INFRASTRUCTURE

We provide compelling end-to-end solutions spanning power, renewables, clean energy and decarbonisation, which are essential for sustainable development.

PROGRESS IN 2023

- First to import renewable energy under LTMS-PIP, with ~270 GWh imported by end-2023.
- Grew proportion of long-term power contracts (3 years and above) from about 36% of total contracted generation capacity as at end-June 2023 to about 60% as at end-December 2023.
- Made good progress on the construction of the Keppel Sakra Cogen Plant, Singapore's first-to-market hydrogen-ready power plant.
- Signed MOUs with international partners including GenZero, Masdar, and AM Green to explore various low-carbon energy solutions such as hydrogen, ammonia, and bioenergy.
- Gained strong traction in EaaS solutions, securing $1.6 billion worth of contracts in 2023.

FOCUS FOR 2024/2025

- Grow the integrated power business and explore strategic opportunities to provide longer-term energy solutions.
- Continue to maintain a robust and balanced portfolio of long-term power contracts with stable recurring income.
- Fortify Keppel's leadership in the Singapore power sector through low carbon electricity import.
- Further develop pipeline of strategic infrastructure assets for private funds and listed infrastructure trust.
- Continue to execute projects well and safely, including the Keppel Sakra Cogen power plant.
- Continue to expand market share for proprietary EaaS and WTE solutions.

Infrastructure is expected to be one of the fastest-growing asset classes, supported by global trends such as the energy transition and the push for decarbonisation. At the United Nations Climate Change Conference (COP 28) in 2023, there were calls to triple renewable energy capacity globally, transition away from fossil fuels, and accelerate zero- and low-emission technologies. With extensive global engineering, development and operating experience, Keppel's Infrastructure segment is at the forefront of providing sustainability solutions and services in areas such as renewables, clean energy and decarbonisation.

The global energy transition and climate action are driving demand for Keppel's renewables, clean energy, decarbonisation and environmental solutions.

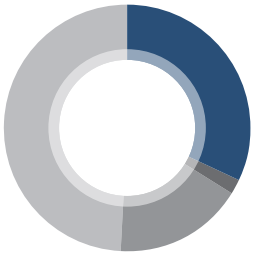
As part of a horizontally integrated value chain, Keppel's Infrastructure Division works with the Fund Management and Investment platforms to build quality asset pipelines for Keppel's private funds and listed infrastructure trust. Focused on an asset-light model with recurring income, the Infrastructure Division provides Energy-as-a-Service (EaaS) solutions on subscription, enabling firms to decarbonise their assets and operations with minimal upfront investments. The Division also confers significant strategic advantages to the Real Estate and Connectivity segments by working with them to future-proof their assets and solutions with low-carbon energy.

INTEGRATED POWER BUSINESS

The Singapore Wholesale Electricity Market (SWEM) was volatile in 1H 2023 amidst geopolitical tensions, increased electricity demand and inflationary pressures, which resulted in high electricity prices. However, following measures put in place by the Energy Market Authority (EMA) to stabilise the energy market and enhance Singapore's energy security and resilience, electricity prices have stabilised since 2H 2023. Despite the volatile market conditions, Keppel's integrated power business performed strongly, bolstered by growth in contracts and improved operational efficiency.

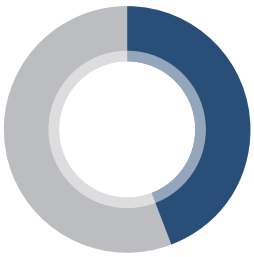
Keppel's market position in the SWEM expanded, with its commercial and industrial retail market share increasing to 15% (excluding SP Services) as at December 2023. In addition, Keppel signed a multi-year Power Purchase Agreement with GlobalFoundries (GF) in January 2024 to provide 150 to 180 MW of electricity annually to power GF's Singapore site commencing May 2024. Come 2026, GF will also be a significant offtaker from the upcoming hydrogen-ready Keppel Sakra Cogen Plant, contracting about 25% of the plant's total generation capacity

ENERGY PORTFOLIO (GW)



Gas	1.9
Renewables – Hydro	0.1
Renewables – Wind	1.0
Renewables – Solar	2.9
Total	**5.9**

LONG-TERM SUPPLY & SERVICE CONTRACTS ($ billion)
as at 31 December 2023



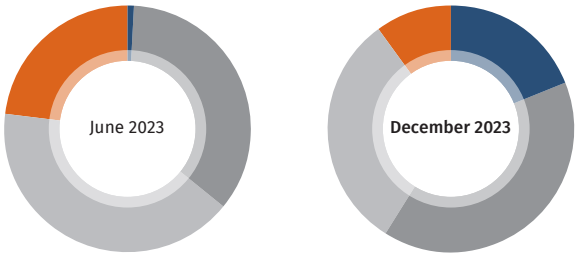
Operations & Maintenance	1.9
EaaS	2.4
Total	**4.3**

for over 15 years. By the end of 2023, about 60% of Keppel's contracted generation capacity was locked in for three years and above, a sharp increase from just 36% six months prior in June 2023.

As the first and only licensed company to start importing low-carbon power via the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP) in 2022, Keppel is well-placed to help pioneer the decarbonisation of Singapore's power sector. In 2023, Keppel was awarded two conditional approvals from EMA to import low-carbon electricity from renewable energy sources in Cambodia and Indonesia respectively. Keppel's Infrastructure Division will continue working with its partners to finalise the technical, commercial, and regulatory aspects of its electricity import projects, with the goal of providing reliable and competitive low-carbon electricity to customers.

While market conditions may continue to be volatile, Keppel's integrated power business is largely insulated against fluctuations in energy prices, bolstered by its end-to-end value chain. To sustain growth and performance, Keppel will also continue to actively pursue opportunities to provide longer-term energy solutions which will contribute to multiple recurring income streams.

POWER CONTRACTS[1] (%)



	June 2023	**December 2023**
>10 years	1.0	**19.0**
3-10 years	35.0	**40.0**
1-3 years	41.0	**31.0**
<1 year	23.0	**10.0**
Total	100.0	**100.0**

[1] Based on Keppel's existing generation capacity.

DECARBONISATION & SUSTAINABILITY SOLUTIONS

Energy-as-a-Service

Decarbonisation technologies play a crucial role in the energy transition, but they often require heavy capital investments which can be prohibitive for businesses. Keppel's Infrastructure Division provides EaaS, a cost-effective, subscription-based solution, to help drive widespread adoption of cleaner energy solutions.

The EaaS solution, which integrates Keppel's capabilities in district cooling, solar energy and electric vehicle (EV) charging, has gained strong traction since its introduction in late 2022. About $1.6 billion worth of EaaS contracts were secured in 2023, out of a total of $2.4 billion worth of EaaS contracts secured as at end-December 2023. These include Keppel's appointment as the District Cooling operator for the upcoming Jurong Lake District in Singapore which has a total design capacity of over 29,000 Refrigeration Tonnes, as well as new contracts from across China, Thailand and Vietnam.

Keppel manages two state-of-the-art operation nerve centres in Singapore and Vietnam, which underpin the efficiency, reliability and scalability of Keppel's EaaS solutions. At these centres, the Infrastructure Division can remotely monitor and optimise all its energy assets in real-time, leveraging digital technology, artificial intelligence and machine learning.

Meanwhile, Keppel's EV charging brand, Volt, has expanded its network to over 200 chargers as at end-December 2023, riding on strong growth in the adoption of electric vehicles in Singapore.

More recently in February 2024, Keppel was appointed to design and build a large-scale solar photovoltaic (PV) system at Changi Airport, which Keppel will own and operate for 25 years. The solar PV system can generate enough solar energy to allow Changi Airport Group to reduce its carbon emissions by about 20,000 tonnes each year.

Further afield, Keppel will seek opportunities to offer EaaS alongside its real estate and connectivity solutions to drive asset-light growth.

Environment

Keppel's proven waste-to-energy (WTE) technology enables effective solid waste management and energy recovery, and also helps cities avoid methane emissions which might arise if the waste was sent directly to landfills. More details on the avoided emissions arising from Keppel's solutions will be disclosed in Keppel's Sustainability Report to be published in May 2024.

In 2023, Keppel made good progress constructing the Hong Kong Integrated Waste Management Facility (IWMF) and Singapore's Tuas Nexus IWMF, which attained about 80% and over 50% completion respectively by year-end. Keppel has successfully delivered the prefabricated modules for the Hong Kong IWMF, the first to adopt the modularisation method of construction within the global WTE industry.

In the UK, Keppel secured the renewal of the five-year Technical Support Agreement for the Runcorn Phase 1 & 2 Energy-from-Waste (EfW) facilities. Designed and built by Keppel, the combined Runcorn EfW is one of the largest and most efficient EfW projects in the UK.

Keppel's $4.3 billion infrastructure supply and service contract backlog as at end-2023 provides earnings visibility over the next 10-15 years.

As a leader in environmental solutions, Keppel is working on integrating carbon capture technology with its WTE plants to create a carbon-negative solution for waste management. During the year, Keppel successfully completed feasibility and pre-Front End Engineering Design (FEED) studies for the integration of a large-scale carbon capture facility with the Runcorn EfW. As the original designer and builder of the Runcorn EfW, Keppel is well positioned to advise on the possible synergies between the Runcorn EfW facility and the proposed carbon capture facility.

Meanwhile, in Singapore, Keppel and the National Environment Agency are in advanced stages of a joint study on the feasibility of implementing carbon capture technology at selected WTE plants in Singapore.

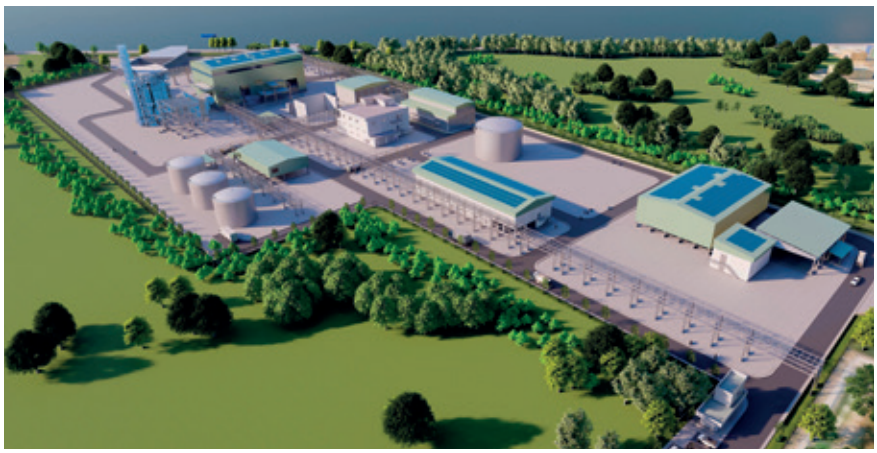
New Energy

Keppel is intensifying its work with international partners on supply chains for low-carbon hydrogen and hydrogen-derived fuels, such as green ammonia, as part of Keppel's plans to capitalise on the growth of the hydrogen economy.

In May 2023, Keppel joined the Central Queensland hydrogen project (CQ-H2) to develop one of the largest green hydrogen projects in Australia as part of an international consortium. FEED studies for the CQ-H2 project have kickstarted with support from the Australian Renewable Energy Agency. Leveraging the green hydrogen feedstock from CQ-H2, Keppel is developing a downstream green ammonia project in Gladstone with Incitec Pivot Limited, which can produce up to 850,000 tonnes per annum of green ammonia for Australia as well as international export.

In Singapore, Keppel signed a Memorandum of Understanding (MOU) with ExxonMobil to explore low-carbon hydrogen and ammonia for scalable commercial and industrial applications that can support both Jurong Island's sustainability goals and Singapore's hydrogen strategy. The collaboration would help to realise the vast potential of low carbon ammonia as a fuel as well as feedstock for refinery and petrochemical operations.

Besides low-carbon solutions, Keppel is also actively engaging its partners on various sustainability solutions including bioenergy. In 2023, Keppel signed separate MOUs with GenZero, Masdar and AM Green to explore projects in areas such as biomethane, biomethanol and Sustainable Aviation Fuel. Bioenergy, a form of renewable energy generated from organic materials such as purpose-grown crops and organic waste, is poised to play a pivotal role in the ongoing energy transition and offers numerous advantages to decarbonise hard-to-abate industries such as aviation and the heavy-duty transport sector.



When completed, the hydrogen-ready Keppel Sakra Cogen Plant will be the most cutting-edge and energy efficient power plant in Singapore, which will translate into superior performance, including lower emission intensity and higher operational flexibility.