needs and their related organizations and divisions regarding electric power quality/stability enhancements toward upgrading/diversifying research.

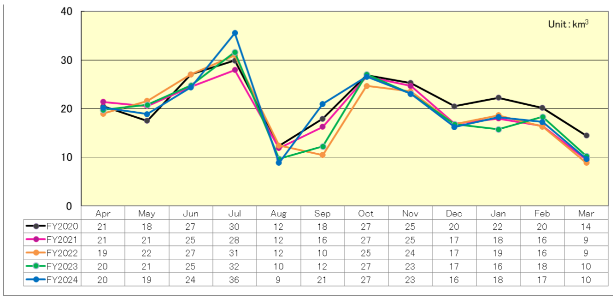

Fig. 1. Electricity consumption trends (at Harima Campus).

Table 1. Electricity consumption.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Industrial power	178.6	170.0	169.1	164.3	166.1
Nonindustrial power	7.0	7.3	7.1	6.9	7.1
SPring-8 as a whole	185.6	177.3	176.2	171.2	1732.2
Comparative (±)	−16.7	−8.3	−1.1	−5.0	2.0

[Unit: GWh]

2-2. Water and sewage

Tap water from the Chikusa River is provided by the water sewage office, Harima Highlands Wide-area Administration Association. The usage flow rate of tap water in FY2024 was 240 km^3, while the amount of sewage discharge was 109 km^3. Figure 2 and Table 2 show the water consumption trends over the past five years, while Fig. 3 and Table 3 show the sewer discharge trends over the past five years.

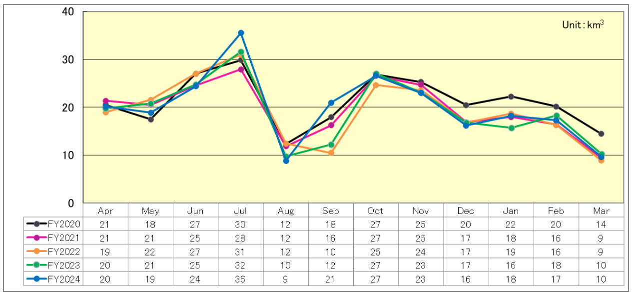

Fig. 2. Amount of water used (at Harima Campus).

Table 2. Amount of water used.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
SPring-8 as a whole	254.7	234.5	230.3	230.3	239.8
Comparative (±)	−15.3	−20.2	−4.2	0.0	9.5

[Unit: km^3]

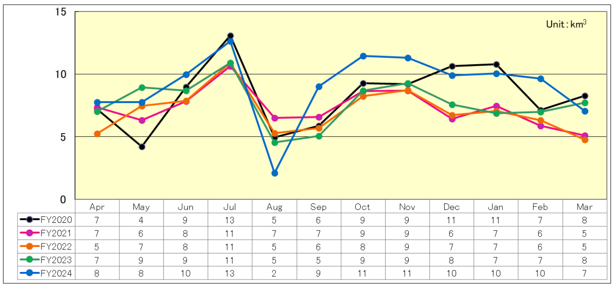

Fig. 3. Amount of sewage discharge (at Harima Campus).

Table 3. Amount of sewage discharge.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
SPring-8 as a whole	99.8	87.5	84.4	92.4	108.8
Comparative (±)	1.4	−12.3	−3.1	8.0	16.4

[Unit: km^3]

2-3. Gas

Town gas (13A) is provided by the West Harima Station of Osaka Gas. The FY2024 usage flow rate was 202 km^3. Figure 4 and Table 4 show the trends of gas use over the past five years.

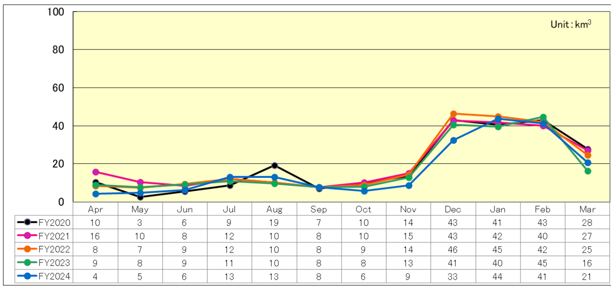

Fig. 4. Amount of town gas used (at Harima Campus).

Table 4. Amount of town gas used.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Shared facility	216.0	225.4	221.1	201.5	185.2
RIKEN facility	15.5	16.3	15.5	14.6	16.7
SPring-8 as a whole	231.5	241.7	236.6	216.1	201.9
Comparative (±)	11.9	10.2	−5.1	−20.5	−14.2

[Unit: km^3]

2-4. Energy conservation

The following measures were implemented in FY2024 to reduce CO_2 emissions and save energy:

(1) Packaged air conditioners were updated at the Main Building. These efforts eliminated 2 tons of CO_2 per year.

(2) All the lighting in the following facilities was updated with LEDs: SACLA Accelerator Building, SACLA Undulator Building, Cafeteria, Linac, and exterior lights around certain areas of the premises. These efforts eliminated 37 tons of CO_2 per year.

(3) A photovoltaic power generation system was newly installed at the Water Supply System Building. These efforts eliminated 9 tons of CO_2 per year.

(4) The photovoltaic power generation systems at the Main Building, Experimental Drainage Treatment, SACLA Accelerator Building, North

Building, and Vacuum Drainage Station generated their own power all year round. These efforts eliminated 82 tons of CO_2 per year.

(5) Operations of an injection system and a machine cooling system at the Storage Ring were temporarily suspended during inspection adjustment periods in the summer/winter, and at the fiscal year-end. These efforts eliminated 2,163 tons of CO_2 per year.

(6) The machine cooling equipment, which was a recirculating piped water system used to remove waste heat at the Storage Ring, was upgraded to a more energy-efficient one. The new equipment uses cold outside air in the winter and a refrigerating machine in the summer. These efforts eliminated 161 tons of CO_2 per year.

(7) The partial operation of the air handling units (AHUs) in the Experimental Hall at the Storage Ring during the summer/winter maintenance periods and at the fiscal year-end eliminated 718 tons of CO_2 per year.

(8) The partial operation of outdoor AHUs and air-exhaust ventilators of the tunnels for the injector and accelerator at the Storage Ring during the summer/winter maintenance periods and at the fiscal year-end eliminated 52 tons of CO_2 per year.

(9) The partial operation of air conditioners in the Experimental Hall at the RI Laboratory during the summer/winter maintenance periods and at the fiscal year-end eliminated 24 tons of CO_2 per year.

(10) The partial operation of the fan coil units (FCUs) in the tunnels for the injector and accelerator at the Storage Ring during the summer/winter maintenance periods and the fiscal year-end eliminated 25 tons of CO_2 per year.

(11) The partial operation of the humidifying function of the outdoor air handling units (OHUs) in the tunnels for the injector/accelerator and in the Experimental Hall at the Storage Ring eliminated 73 tons of CO_2 per year.

(12) The use of air-conditioning units during the night was suspended between 19:00 and 07:00 at the research building of the Medium-length Beamline Facility.

3. Environmental conservation efforts

3-1. Industrial waste

Wastes discharged from operating activities were mainly experimental equipment, office automation equipment, scrap metal, waste plastics such as packing material/filters, and sludge generated during water treatment. Wastes containing poisonous and deleterious substances, such as experimental waste liquid and lead-acid batteries, used in operations and maintenance, were collected and stored as specially controlled industrial waste. Additionally, because tools such as sterilized syringe needles and scalpels are difficult to distinguish from medical waste, they were collected and stored as specially controlled industrial waste. Then, we hired a contracted waste management company to dispose of them.

Although the animals used in laboratory experiments can be disposed of as general waste, we buried them in an animal cemetery to express our sympathy for the loss of the laboratory animals, following the guidance of the local municipality.

Because cooperation from employees and users is necessary to properly conduct garbage separation, explanatory sessions on waste disposal were held and warning notices were issued via emails and posted announcements to employees not properly handling waste. Tables 5–7 show the amounts of waste generated over the past five years.

Table 5. Waste types and amounts in industrial waste.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Sludge	4,405	2,165	3,273	1,399	5,520
Waste oil/slush	3,560	5,024	1,999	2,801	12,283
Waste alkali	44	90	485	26	96
Waste acid	92	14	57	447	109
Waste plastic	8,898	9,454	8,733	9,000	16,163
Waste wood	1,949	1,653	1,674	6,075	4,168
Waste/scrap metal	60,779	113,255	65,443	136,146	204,612
Waste/cullet glass	628	511	403	906	994
Wastes other than the above (concrete, stone, etc.)	44	925	810	11	685
Biochemically stable waste mixture	2,797	3,156	1,980	19,536	5,111
Biochemically unstable waste mixture	3,062	4,458	2,823	9,235	10,956
Waste plastic (containing asbestos)	0	0	0	0	0
Mercury-containing product industrial waste	710	711	1,035	570	880
Dry batteries	210	50	30	60	90

[Unit: kg]

Table 6. Amounts of specially controlled industrial waste.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Waste acid	489	250	375	561	490
Waste alkali	430	475	49	54	5
Waste oil	305	187	50	22	0
Sludge	93	174	14	19	90
Infectious waste	10	10	10	10	10
PCB	—	—	—	—	165

[Unit: kg]

Table 7. Amount of general waste.

	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
Laboratory animals	36	158	214	202	132

[Unit: kg]

Facilities Section, Harima Operations Division, Safety and Campus Operations Group, RIKEN
Harima Safety Section, Safety and Campus Operations Group, RIKEN