

Efforts to Reduce Greenhouse Gas Emissions in a Medical Corporation: Twelve Years of Achievements and Challenges

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1 Background & Objective

In Japan, the **Energy Conservation Act** requires enterprises to report electricity consumption to METI; greenhouse-gas (GHG) emissions are then calculated using national emission factors. While accountability has improved, **few healthcare institutions implement systematic environmental management.**

Kyoto Health Association — affiliated with the Japan Federation of Democratic Medical Institutions — began visualising energy use and CO₂ emissions in 2013 and obtained **Eco Action 21 (EA21) certification in 2015.**

Objective: to evaluate the long-term outcomes and challenges of this 12-year decarbonisation initiative within a healthcare organisation.

2 Methods

Setting: All facilities of Kyoto Health Association (acute & chronic-care hospitals, clinics, care services).

Period: FY2013–FY2024 (12 years).

Data: Annual energy use and CO₂ emissions from EA21 reports, calculated with official national emission factors.

Fuels analysed: gasoline, kerosene, diesel, LPG, city gas, electricity (FY2013 baseline).

Analyses: year-on-year change, total CO₂ reduction, and **correlation between electricity consumption and the national emission factor** to identify the main drivers of emission trends.

3 Results

By FY2024 vs. FY2013:

kerosene -86 %, LPG -54 %, city gas -45 %, diesel -31 %

gasoline +21 %, electricity +33 %

The gasoline rise reflects continued fossil-fuel use for transportation, **independent of electrification.**

Strong negative correlation $r = -0.90$ between electricity consumption and the national emission factor — national grid decarbonisation (nuclear restarts, renewable expansion) drove most of the CO₂ reduction.

Total CO₂: declined FY2017–2020, rose temporarily in FY2021, stabilised after FY2022. Twelve-year total: **-1,027 t-CO₂ (-24.7 %).**

4 Conclusions / Lessons Learned

Energy mix vs. internal efficiency. Most CO₂ reduction came from changes in the national energy mix, not internal efficiency alone.

Stance on nuclear power. We oppose decarbonisation dependent on nuclear power, given the ethical and safety issues highlighted by the **2011 Fukushima disaster.**

Rising electricity demand. Total demand rose 33 % vs. FY2013, driven by digital transformation, **semiconductors, AI systems and advanced medical equipment.**

Renewable transition. Essential, but the large initial investment is difficult for healthcare institutions.

Way forward. Stepwise investment, energy-efficient digitalisation, and staff education are key for sustainable decarbonisation.

12-YEAR HEADLINE OUTCOME

-1,027 t-CO₂

(-24.7 % vs. FY2013 baseline, all sites)

$r = -0.90$ between electricity use and grid emission factor

Figure 1. Energy Use by Fuel Type — FY2013 = 100

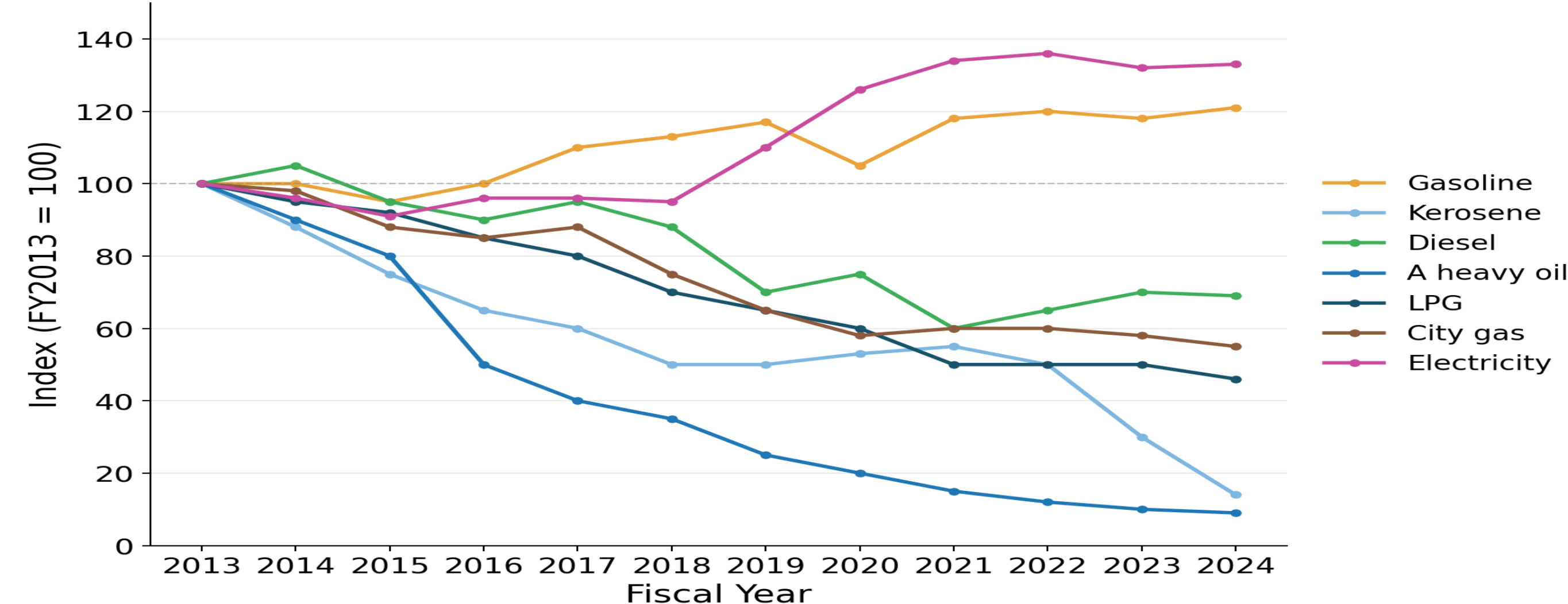


Figure 1. Energy use indexed to FY2013. Fossil fuels (kerosene, LPG, city gas, diesel, A heavy oil) all declined sharply, while electricity (+33 %) and gasoline (+21 %) rose — the energy mix shifted toward electricity.

Figure 2. CO₂ Emissions by Fuel — Annual Trend

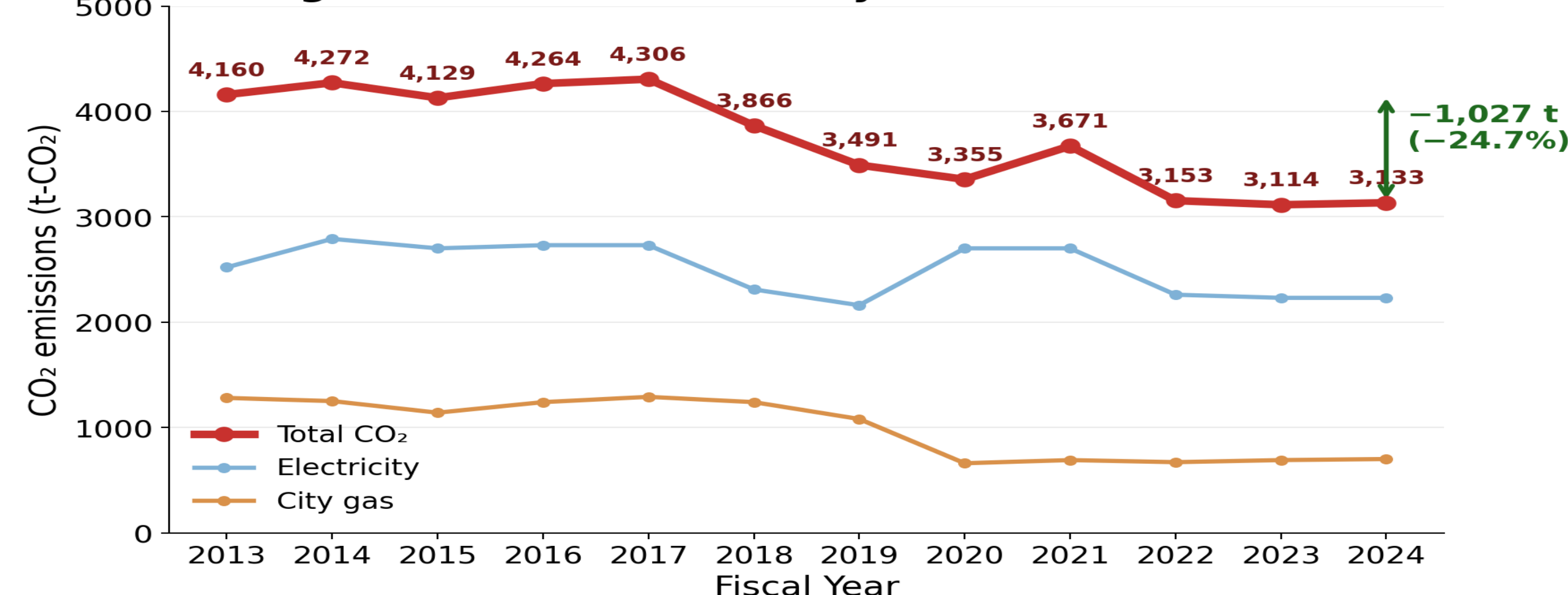


Figure 2. CO₂ emissions by fuel, FY2013–FY2024. Total fell from 4,160 t-CO₂ to 3,133 t-CO₂ (-1,027 t; -24.7 %).

Figure 3. Electricity Use vs. Grid CO₂ Emission Factor

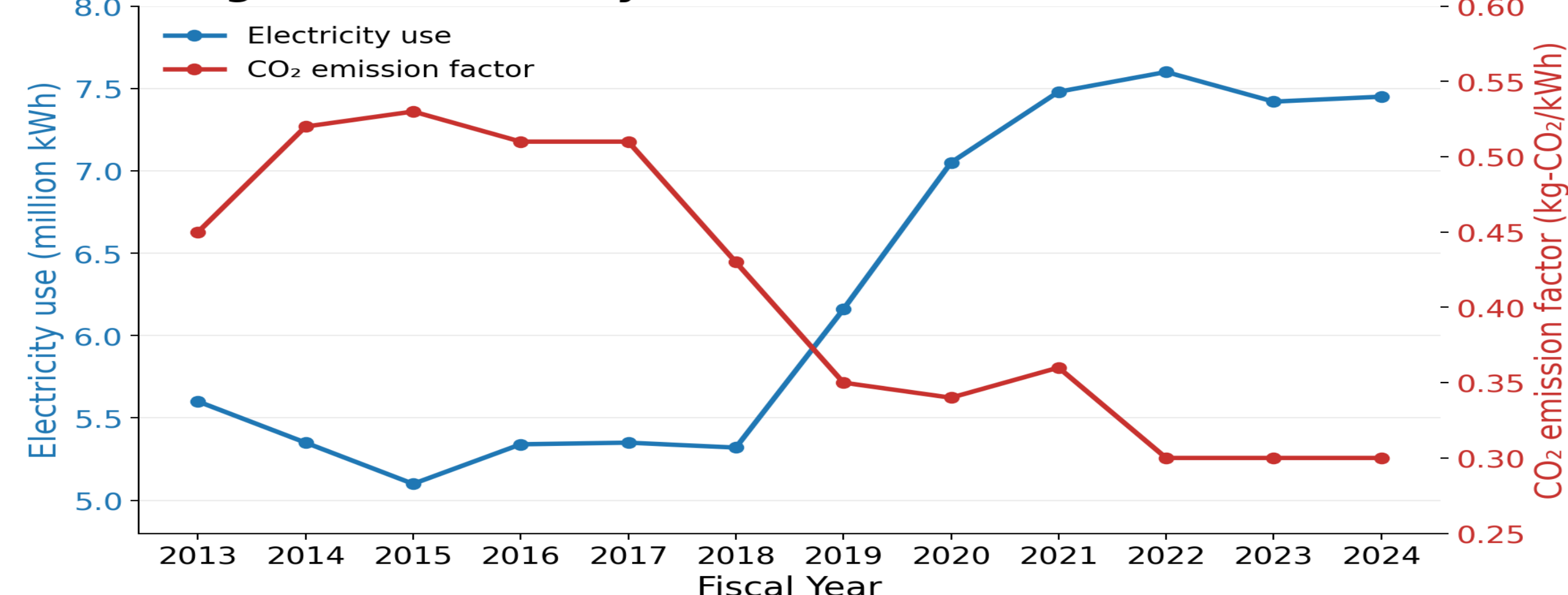


Figure 3. Electricity use rose ~33 % while the national grid emission factor fell from ~0.45 to 0.30 kg-CO₂/kWh — most of our CO₂ reduction came from a cleaner grid, not lower demand.

Relevance to Health Promoting Hospitals

This initiative corresponds to **HPH Standard 4: Healthy Workplace / Healthy Environment** of the 2020 HPH Standards. Environmentally responsible healthcare contributes directly to the health and well-being of **patients, staff, and communities**, integrating sustainability into daily operations and aligning with the HPH vision of **promoting health through organisational responsibility and environmental integrity.**

Keywords & Subject

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Subject: Environmental health and sustainability — Climate-resilient and environmentally sustainable healthcare

Abstract type: Practice

Conflict of Interest & References

The lead author (C. Tamaki) and co-author (M. Kanikawa) declare no conflicts of interest.

Ministry of the Environment (Japan) — emission factors of electric utilities; GHG calculation, reporting and disclosure system.

EA21 Central Secretariat — EcoAction 21 programme overview (www.ea21.jp).

Health Care Without Harm — Health care's climate footprint (2019).

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