CLP 中電

Together for Sustainability, Powering Tomorrow



2024

Sustainability Report

Stock Code: 00002

Customers

Highlights

Stakeholders' areas of interest

- Customer portfolio
- Access to reliable energy
- Asset management
- Energy services and solutions
- Customer privacy
- Customer satisfaction
- Artificial Intelligence
- Security management
- Cyber security
- Physical security *(online only)*
- Emergency and crisis management

Relevant sustainability agenda

- Energy growth opportunities
- Digital innovation and cyber security

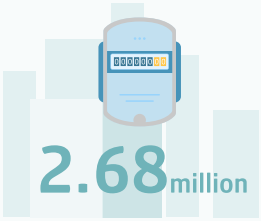
Outcomes for stakeholders

Maintained a world-class reliability of
99.999%
in Hong Kong





Signed a Memorandum of Understanding (MoU) with **Creative Property Services Consultants Limited** to strengthen its energy management capabilities



Connected over 2.68 million smart meters for CLP Power's residential and Small and Medium Enterprises (SME) customers since 2018

EV charging infrastructure has been **installed in more than 9,000 residential parking bays** across Hong Kong by Smart Charge



CLP is committed to delivering reliable and affordable energy to its customers. By leveraging innovative technologies and customised services, CLP enhances customer satisfaction while promoting energy conservation and supporting renewable energy adoption. By actively engaging with customers and stakeholders, CLP is addressing their evolving energy needs and fostering strong relationships, as well as contributing to sustainability and community wellbeing.

Customer portfolio

HKFRS S2/SASB reference: IF-EU-000.A; GRI reference: EU3

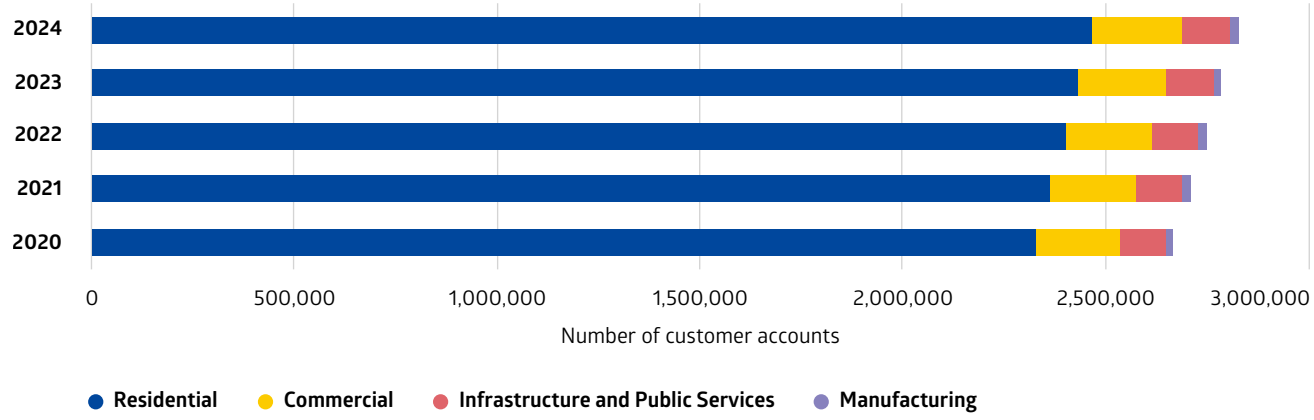
CLP operates retail businesses in Hong Kong and Australia, each characterised by distinct market structures, regulatory requirements, electricity demand, customer preferences and cultural norms. In 2024, the number of customer accounts in Hong Kong in residential, commercial and infrastructure and public service sectors increased but decreased in the manufacturing sector. However, there was an overall increase in the commercial and industrial (C&I) sectors.

CLP Power is the sole electricity provider for Kowloon, the New Territories and most of the outlying islands in Hong Kong. It serves about 2.83 million customers accoutning for over 80% of Hong Kong's households. Total electricity sold in 2024 was 36,125GWh.

Despite its status as a mature market, Hong Kong continues to experience growing demand for electricity. This is largely being driven by territory-wide development and infrastructure projects, as well as new local railway infrastructure projects. Due to Hong Kong's Northern Metropolis Development Strategy, it is essential to ensure highly reliable power supplies to support this ambitious transformation of the New Territories into a major urban centre and technology hub.

Hong Kong customer account breakdown

The number of customer accounts has continued to grow gradually over the last five years, mainly from the residential sector.

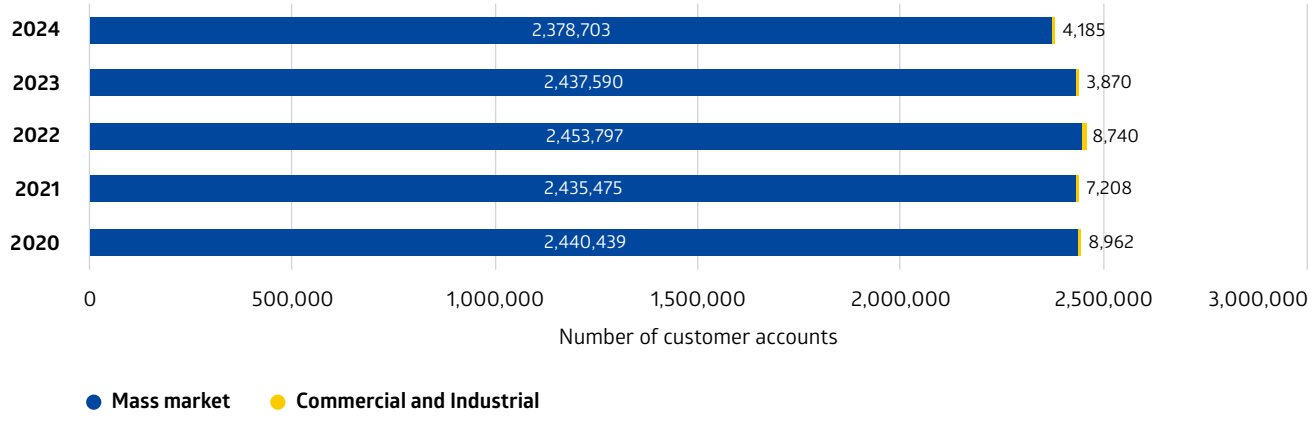


	2024	2023	2022	2021	2020
Residential	2,474,155	2,439,557	2,407,225	2,369,217	2,333,901
Commercial	218,266	214,616	212,251	210,821	208,150
Infrastructure and Public Services	121,479	118,548	115,404	113,956	112,245
Manufacturing	16,511	16,923	17,191	17,427	17,540

EnergyAustralia operates as a retail energy provider, selling electricity and gas to customers in New South Wales, Victoria, South Australia, the Australian Capital Territory and Queensland (electricity only). It is among approximately 30 retailers active in the key markets of New South Wales and Victoria.

Australian customer account breakdown

In 2024, total customer accounts declined by 2.4% or around 58,572 accounts. Intense retail competition has persisted and the rising cost of living has prompted more customers to explore the market in order to lower their energy costs. Other retailers have offered large upfront credits alongside deep discounting prompting some customers to switch retailers.



Access to reliable energy

HKFRS S2/SASB reference: IF-EU-550a.2, IF-EU-000.C; SASB reference: IF-EU-240a.3, IF-EU-240a.4; GRI reference: 203-1, EU4, EU12, EU26, EU27, EU28, EU29, EU30

CLP calculates the availability factor for its generation assets in terms of the amount of time that the asset is able to produce full load equivalent electricity over a period, divided by the amount of time in that period. Typical values range from 70% to 90%. CLP aims to maintain an availability range of 90% and above for its newer assets.

Targets for each asset are set annually and are included in the business plan. Performance is reported on a weekly basis to senior management. Any significant variances in performance are analysed and appropriate corrective actions taken.

Strategies and procedures

While CLP has generation businesses across the Asia-Pacific region, Hong Kong is the only location where its business is vertically integrated, so that it provides generation, transmission and distribution of power as well as retail services. CLP Power is regulated by the Hong Kong SAR Government under the Scheme of Control (SoC) Agreement, which requires the Company to provide a sufficient and reliable electricity supply at a reasonable price and in an environmentally responsible manner.

In Hong Kong, CLP Power employs various measures to maintain high supply availability and high reliability. These include:

- Regularly upgrading generation and network facilities to meet increasing electricity demand;
- Maintaining sufficient generating capacity to meet forecast demand as well as to cope with both planned and unforeseen outages;
- Strengthening energy security by providing access to competitive gas supplies from global markets using Floating Storage and Regasification Unit (FSRU) technology;
- Implementing the demand response programme in a selected distribution network to resolve temporary local peak demand, improving supply reliability while optimising the utilisation of existing assets. This programme is also helping CLP better prepare for the new demand arising from increasing Electric Vehicles and Renewable Energy systems penetration;
- Using cage drones equipped with a Light Detection And Ranging (LiDAR) system and sensors, as well as crawler robots, to undertake flexible and regular inspections of narrow and physically constrained areas of power stations, to enhance operational efficiency;

- Fully deploying a centralised digital Asset Health Monitoring System to monitor and assess the health condition of critical power supply equipment to formulate effective preventive maintenance plans;
- Installing appropriate lightning protection systems to safeguard outdoor power equipment against lightning strikes, thereby reducing the occurrence of voltage dips;
- Enhancing anti-flooding measures for high-risk substations;
- Accelerating the replacement of identified assets to improve power system performance;
- Deploying a smart management system (Grid-V) to enhance the real-time monitoring of critical power equipment and its operating environment;
- Enhancing collaboration with relevant government departments, community stakeholders and property management companies and manpower support in handling emergency events to support customers affected by power incidents;
- Developing a well-trained and competent workforce to operate and maintain the system.

In addition to recruiting professionals from the market, CLP also trains young engineering talents through systematic training schemes. It established the CLP Power Academy in 2017 to collaborate with overseas and local tertiary institutions to train electrical and mechanical engineering professionals, thus creating a healthy succession pipeline for the power industry.

To guarantee the availability and dependability of its power supply, CLP is working to strengthen its technological capabilities and enhance its organisational development across the Group. Departments collaborate to design for an integrated management framework by sharing insights gained from regional experiences. This procedure is lowering the Group's overall operations risk and contributing to improved portfolio management.

A number of innovative projects to promote energy availability and reliability are currently being pursued in the areas of robotics, asset health, video analytics, energy storage, building information modelling (BIM) and automation. These projects have been initiated both by third parties and CLP's own engineers, who are developing innovations based on their own operational experience.

Transmission network

To keep pace with the territorial development of Hong Kong, CLP conducts an annual review of future transmission network developments, assessing the latest system maximum demand forecast, as well as reviewing area load growth, infrastructure development and generation development for future planning.

Major transmission assets undergo annual maintenance and improvement programmes based on an analysis of current conditions, performance of the assets, levels of investment and risk.

CLP Power's reliability performance

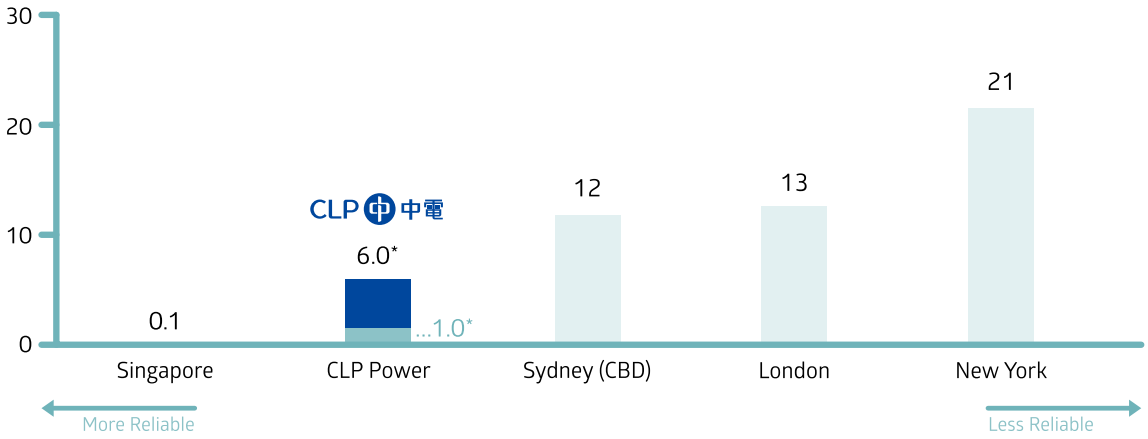
In Hong Kong, CLP has maintained its world-class supply reliability of 99.999%, surpassing the reliability performance of other major international cities such as London, New York and Sydney.

CLP's transmission and distribution network in Hong Kong serves approximately 80% of the city's overall population. At the end of 2024, CLP Power had approximately 17,123 km of circuits at medium or higher voltage. In addition, there were 250 primary and 15,759 secondary substations operating in Hong Kong. As of 2024, the average network loss for the past five years was 3.36%, slightly lower than the five-year average of 3.44% reported in 2023.

CLP uses a set of universally recognised supply reliability performance indicators from the Institute of Electrical and Electronics Engineers standard (IEEE 1366-2012) to monitor its system performance. It reports CLP's performance against these indicators quarterly to the Hong Kong SAR Government.

Comparison of reliability levels between cities

Unplanned customer minutes lost per year



Remarks:

1. *2022-2024 average for CLP Power was 6.0 minutes; Taking out the impact due to Major Event Day (such as cable bridge fire incident in Yuen Long in 2022, Typhoon Saola in 2023), the three-year average was 1.0 minute.
2. 2021-2023 average for all other cities.
3. There are no overhead lines in Singapore.

Supply reliability performance indicators and results for CLP Power

Indicator	Result
System Average Interruption Frequency Index (SAIFI)	
The average number of supply interruptions for each customer served. Both planned and unplanned interruptions are included.	• The three-year average SAIFI (2022–2024) was 0.26, meaning customers experienced a power interruption approximately once in four years during this period. This was slightly lower than last year's three-year rolling average of 0.27.
System Average Interruption Duration Index (SAIDI)	
The average duration of interruptions each customer may encounter in a given year.	• The three-year average SAIDI (2022–2024) was 0.30 hours, including both planned and unplanned interruptions. This was slightly higher than last year's three-year rolling average of 0.29.
Unplanned Customer Minutes Lost (Unplanned CML)	
The average duration of unplanned power interruptions per customer in a given year. These outages occur without prior notice and happen as a result of various factors such as weather events, third-party damage to the network and equipment faults.	• The three-year rolling average (2022–2024) of unplanned CML was about 6.0 minutes[1], which was the same as last year. CLP Power maintains a world-class supply reliability of 99.999% in Hong Kong, which is higher than that of other major international cities as shown in the diagram above.

1 Taking out the impact due to Major Event Day (such as cable bridge fire incident in Yuen Long in 2022 and Typhoon Saola in 2023), the three year average was 1.0 minute.

Asset management

HKFRS S2/SASB Reference: IF-EU-000.D; GRI reference: 301-1, 302-1, 302-3, 302-4, 302-5, EU11

CLP is constantly looking for ways to improve the operational efficiency of its assets so that they remain compliant with the increasingly stringent regulations on emissions and fuel efficiency in certain jurisdictions. In addition, improvement opportunities continue to arise from innovation and optimisation, particularly through the leveraging of data analytics.

Energy efficiency for its asset operation

On the energy conservation and efficiency front, CLP continues to strengthen its electricity supply networks and infrastructure to offer high-quality, efficient and reliable electricity in its operating regions. The Company uses innovative technologies and has developed energy management programmes and initiatives through environmental management processes and tools. In CLP's major offices, building energy management systems with energy-efficient features have been deployed, with some upgraded with artificial intelligence algorithms to support smart energy control, particularly for air conditioning. Regular energy audits assess energy consumption efficiency and identify opportunities for improvement. CLP Power also sets energy-saving targets with a defined timeline for selected offices. An internal energy use target ensures energy utilisation remains below a reference Energy Utilisation Index (EUI).

Fuel use and energy sent out

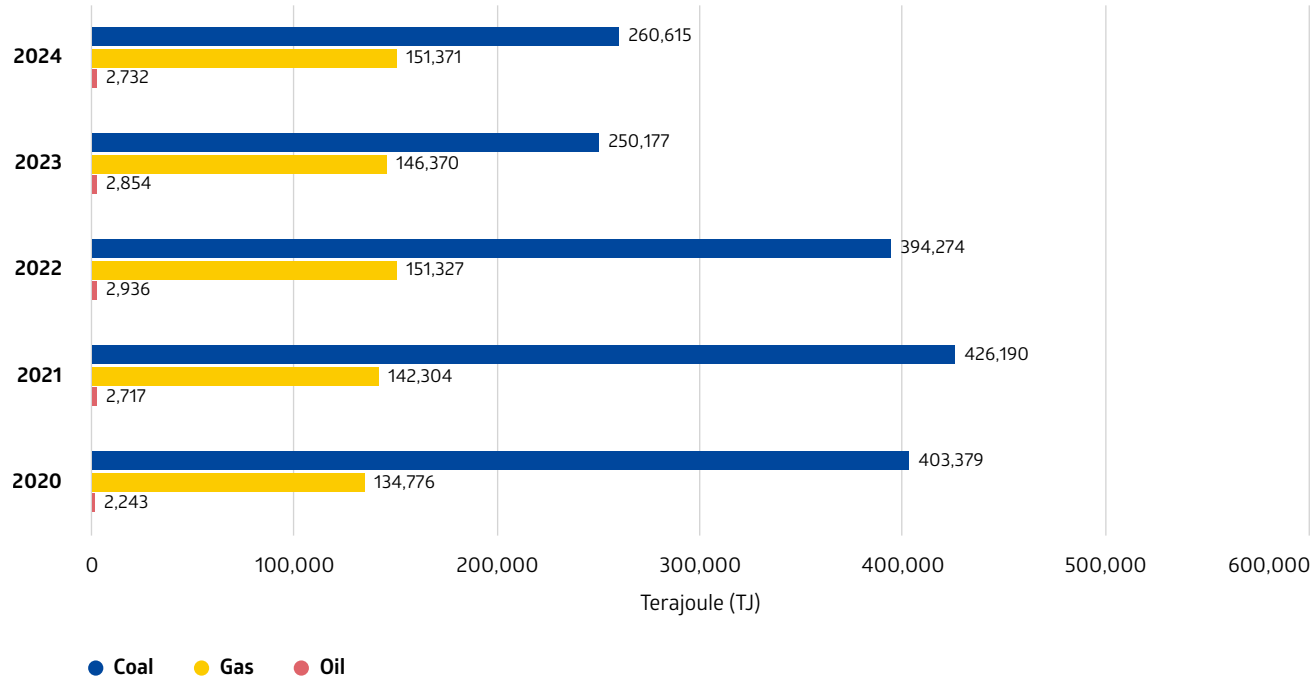
In 2024, the consumption of coal and gas for power generation increased by 4% and 3% respectively compared with 2023 (on an operational control basis). Accordingly, electricity sent out from coal assets decreased by 1%, while electricity sent out from gas assets increased by 3% (on an equity plus long-term capacity and energy purchase basis).

CLP reports the annual operating performance of those of its generation assets that fall within the reporting scope. The asset performance metrics include availability, generation sent out, thermal efficiency and energy intensity.

Download CLP's asset performance statistics

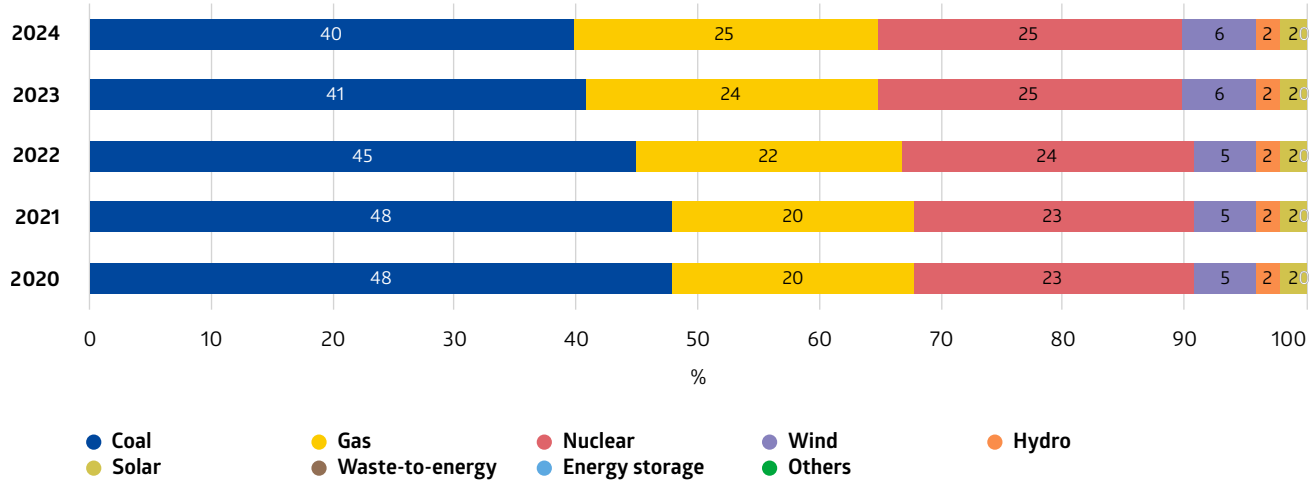
Annual fuel consumed for power generation

Following the successful commissioning of the new gas-fired unit at Black Point Power Station, Hong Kong advanced its decarbonisation efforts in 2024 by reducing coal reliance. Compared to 2023, coal usage in Hong Kong decreased by 10%, while gas consumption increased by 5%. In Australia, coal consumption increased by 10% due to higher availability and utilisation of Mount Piper Power Station. Conversely, gas usage dropped by 14%, attributed to reduced market demand and a scheduled major outage at Tallawarra Power Station in 2024. Overall, fossil fuel consumption for CLP's operational control thermal assets saw a slight increase, with coal and gas consumption for power generation rising by 4% and 3% respectively compared to 2023.



Energy sent out by asset type (on an equity plus long-term capacity and energy purchase basis)

CLP maintained a steady electricity output in 2024, generating 79,760 GWh on an equity plus long-term capacity and energy purchase basis, similar to the 79,512 GWh produced in 2023. The proportion of energy generated by each asset type showed minimal variation.



Energy services and solutions

GRI reference: 2-6, 302-5

The CLP Power Customer Service Quality Policy includes a commitment to support customers in using CLP products and services more efficiently and effectively.

In Hong Kong, CLP Power has worked closely with the Hong Kong SAR Government on the Scheme of Control (SoC) Agreement. The Plan includes:

1. **Performance targets:** Under the current SoC Agreement, targets have been set on supply restoration, energy saved annually, number of buildings or customers supported, the CLP Eco Building Fund, Electrical Equipment Upgrade Scheme and Energy Audit.
2. **Peak Demand Management programmes:** This enables commercial and industrial customers to help lower the overall system demand, reducing the need for investment in new generation units in the long term. The programme leverages artificial intelligence (AI) developed in partnership with Autogrid to help lower demand. The target is to achieve a reduction of up to 60MW from the demand peak.
3. **A new five-year energy-saving target:** CLP Power must achieve energy savings of at least 4% on the basis of average annual sales within a five-year period in order to earn incentives under the SoC Agreement. More incentives can be earned if energy savings reach 5%.

Investing in innovation

In addition to its SoC Agreement obligations, CLP has harnessed its innovation abilities and digital capability to develop a range of customer-facing solutions and energy services.

CLP has a dedicated venture capital team (Group Ventures & Investments) that invests in a range of early-stage companies focused on innovative, energy-related technologies and business models. In addition, CLP's Research & Ecosystems functions integrate the Company's research capabilities and ecosystem activities in a single team. This enables a more systematic and synergistic process of formulating strategic focus and long-term vision, extracting strategic knowledge and value, building up research networks and ecosystems worldwide and driving innovation delivery across the CLP Group.

CLP has established a global open innovation platform designed to identify solutions that address operational challenges, enhance efficiency and unlock new business opportunities. Committed to continuous innovation, CLP actively participates in accelerator programmes aimed at discovering novel solutions and promoting innovative practices. Through initiatives like Free Electrons and the Phoenix scouting programme, CLP collaborates with startups worldwide. These partnerships enable CLP to gain valuable market insights and enhance its solution offerings, strengthening its ability to meet customer needs and effectively navigate the energy transition.

CLP's research initiatives are dedicated to identifying emerging ideas and technologies that could have a significant long-term impact on CLP's business and the energy transition. CLP has established robust research networks and partnerships with local and international associations, research institutes and universities to collaborate on key projects. Notably, CLP is exploring transport decarbonisation through its Research Fellowship Scheme and studying the utilisation of urban flexible load resources to enhance power system flexibility. This includes potential joint research initiatives, which are being explored with universities in Hong Kong and Mainland China.

Summary of energy services and solutions

Improving energy efficiency	
Products and services	**Updates in 2024**
Cooling-as-a-Service (CaaS) Cooling systems are usually a building's largest source of power consumption. CLP*e* provides targeted solutions such as chiller retrofitting and replacement services, CaaS and district cooling solutions to enhance energy efficiency and reduce carbon emissions of building complexes. Under the Build-Own-Operate-Transfer model, CLP*e* will fund, design, construct, operate and maintain the new cooling system over a period of time at an agreed rate to enhance energy efficiency and reduce carbon emissions of building complexes.	• In May 2024, CLP*e* partnered with **Pacific Textiles Holdings Limited** to provide Cooling-as-a-Service to its subsidiary Pacific Panyu Textiles Limited in Nansha, Guangzhou. CLP*e* will build a new centralised electricity chiller plant system which is more energy-efficient and environmentally friendly to replace the existing distributed, aged absorption chiller plant system which is expected to reduce carbon emissions by about 42,700 tonnes of carbon dioxide annually. This aims to become an energy-saving benchmark project for the industrial segment in Nansha and Guangzhou. • CLP*e* signed a Memorandum of Understanding (MoU) with **Hysan Development Company Limited** to explore innovative energy management solutions. These include a distributed district cooling system in commercial properties in Causeway Bay, a major shopping district in Hong Kong.
Solar-as-a-Service (SaaS) CLP*e* offers seamless, one-stop services to help customers install and operate solar power systems over a period of time at an agreed rate. Solar photovoltaics (PV) systems convert solar energy into electricity to support energy demand and allow customers to feed electricity back into the grid.	• CLP*e* signed Build-Own-Operate-Transfer Service Agreements with **Link Real Estate Investment Trust,** encompassing a total of 23 solar generating systems. • In June 2024, CLP*e* has teamed up with the **City University of Hong Kong** to install a solar power system across the campus. Nearly 2,000 high-efficiency bifacial solar panels will be fitted on the rooftops of more than 30 buildings on the campus by CLP*e*. The system is expected to generate approximately 1.15GWh of electricity per year. • CLP*e* is expanding the **floating PV system at San Tin Polder** in support of the Government's sustainable development plan. • In August 2024, a commissioning ceremony was held at MTR Corporation (Shenzhen) Limited (hereinafter referred to as **MTR (Shenzhen)**) to mark the completion of the distributed solar PV system and electric vehicle charging system. CLP*e* installed over 5,600 solar panels on the aluminium alloy roof of the car compartment inspection and washing depot, expected to generate 3,140MWh of clean energy and eliminate over 1,600 tonnes of carbon emissions annually.

Improving energy efficiency	
Products and services	**Updates in 2024**
Battery Energy Storage System (BESS) as-a-Service Tailor-made BESS solutions can greatly improve business performance by providing safe, efficient and secure energy storage. CLP*e* provides a one-stop design, build and implementation service, technical support and maintenance work and collaborates with its customers over a period of time at an agreed rate to develop fully integrated energy storage solutions that meet their specific needs.	• In 2024, CLP*e* deployed **94 Battery Energy Storage Systems** across construction sites operated by prominent construction companies in Hong Kong. The replacement of conventional diesel generators resulted in a reduction of over 2,500 tonnes or a 75% reduction in carbon emissions compared to those created by diesel generators. These BESS installations, powered by advanced lithium-ion batteries, minimise the risk of system instability during maintenance while operating at significantly lower noise levels. They exemplify CLP*e*'s commitment to sustainability and safer construction practices. • In September 2024, CLP*e* facilitated the launch by **Hip Hing Construction Co., Ltd** of Hong Kong's first mobile BIM CAVE system, providing the Company with a compact and mobile BESS as a stable and reliable power source.
Energy efficiency improvement for buildings • CLP Eco Building Fund: The fund provides subsidies for energy efficiency improvement works for residential, commercial and industrial buildings. • CLP Electrical Equipment Upgrade Scheme: The scheme for business customers provides subsidies to customers, especially SMEs, to replace or upgrade their lighting and air-conditioners to more energy-efficient models.	• The **CLP Eco Building Fund** provides HK$100 million a year to subsidise improvement works for a target number of 400 residential blocks and C&I buildings that will enhance the energy efficiency of their communal areas. The initiative aims to save 48GWh of energy annually. • In 2024, customers saved around 50GWh of electricity from over 600 buildings with the support of the **CLP Eco Building Fund**. • Since the launch of the **CLP Electrical Equipment Upgrade Scheme** in 2019, over HK$140 million in subsidies has been offered to C&I customers for replacing or upgrading their electrical equipment to more energy-efficient models.
Energy efficiency improvement for businesses CLP Power works in partnership with institutions to offer flexible and innovative financing solutions to businesses.	• CLP Power, Link Asset Management Limited (Link) and DBS Bank (Hong Kong) Limited launched the **Low Carbon Rewards Programme** in 2024 to support the transition of Link's small- and medium-sized enterprise tenants to low-carbon operations. This initiative combines the partners' expertise in asset management, banking and energy management, offering incentives such as subsidies for renewable energy certificates and banking privileges. The programme aims to foster a sustainable business environment, benefiting both merchants and consumers by promoting sustainable practices and enhancing revenue opportunities. • CLP Power, CLP*e* and **Gaw Capital Partners** have signed a Memorandum of Understanding (MoU) to enhance energy efficiency across various premises. This initiative aims to reduce carbon emissions and support a sustainability-linked loan of HK$14.4 billion, fostering more sustainable development within Gaw's portfolio.
Peak demand management • Demand Response programmes are offered to C&I and selected residential customers in Hong Kong to lower overall system demand, reducing the need to invest in new generation units. • EnergyAustralia's PowerResponse includes a residential demand response programme and a contracted demand response programme for commercial customers.	• In Hong Kong, CLP Power **achieved around 144MW and 93MW demand cut** from residential and C&I customers respectively in 2024. • EnergyAustralia's PowerResponse has **a current contracted capacity of 406MW** involving over 575,712 household customers and 626 business and large industrial customers.
Energy management technology • Launched in 2019, CLP's Smart Energy Connect (SEC)'s solutions cover the entire value chain from energy supply to energy consumption and include innovations for carbon-free energy, grid modernisation, power storage, EVs, building energy management and carbon offsetting.	• Since 2018, CLP Power has connected **over 2.68 million smart meters** for its residential and SME customers in an effort to promote low-carbon living and further improve the safety and dependability of the power supply. CLP Power expects to replace all its residential and SME customers' conventional electricity meters with smart meters by 2025. • As of 31 December 2024, EnergyAustralia had approximately **895,000 smart meters installed** for its customers across Australia. It is entering into the Legacy Meter Replacement Plan (LMRP) in December 2025, which aims to replace all basic meters by the end of 2030, increasing the total number of smart meters to over 2 million.

Improving energy efficiency	
Products and services	**Updates in 2024**
• A mass rollout of smart meters to all CLP Power customers, from 2018 to 2025, is supporting Hong Kong's Smart City transformation.	
Energy audits CLP Power provides free energy audits and various consulting services to C&I customers to help them understand their energy needs and identify opportunities to reduce their energy use and hence their operating costs.	• In 2024, CLP Power had exceeded the annual total electricity saving target of 48GWh, and helped its C&I customers save around 50GWh of electricity with **more than 600 energy audits completed**.
Energy data and analytics • At EnergyAustralia, PurchasePro is a self-service web portal which allows business customers to purchase an agreed load progressively rather than commit to a price at a single point in time. • Smart Energy Online is an online assessment and management tool for C&I customers in Hong Kong. Similarly, EnergyAustralia's InsightsPro allows its C&I customers to access real-time consumption and cost data to optimise their business's energy usage.	• Approximately one third of EnergyAustralia's C&I customer load is managed by PurchasePro and over 1,000 EnergyAustralia customers have access to InsightsPro. • Over 2,500 C&I customers in Hong Kong use Smart Energy Online to manage their energy consumption and improve their energy efficiency.
CLP Retro-Commissioning and Retrofitting Training Upgrade Programme CLP Power offers free retro-commissioning and retrofitting training courses comprising classroom trainings and field visits for energy management employees and engineers who already have a basic understanding of retro-commissioning and retrofitting. The training covers advanced topics and techniques such as data analysis, system diagnosis, measurement and verification.	• In 2024, CLP Power allocated HK$1.15 million to launch the **CLP Retro-Commissioning and Retrofitting Training Upgrade Programme**. The programme provides training courses covering a variety of energy-saving solutions including retro-commissioning and building services replacement projects for employees involved in energy management across different businesses. It aims to encourage C&I customers to retrofit and decarbonise their existing premises for greater energy efficiency and lower operating costs in the long run.

Using electricity more widely for transport industry	
Products and services	**Updates in 2024**
Electric Vehicle Charging-as-a-Service • Electric Vehicle Charging-as-a-Service is a one-stop fleet charging offering that enables fleet customers to enjoy flexibility in their fleet electrification journey while saving capital investments related to charging infrastructure and software. CLP*e* will invest, design, build, operate and maintain Electric Vehicle Charging-as-a-Service charging solutions in their own or other premises over a period of time at an agreed rate.	• In 2024 CLP*e* signed a number of Electric Vehicle Charging-as-a-Service contracts with target customer groups including electric minibus supplier, corporate fleet operator and electric taxi provider. This reinforces the proposition CLP*e* is building by providing convenient fast charging stations for commercial use. • In August 2024, CLP*e* launched the CLP*e* **Charging mobile app** for the use of CLP*e* public charging services. By the end of 2024, CLP*e* expanded its charging network to 6 different locations with more than 100 charging bays targeting both overnight and top-up fast charging needs of corporate fleet and taxi businesses. • In addition to pay-as-you-go charging service, customers can also sign subscription contracts with CLP*e* with committed usages over certain periods at agreed rates. During the contract period, customers will pay a monthly fee to CLP*e* which covers the EV charging service and software license fees, thus, minimising the investment costs, company assets, charging location constraints and manpower needed for electrification. Other benefits include 24-hour customer support services and cloud management platform. The cloud management platform and mobile app designed by CLP*e* enable customers to easily manage their fleet users, make adjustments according to their operational needs and get the real-time availability status of charging facilities and the charging status of EVs with electricity consumption data.
Electric vehicle infrastructure • CLP Power continues to support green motoring and the electrification of vehicles in Hong Kong – a long-term government policy objective set out in the *Hong Kong Roadmap on Popularisation of Electric Vehicles*. • In 2016, CLP formed Smart Charge (HK) Limited a joint venture with HKT to provide a one-stop service for EV charging. • The CLP Charge Point Operator platform and EV driver app were successfully launched in 2023, both of which are instrumental to the electrification of the CLP fleet and the creation of a future business model that includes charging-as-a-service. • In Australia, EnergyAustralia has outlined plans to support the transport industry with vehicle electrification by working with EV manufacturers, fleet operators and their customers to plan and build the charging infrastructure they need.	• CLP*e* **eMobility** has installed close to 600 EV chargers in the past 2 years, out of which over 100 EV charging bays with majority of direct current fast chargers are connected to the CLP*e* public charging network, promoting commercial EV development in Hong Kong. • To date, **Smart Charge** has designed, installed and is currently managing EV charging infrastructure in residential car parks in Hong Kong covering more than 9,000 parking bays. • In 2024, EnergyAustralia embarked on the first stages of rolling out **a commercial green transport package**, to support its business and C&I customers (primarily fleet customers such as bus depots), involving of EV charging systems to power their fleets. Its aim is to help its customers further decarbonise over time by powering a portion of their vehicle charging from solar and battery systems and participating in the Virtual Power Plant (VPP). • EnergyAustralia's approach represents the next horizon for emissions reduction in the broader market as it addresses **'Scope 4 emissions'**, through initiatives and products that help to avoid or reduce emission in other market segments or parts of the value chain. EVs are good examples of avoided emissions. While the production process generates emissions (as is the case for all vehicles), compared to vehicles with traditional internal combustion engines, EVs generate lower emissions over their lifetime. As an energy company, EnergyAustralia has a unique position in facilitating greater efficiency, electrification and electric vehicle infrastructure and contributing to lower emissions throughout the whole Australian economy. • In parallel, operators of electrified fleets of vehicles will benefit from the continuing decarbonisation of the electricity they access for charging from the grid as the national electricity market continues to decarbonise, from lower electricity consumption as vehicle efficiency continues to improve and from lower emissions if they invest in expanding "behind the meter" solar and battery systems.

Enabling zero-carbon electricity supply	
Products and services	**Updates in 2024**
Decentralised renewable energy/rooftop solar CLP offers feed-in tariffs and rooftop solar for its customers in support of the decentralisation of energy and the growth of renewable energy. • The Feed-in Tariff (FiT) Scheme in Hong Kong enables customers to earn FiT payments by installing renewable energy system on their premises and connect the system to the CLP grid. • The array of decentralised generation products has expanded in Australia to now include residential rooftop solar and batteries, community batteries and support the 150MW VPP.	• From the commencement of the **FiT Scheme** in mid-2018 to the end of 2024, CLP Power received over 26,600 applications. Approximately 96% of the applications, representing a total capacity of around 404MW - equivalent to the annual electricity usage of around 99,700 residential customers, have been approved. About 23,800 applications have been completed and connected to the grid. • A **bring-your-own battery VPP product ("Battery Ease")** was launched as part of the growing Behind the Meter portfolio to provide solutions for residentials customers that already have invested in a residential battery to both lower energy bills during peak periods and manage peak price events. For customers without rooftop space, a community battery product was also launched so that a broader set of customers can partake in Australia's decarbonisation journey.
Corporate Power Purchasing Agreements (PPAs) Businesses wishing to increase the direct renewable energy available to them may elect to enter Power Purchasing Agreements with CLP. PPAs provide customers with the most credible and efficient clean energy available. There has been continued interest in the direct purchase of renewables whether via annual purchasing or 24/7 granular matching. In response to this positive market momentum, CLP is leveraging its expertise in renewable energy assets, battery storage and energy management indicators to support its corporate customers.	• In October 2024, **CLP China, BASF and Envision Energy** signed a 10-year power purchase agreement to support BASF's adoption of 100% renewable energy at its manufacturing sites in Nanjing, Rudong and Zhenjiang in Jiangsu province. CLP will provide renewable energy to BASF's three manufacturing sites in Jiangsu from its solar projects in Wuxi, Huai'an and Yangzhou within the province and Envision Energy will help achieve green electricity settlement between CLP and BASF. As one of the largest external investors in the energy sector in Mainland China, CLP focuses on developing clean and renewable energy and providing green energy solutions to corporate customers. The agreement will contribute to BASF's corporate goal of achieving net-zero carbon emissions by 2050 and accelerate the low-carbon energy transformation of Jiangsu.

Offsetting emission that cannot be otherwise avoided	
Products and services	**Updates in 2024**
Energy attribute certificates (EACs) CLP offers a range of EACs to support customers' decarbonisation objectives. In Hong Kong, Renewable Energy Certificates (RECs) offer an alternative way for customers to support local clean energy generation. Each unit of a REC represents the environmental attributes of electricity produced by local renewable energy sources, generated or purchased by CLP Power. In Mainland China, CLP China's renewable assets issue Green Electricity Certificates (GECs) which are the only officially recognised renewable energy certificates in Mainland China. They can be used to meet obligations under Mainland China's mandatory Renewable Energy Portfolio Standard, or to support voluntary green power trading. In Australia, EACs serve as an option to reduce customers' Scope 2 emissions when decentralised renewables are not a viable option. For example, PureEnergy from EnergyAustralia helps customers support the production of green energy from government accredited renewable sources.	• In 2024, **close to 340GWh units of RECs** were sold in Hong Kong, a significant increase from the 173GWh units sold in the past year. • CLP China's wind and solar projects are eligible to apply for and issue GECs that can be traded through the market. For example, the Qian'an III Wind Power Station in Jilin province transfers GECs to a multinational data centre client in Ningxia province. • Around 11,000 EnergyAustralia customers have chosen a GreenPower government accredited PureEnergy option for their electricity supply.
Carbon Credit Brochure CLP has recently transitioned its carbon credit-related information from the website to a brochure. This change aims to present the information in a more straightforward and accessible format.	• The brochure is designed to provide a clear and concise overview of carbon credits, making it easier for readers to understand the benefits and processes involved. By simplifying the presentation, CLP hopes to enhance engagement and ensure that all relevant details are readily available to those interested in CLP's carbon credit initiatives.
Carbon Credits Carbon credits represent carbon emissions avoided as a result of emissions reduction projects. CLP encourages its customers and corporates to purchase these carbon credits to offset their unavoidable emissions. In addition to selling carbon credits, CLP also collaborates with many industries to deliver carbon offset initiatives.	• CLP continues to support customers' decarbonisation journey through carbon offsets. Customers can offset their unavoidable emissions with CLP Carbon Credits after taking actions to reduce their emissions. In 2024, Apraava Energy has sold over 900,000 tCO_2e units of offsets from their renewable generation assets to customers around the world. • As at the end of 2024, EnergyAustralia had commenced the process of discontinuing its carbon offset products, Go Neutral for mass market customers, and Business Carbon Neutral. This will occur progressively in accordance with the terms that apply to customers. EnergyAustralia's focus is now on helping its customers to directly reduce their emissions. EnergyAustralia, however, continues to recognise that high integrity carbon offsets have an important role to play in the energy transition and the achievement of Net Zero. It is noted that the use of such high integrity offsets, having regard to best practice guidance, will be required to mitigate residual emissions associated with achieving Net Zero for Scope 3 by 2050. In the context of EnergyAustralia's Tallawarra B project, Australian Carbon Credit Units are currently being used to offset its Scope 1 emissions.

Case Study

Strengthening the energy management capabilities of Creative Property

CLP Power has signed a Memorandum of Understanding (MoU) with Creative Property Consultants Limited (Creative Property) to improve the energy management capabilities of its property management team, and enhance the industry's resilience in the face of extreme weather conditions.

The newly signed MoU will deepen the partnership between CLP Power and Creative Property in order to address climate change and encourage a low-carbon lifestyle for residents. CLP Power will assist Creative Property in raising its property management practitioners' awareness of power quality, and will arrange for engineering teams to conduct site visits to housing estates and test electrical equipment. CLP Power will also provide professional advice, technical support and recommendations on the installation of post-voltage-dip operation devices for equipment sensitive to voltage dips such as lifts, to help minimise the impact of voltage dips on residents.

Creative Property currently serves more than 120,000 public housing properties, Home Ownership Scheme flats and private residential units in CLP Power's supply area, more than 90% of which are connected to smart meters. To promote digitisation, CLP Power will also collaborate with Creative Property to encourage residents to switch to eBills, mobile payment services and mobile apps, and embrace low-carbon lifestyle. CLP Power and Creative Property will also pool their respective strengths to develop various community activities and support services to enhance residents' knowledge of energy saving, decarbonisation and home electricity safety and to support people in need.



CLP Power and Creative Property sign a MoU to enhance Creative Property's resilience against extreme weather conditions and to promote energy saving, decarbonisation, digitisation, and community support, drawing on their combined strengths to combat climate change.

Case Study

Supporting the Government's decarbonisation goals through a waste-to-energy initiative at the West New Territories (WENT) Landfill

In support of the Government's policy of promoting waste-to-energy initiatives and increasing lower-carbon energy supply for customers, CLP Power has installed power generation units (namely WE Station) at the WENT Landfill, in operation since 2020.

The units utilise landfill gas produced locally at the landfill site for power generation, and the electricity generated will be transmitted to CLP Power's power grid. With the commissioning of the two new generation units in October 2024, the generation capacity of WE Station has increased to 14MW, making it the largest landfill gas power generation facility in Hong Kong. The project highlights CLP Power's dedication to the decarbonisation of Hong Kong by converting waste into energy and reducing carbon emissions.



CLP Power's WE Station at the West New Territories (WENT) Landfill.

Case Study

CLP's new head office relocation to Kai Tak showcases sustainable building features to its customers

On 10 December 2024, CLP reached a new milestone in its history with the opening of its new head office in Kai Tak. The state-of-the-art building, custom-built for CLP, symbolises the firm's unwavering confidence in Hong Kong's future and its commitment to fostering sustainable practices.

To reduce overall air-conditioning energy consumption across the 320-hectare new Kai Tak urban development, the Hong Kong SAR Government spearheaded the design of an innovative seawater-cooled district cooling system (DCS). CLP has aligned itself with these governmental efforts and been closely involved in one of the city's most vital energy efficient infrastructure projects. CLP is also promoting sustainable transportation by example, every car parking space is equipped with an EV charger.

The building's energy-saving features include both passive design elements such as high-performance glazing and thermal-insulated building materials to avoid excess heat uptake and active measures such as Demand Control Ventilation (DCV) with carbon dioxide sensors and lighting controls responsive to daylight and occupancy photovoltaic panels on skylights are providing the building with renewable energy. The building's design prioritises energy efficiency, with carbon dioxide emissions reduced by 28% compared to the compliance standard specified in the Building Energy Efficiency Code (BEC) in Hong Kong.



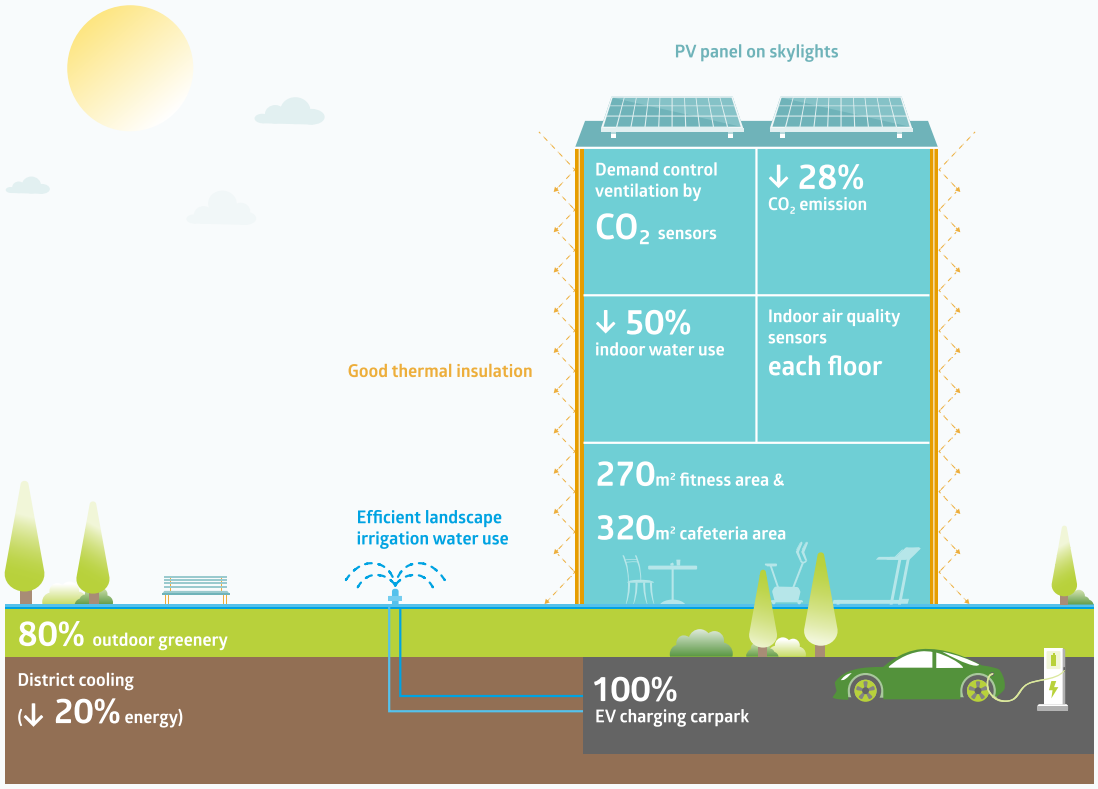
An overwhelming participation of colleagues at the housewarming event, filling the main entrance of the new Kai Tak office building.



The head office includes a series of site-specific art wall installations that embody the core brand values of CLP, titled Transformative Loops. Using recycled materials in visually striking forms, Transformative Loops invites viewers to contemplate the transformative power of innovation and sustainable recycling practice.

The head office also incorporates a sustainable office strategy that reduces indoor water use by over 50% and landscape irrigation by 50% compared to Leadership in Energy and Environmental Design (LEED) standards. It adopts a low-carbon construction through the use of recycled materials and eco-friendly products. Community wellbeing is fostered with abundant green spaces that cover over 80% of outdoor areas. The health of building users is another priority, with Indoor Air Quality sensors on each floor, high-quality drinking water dispensers and a well-equipped fitness room promoting an active lifestyle, aligned with WELL building standards for a holistic approach to sustainability and wellbeing.

The head office design achieved the highest rating (provisional Platinum/pre-certification Platinum) in the BEAM Plus, LEED and WELL green and wellness building rating systems.



Customer privacy

GRI reference: 418-1

In Hong Kong, the Personal Data (Privacy) Ordinance (PDPO) governs the protection of the personal data of individuals. The Data Protection Principles in the PDPO outline CLP Power's obligations as a data user. They relate to the collection, accuracy, retention, use and security of personal data, as well as individuals' rights to access and correct their personal customer data.

Under Australia's *Privacy Act 1988* (Privacy Act), EnergyAustralia has obligations to ensure the appropriate collection, use, disclosure and security as well as access to individual's own personal information. There are also mandatory data breach reporting obligations in relation to Notifiable Data Breaches. On 28 November 2024, Parliament passed the first set of amendments to the Privacy Act to create a statutory tort for serious invasions of privacy and provide the privacy regulator with additional rights to enforce penalties for breaches of privacy. The new amendments also create a new obligation for EnergyAustralia to ensure that individuals are informed about situations where automated decision-making (ADM) 'could reasonably be expected to significantly affect the rights and interests of an individual'. The timeline for compliance is two years. A second tranche of reforms is expected in 2025 and EnergyAustralia continues to monitor for developments.

In 2024, no cases of customer data loss were reported by CLP Power in Hong Kong or by EnergyAustralia.

Customer satisfaction

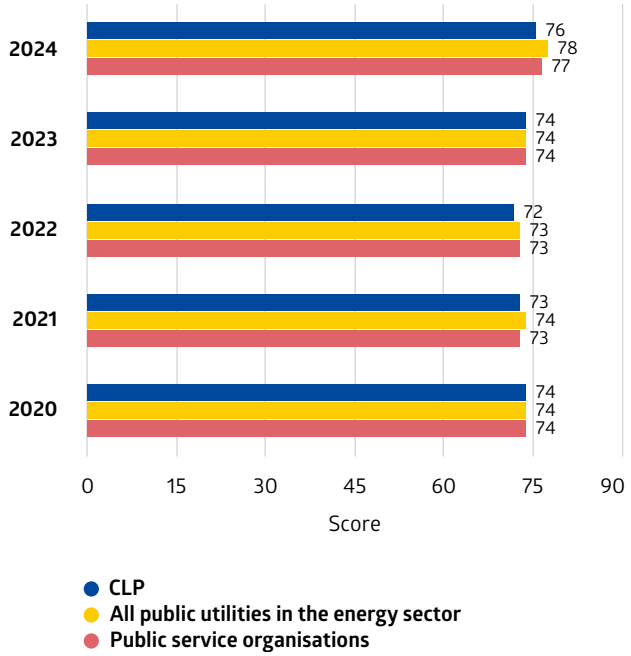
GRI reference: 417-3, 418-1

CLP is committed to providing safe and reliable energy for its customers to support their business operations and daily lives. Its frontline teams have continued to maintain essential support and customer services and to ensure the reliability of the power supply.

Hong Kong

CLP Power Hong Kong Limited customer satisfaction score

CLP Power's customer satisfaction score improved in 2024 and is on a par with other public service organisations.



Australia

EnergyAustralia averages around one to two million conversations with customers every year, either over the phone or via digital service channels. In 2024, EnergyAustralia handled more than 2.2 million calls. It also engaged with over 110,000 individuals, businesses and stakeholders through formal research to help shape its business decisions, products and services.

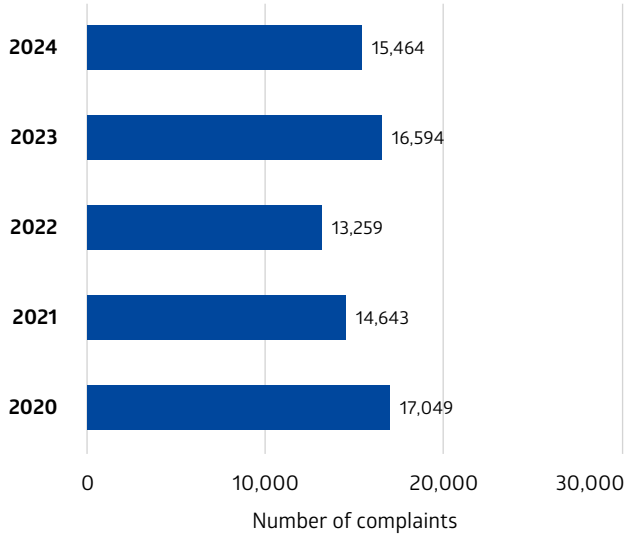
Complaints received by EnergyAustralia
Total complaint volumes in 2024 decreased by 10% from the 2023 figure. Following challenges in the first half of 2023 across the industry, this year saw the situation stabilise with flow on impacts of a decrease in customers bypassing EnergyAustralia's complaints process and decreased direct customer complaints. This resulted in customers showing greater trust in EnergyAustralia to resolve the complaint.

Despite these challenges, EnergyAustralia continued to go above and beyond to successfully address and resolve customer concerns through timely engagement and effective conversations with its customers preventing further escalations.

This has been reflected in EnergyAustralia's Transactional Net Promoter Score (TNPS) which is at a 6 year high of 36.8.

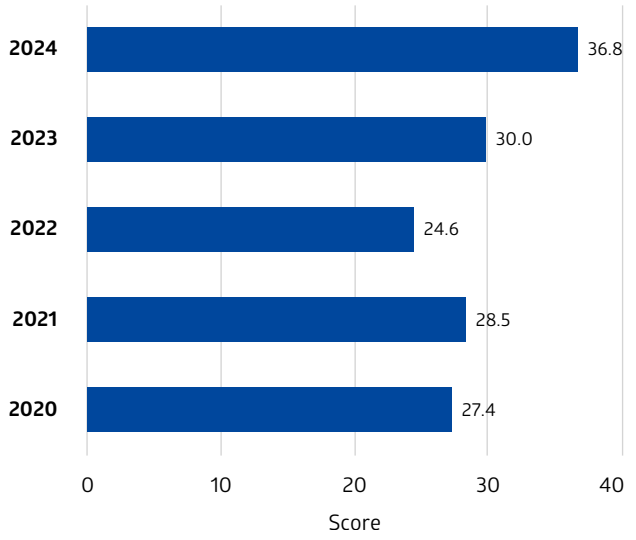
Complaints received by EnergyAustralia

Total complaint volumes in 2024 decreased by 12% from 2023.



EnergyAustralia's Transactional Net Promoter Score (TNPS)

This year's TNPS increased significantly as a result of EnergyAustralia's efforts to address and resolve customer concerns through timely engagement and effective conversations.



Artificial intelligence

Our approach

CLP's approach to AI governance is centred around building trust, transparency and accountability. This involves clearly defining the use and purpose of AI, assessing its limitations and impacts and ensuring transparency through notification, comprehensive user guides and risk assessments.

With reference to best practices across the globe, CLP has designed principles to help identify risks and controls when adopting AI in CLP's operations.

Strategies and procedures

The AI principles play a crucial role in CLP's governance approach by acting as the anchors to risks and controls when using AI. A summary of CLP's AI principles is:

- **Accountability**: Throughout the AI solution life cycle all stakeholders are responsible for adhering to the AI principles.
- **Purposeful use:** Each AI use case must have a clear purpose that aligns with CLP's values.
- **Fair, non-discriminatory and ethical design:** CLP aims to ensure that outcomes of AI-embedded solutions are fair, non-discriminatory and ethical.
- **Reliable, explainable and transparent AI:** CLP ensures a thorough understanding of inputs to AI and implication of its outputs; maintains relevant transparency with pertinent customers, employees and stakeholders.
- **Protect data privacy, data quality and ensure compliance**: Existing obligations relating to data privacy, regulations and quality requirements do not change with the use of AI.
- **Risk management**: A risk-based approach is adopted to identify and assess risks arising from use of AI in operations. These in turn gives rise to controls and mitigations that reduce risks to acceptable business appetites.
- **Security**: Comply with CLP's cyber security policies, to protect data & information when using AI in operations.
- **AI knowledge excellence**: Commitment to upskill employees, provide training and encourage continued adoption of AI in work processes. Promote knowledge exchange across use cases to leverage best-practices and continuous improvement.

Comprehensive efforts have been made to ensure compliance with the AI principles, identify incremental risks and design corresponding controls and mitigations. For CLP's Hong Kong businesses an AI risk taxonomy together with an AI impact assessment have been developed and integrated into existing processes.

Initiatives and progress

This year, CLP has spearheaded several key initiatives:

- **Digital marketing platform**: Included an event-driven customer messaging feature. This initiative has achieved an 80% reduction in turnaround time, significantly lowering the risk of Personal Identifiable Information (PII) data leaks.
- **AI-driven load forecasting:** Implemented AI-driven short-term load forecasts (intra-day, next-day, and 9-day) to support business decisions related to dispatch and maintenance activities.
- **Knowledge retrieval chatbot:** Developed knowledge retrieval chatbot powered by generative AI. This tool enhances domain training activities with multilingual content. Additionally, a similar solution has been introduced to streamline bespoke business processes, reducing manual workload.

To support the Hong Kong Government's green and sustainable finance initiative, CLP collaborates with banks, certification bodies, and partners to create synergy and facilitate customers' access to green and sustainable finance solutions:

- Sustainability-Linked Loan (SLL): Collaborates with banks, certification bodies, and corporates to assist in setting sustainability performance targets.
- SME Low Carbon Rewards Programme: A joint initiative with a bank and mall developer to encourage SMEs to adopt low-carbon operations and enhance sustainability practices.
- Community Energy Saving Fund (CESF): Established to provide funding and sustainability services to support energy-saving projects.

These initiatives involve a huge amount of data exchange between CLP and various entities, hence a secure, consistent, reliable and flexible data exchange gateway is indispensable for supporting different trials with low setup cost and short lead time. To address this need, CLP has developed the Reusable Data Exchange Gateway. This gateway has already been leveraged in multiple trials with different banks and organisations, enabling seamless and secure data communication to support the above innovative initiatives.

Case Study

Innovation Carnival 2024: Inspire and empower through innovation

The Innovation Carnival 2024, aligned with CLP's three-pillar strategies, ran from April to November, fostering collaboration and innovation in the utilities sector across the CLP Group. Roadshows at various CLP locations, reflecting our commitment to community involvement and reinforcing CLP's leadership in sustainable innovation.

Spotlight on Achievements

1. EV Charging Hub (Winner):

The final round was concluded in a CLP-wide poll, garnering 272 votes, 73 comments and 736 video views. The "EV Charging Hub" team emerged as the winner, receiving over 56% of the total votes.

Driving decarbonisation and enhancing user experience

CLPe eMobility has installed close to 600 EV chargers in the past 2 years. To improve customer experience, the team proposed new CLP App features powered by NLP, Machine Learning and Generative AI, enabling seamless access to charger details, user manuals and promotions.

AI-powered chatbot: smarter, faster support

The AI-powered chatbot will be capable of:

- **Intent recognition:** Recognise user intent for accurate, instant responses.
- **Autonomous reasoning:** Use case histories to provide solutions and clarify user needs.

This functionality will significantly reduce manual effort and improve response times, ensuring a smoother experience for EV users.

Next steps

The team targets to begin in-depth solution design for these enhancements in 2025, marking a key milestone in CLP's journey to deliver smarter, customer-focused solutions.

2. Battery AI optimisation (2nd place):

This innovative solution harnesses advanced analytics to deliver actionable battery insights, optimise performance, enable predictive maintenance and extend battery lifespan for CLP users and clients. In November 2024, an initial trial analysed data from two CLP battery systems to assess health and recommend strategies for improved efficiency and reliability.

Moving forward, the team will continue refining and enhancing the algorithm to maximise its effectiveness.

3. Battery all-in-one platform (3rd place):

To address challenges in CLP*e*'s BESS operations, such as decentralised monitoring and limited remote control, the team designed an advanced platform to improve efficiency (20% faster operations), enable real-time monitoring via an interactive dashboard and simplify multi-site management.



The Innovation Carnival 2024 exemplifies CLP's commitment to fostering a culture of innovation, driving forward-thinking solutions in the energy sector.

Cyber security

Alongside the Hong Kong-based Security Operations Centre (SOC), which provides 24/7 security monitoring, reporting and response, the SOCs in CLP China, Energy Australia and Apraava Energy have also developed during 2024. The Incident Response Process and Business Continuity Planning have also been enhanced to speed up the responses to both IT and OT cyber security events.

Given that cyber security is one of CLP's top-tier risks, it is regularly assessed and reported to senior management through the risk management process. Cyber security risks to CLP Group, its investments and business interests are managed in line with CLP's established Risk Management Framework. Group Security offers business asset owners and project managers a Cyber Security Governance and Risk Management framework which helps them identify, assess and manage cyber security risks in line with their overall business objectives. Evidence of treatment action is gathered and the Group Security team track progress, re-assessing risks periodically or when there is significant configuration change. Appropriate internal and external validation and assurance (e.g. 'red team' cyber simulations) supplement the risk-based approach and CLP closely collaborates with broader government and law enforcement drills on a regular basis.

Work on cyber security has also continued throughout the year in Mainland China, India and Australia. CLP plans to continue to enhance its processes, personnel and technology capabilities and the Company is committed to retaining and acquiring the expertise required to execute them effectively.

Security management

The Group Security Policy lays out CLP's overall approach to minimising risks to people, including employees, contractors, customers and the public and managing other business risks to acceptable levels. Cyber security-related standards are regularly updated to take into account technological advances, changing legislation and emerging standards of good practice.

The Group Security Policy addresses the following areas

- **Integrated and centralised organisation and governance** – CLP has developed an integrated, enterprise-wide Group Security function within CLP Digital to provide security support to all areas of the business.
- **Standards and guidelines** – CLP applies standards, guidelines, procedures and processes to manage and monitor the organisation's regulatory, legal, risk, environmental and operational requirements in line with recognised industry standard.
- **Understanding the threat** – CLP ensures decisions related to the application of security measures are appropriately informed and, wherever possible, intelligence driven.
- **Communications and awareness** – CLP continuously enhances the security awareness and knowledge of its employees and contractors with the objective of encouraging positive security behaviour.
- **Technical domain** – CLP ensures that robust operational security protocols are developed, applied and maintained.
- **Liaison** – CLP maintains constructive and trusted security relationships with relevant government agencies and industry bodies to ensure speedy and effective cooperation when the need arises.

The Group Security team was established to ensure that CLP's cyber and physical security capabilities and efforts complement each other. The team gives CLP in-house capabilities across the full range of security skillsets. Regular reports are provided by Group Security to the Board's Audit & Risk Committee (ARC), providing assurance that adequate risk management is in place and that appropriate remedial action is being taken where needed.

Emergency and crisis management

CLP has continued to enhance its crisis management capability to ensure the organisation can respond promptly and effectively if an incident occurs.

From a crisis management perspective, the emphasis of the Company has been on maintaining and enhancing capability. Initiatives continued in the year include:

- Assessing potential replacements for the now established interim solution for the Crisis Communications Billboard (CCB 2.0) which was rolled out in early 2024;
- Rewriting the Group Crisis Management Plan to reflect the CLP Group's move to its new Headquarters office building in Kai Tak;
- Supporting CLP Power in its drafting of business continuity plans and playbooks to support new scenarios; and
- Creating an upper tier Group Business Resilience Policy and framework to encompass them.

Crisis management during extreme weather events

CLP has strengthened safeguards, increased contingency measures and enhanced monitoring to ensure its electricity supply systems remain as safe and reliable as possible before, during and after extreme weather events.

In Hong Kong, more than 30% of CLP Power's transmission network comprises overhead lines, which are more susceptible to adverse weather, lightning strikes and external interferences such as fallen trees that could affect power supply reliability. CLP Power has stepped up inspections of the power supply equipment in the network ahead of the typhoon season, using helicopters and drones to examine transmission towers and overhead cables and pruning trees that may potentially interfere with overhead lines. Floodgates have been installed at substations which are at risk of flooding during severe weather and emergency drills have been conducted to ensure staff's readiness to respond swiftly and effectively to typhoon and storm impacts.

Extreme weather events could also result in voltage dips and even power interruptions, causing inconvenience to customers. CLP Power's System Control Centre closely monitors grid operations throughout typhoons and storms, while emergency teams and additional personnel are dispatched promptly to restore power to affected customers wherever necessary.

CLP Power's 24-hour Customer Service Hotline service has been bolstered to enhance responsiveness during extreme weather events. CLP Power also maintains close coordination with relevant government departments and communities across its supply area during typhoons or power incidents to facilitate timely responses and coordinate power restoration efforts.

Tailored to different geographies, asset types and locations, CLP has also implemented a range of measures in the Group's value chain to strengthen its resilience to climate change. Examples of the Group's climate-related adaptation measures are summarised in the table on the next page.

Relevant part of the value chain	Climate-related adaptation measures
Supply chain	Diversify fuel supply. For instance, Hong Kong's offshore liquefied natural gas terminal would assist CLP Power in diversifying the natural gas supply.
Generation	**To address extreme heat and increased temperature:** • Maintain cooling equipment in good condition. • Refurbish cooling towers to improve efficiency. **To address water shortage and drought for thermal plants:** • Use sea water or recycled water for cooling to mitigate risks from freshwater shortage. • Where possible, work with local authorities to construct water transfer pipelines from nearby sources and water treatment facilities to secure water supply. **To address flooding:** • Ensure protection walls for coal yards and run-off water storage are in place. • Deploy asset-specific anti-flooding measures, including water pumps and piping for water discharge, ground-level drainage systems, sea walls along power station shorelines, flood gates and flood barriers. • Implement additional coverage via tarps, grass and tree planting and drainage works to avoid soil erosion. • For assets downstream of dams, continually control and monitor river rate flow. Maintain regular communications with local authorities on flood discharge schedule and flowrate. **To address changing weather patterns:** • Commissioned a climate model to estimate the future performance of wind farm projects. The data collected can be used to support investment decisions. • For CLP-operated wind farms, conduct regular wind resource forecasts based on the latest wind plant performance data • Maintain a Bushfire Mitigation Plan in Australia. **To address tropical storms:** • Critical structural assessment against typhoons of 360km/h three-second wind gust at a height of 500m was conducted. • The continuous ship and grab unloaders will be anchored by tie downs during a hit of super typhoon.

Relevant part of the value chain	Climate-related adaptation measures
Transmission and distribution	**To address extreme heat and increased temperature:** • Have operational guidelines in place that consider operations under high temperatures (of up to 45°C) **To address flooding:** • Continue flooding assessment for intensified heavy rain scenarios and mitigation measures for new and existing substations. **To address tropical storms:** • Continue reinforcement of transmission overhead line tower structures. • Strengthen foundations of transmission towers, and stabilisation of nearby slopes. • Enhance automatic detection and isolation of faulty sections of distribution overhead line circuits and use smart meter supply interruption data to proactively contact customers and prioritise recovery. • Implement predictive vegetation management to minimise risk from overgrown vegetation.
Retail	• Provide necessary support to customers directly impacted by extreme weather events through business continuity planning. • Through engagement events, inform customers of initiatives already undertaken to increase system resilience.
Condition monitoring and service recovery	• Install online condition monitoring systems for switchgear and transformers to allow real-time monitoring and detection of incipient fault conditions. • Develop intelligent management system (Grid-V) to manage key power facilities, which can identify potential risks in the environment in real time, issue alerts to engineers. • Enact emergency management procedures and response plans across all operations, and conduct regular drills. • Establish a typhoon response protocol and coordination system. Conduct regular drills and post-typhoon reviews to ensure smooth execution of contingency plans. • Utilise the CLP System Control Centre, providing round-the-clock surveillance of network status, enabling prompt mobilisation during power outages. • Utilise the emergency restoration system, enabling rapid construction of temporary masts to expedite restoration of 400kV overhead line circuits. • Enhance the communication capacity of customer services; in particular, post-incident customer communication for energy transmission outage. • Establish in-house unmanned aerial vehicle teams for post-typhoon surveillance inspection. • Reserve capacity, fuel switching or power import in case of emergency via the CLP Business Continuity Plan.