

As a public utility, HK Electric has a social responsibility to safeguard the environment. We are investing continuously in new technologies and initiatives to minimise the impacts of our operations.

Our commitment to protecting the environment is articulated in our Environmental Policy, the implementation of which is overseen by the Environment Committee. Environmental considerations are integrated into all areas of our business through comprehensive environmental and energy management systems conforming to ISO 14001 and ISO 50001 standards. We evaluate the effectiveness of our environmental management programmes with reference to specific and measurable targets, and strive for continuous improvement.

HK Electric cannot achieve its environmental objectives without the support of its many stakeholders. We work with the Government, academia, professional engineering and non-governmental organisations, green groups, customers, students and the general public to address issues of shared concern.



Sharing our Planet

Action on Climate Change

Energy Conservation

Improving Air Quality

Responsible Resource Management

Eco-Friendly Lifestyle



Action on Climate Change

In response to international agreement on decisive actions to combat climate change, HK Electric is taking a proactive approach to reduce greenhouse gas emissions, commonly known as carbon emissions.

We also acknowledge the global consensus on avoiding the worst effects of climate change by keeping global warming within 2°C of the pre-industrial level. In November 2017, HK Electric established a new target for reducing carbon emissions per unit of electricity generated by 30% in 2022 compared with the level in 2005. This target has been recognised by the Science Based Targets initiative, a global partnership encouraging organisations to set scientific targets compatible with the “2°C” scenario.

Displacing Coal with Natural Gas

Natural gas is a cleaner fuel than coal and produces fewer carbon emissions in power generation. Phasing out coal-fired plants and replacing them with natural gas-powered generation is essential for helping Hong Kong achieve the Government’s targets for reducing carbon emissions by 2020 and 2030.

In 2017, power generated from natural gas comprised about 34% of our total power output, and the carbon intensity of our electricity sold was 0.79 kg CO₂e/kWh. By comparison, in 2005 before the introduction of any natural

gas-fired generation at Lamma Power Station, the carbon intensity of our electricity sold was 0.93 kg CO₂e/kWh.

During the year, we retired our oldest coal-fired unit, L1, and continued to make good progress with the construction of two new gas-fired units, L10 and L11. These units will feature advanced efficiency-enhancing technology producing about 50% fewer carbon emissions than our existing coal-fired units.

The share of natural gas-fired generation in our total power output is increasing. It is expected to reach 50% in 2020 with the commissioning of L10, and 55% in 2022 when L11 is put into operation. Timely implementation of these gas-fired projects will contribute towards the Government’s short-term carbon reduction target for 2020.

We plan to continue displacing coal with natural gas in supporting the Government’s longer-term carbon reduction target for 2030. To ensure the commercial and operational viability of this strategy, we are partnering with CLP Power, the other local power company, to develop an offshore liquefied natural gas (LNG) terminal using Floating Storage and Regasification Unit (FSRU) technology. This project, currently at the Environmental Impact Assessment stage, would help to secure a sufficient and competitive supply of natural gas. Subject to government approvals, we anticipate that the new terminal can be constructed for commissioning by the end of 2020, at the earliest.



New gas-fired generating units under construction at Lamma Power Station.

Case Story

Nanotechnology Enhances Solar Power Generation

In 2017, the power generation efficiency of some solar panels at Lamma Power Station increased by as much as 2%, following successful implementation of a pilot study to test the effectiveness of a new self-cleaning coating that was invented by a team at The Hong Kong Polytechnic University.

When the special coating is applied to the surface of the solar panels, nano-sized titanium dioxides (TiO₂) convert organic compounds into harmless gases through a process known as photocatalysis. Inorganic substances also become effaceable, so they are easily washed off by rain water.



A Role for Renewable Energy

We are keen to support the use of renewable energy (RE) and are operating one of Hong Kong's largest commercial-scale solar power systems and the city's first and only commercial-scale wind power station – Lamma Winds.

2017:

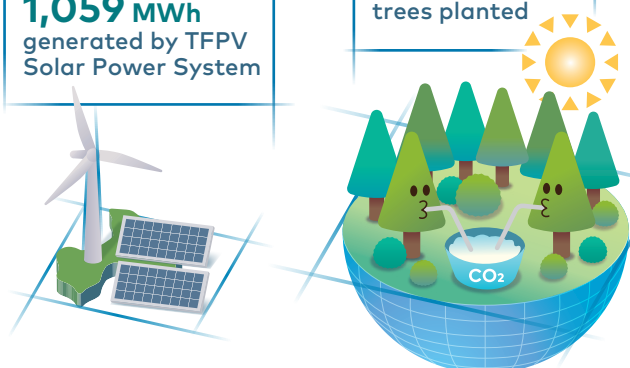
825 MWh
generated by
Lamma Winds

1,059 MWh
generated by TFPV
Solar Power System

1,570 tonnes
CO₂ avoided

or

68,000
trees planted



More widespread adoption of RE technologies in Hong Kong is constrained by limited space and high per unit investment costs. Nevertheless, we are committed to finding innovative and practical ways to overcome these challenges. In 2017, the Government gave the go-ahead for an in-depth study of a new solar power system to provide ancillary power for residents on Po Toi Island, Hong Kong's southernmost outlying island. By reducing reliance on Government-owned generators, the project will reduce the amount of diesel fuel required to be transported to and consumed on the island.

Resilience to Climate Risks

According to regional forecasts, the Pearl River Delta region will be directly impacted by rising sea levels, higher temperatures, more erratic rainfall, and potentially more powerful storms as a result of climate change. We are continuously building up our resilience to climate-related threats to ensure the reliability of our service. In July and August of the year, though several typhoons severely impacted Hong Kong, they did not undermine the security and reliability of our power system.

The key elements of our strategy are to assess the risks to our business, adopt resilient designs, conduct regular operational reviews, and implement timely enhancement measures. High ambient temperatures, for example, increase the risk of failure of power plant components and electricity network cables. We closely monitor the conditions of critical plant components and important cable sections, and carry out regular reviews to ensure appropriate enhancements are completed.

In 2017, we continued our existing programme to enhance reliability and increase cable capacity under high temperature conditions by converting 11-kV open-ring distribution feeders to 22-kV closed-ring feeders.

Our transmission network, comprised almost entirely of underground and submarine cables, is largely protected from inclement weather. We have anti-flooding systems in place at Lamma Power Station and in our coastal transmission and distribution stations, as well as a typhoon emergency team on standby to undertake emergency maintenance. Our System Control Centre is equipped to manage abnormal operating conditions and to apply remedial measures in real time.

Throughout our operations, we have contingency plans and emergency procedures in place that are subject to frequent practice drills and regular reviews to ensure they remain effective and up-to-date.

Energy Conservation

Energy efficiency and conservation (EE&C) is integral to the Government's Climate Action Plan 2030+, which calls for concerted efforts by the whole community to achieve carbon and energy savings. Under the SCA, HK Electric is well positioned to educate customers and the public about the benefits of energy conservation, and we have implemented various measures on our own premises to set examples for industry benchmarking.

We also empower our customers with information to make better choices. Our electricity bills for residential customers contain data on electricity use, including monthly per capita consumption and carbon dioxide emissions per unit of electricity consumed. We offer a load profile enquiry service for non-residential customers to help them make better use of energy as part of their overall business strategy.

Help for Building Owners

The vast majority of Hong Kong's energy-saving opportunities arise in our built environment. Our policy is to engage regularly with various stakeholders in the community, including building owners, district council members and property managers, to promote EE&C.

In 2017, we carried out more than 50 free energy audits for non-residential customers. These audits not only identify practical measures for energy saving, but also qualify eligible customers to apply for the Energy Efficiency Loan Scheme offered by collaborating banks for carrying out improvement works.

For owners of residential buildings, subsidies are available through our Smart Power Fund on a 50/50 matching basis to implement projects that will improve the energy efficiency of existing building services installations for communal use. These projects often involve the installation of more energy-efficient lift driving systems, public lighting and air-conditioners.

To encourage more extensive energy efficiency improvements or upgrades under the Smart Power Fund, we have doubled the upper limit of our subsidy from HK\$200,000 to HK\$400,000 from January 2017 onwards. Under special circumstances, funding of up to HK\$500,000 is also available for highly impactful projects.

During the year, we approved 20 Smart Power Fund applications amounting to HK\$6.2 million. Since the inception of the Fund in June 2014, a total of 49 applications have been approved.

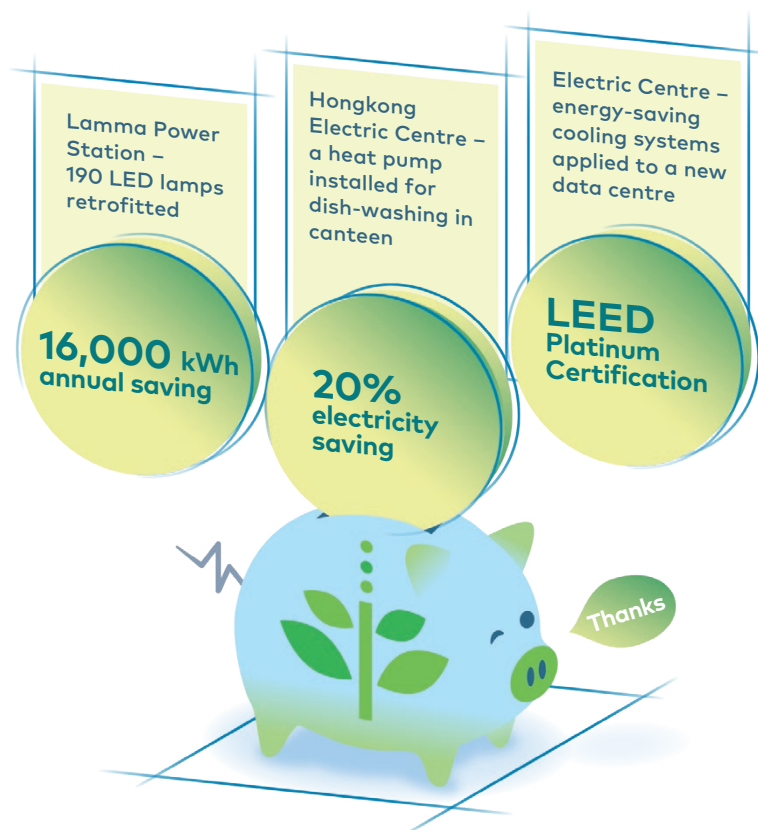
Energy Savings@HK Electric

We support the Government's Energy Saving Charter and 4Ts (Target, Timeline, Transparency and Together) Charter to achieve energy savings on our premises. We are committed to maintaining an average indoor temperature between 24–26°C during summer, turning off electrical appliances and systems when not in use, and engaging our employees on energy-saving practices that are underpinned by objective targets and timelines.

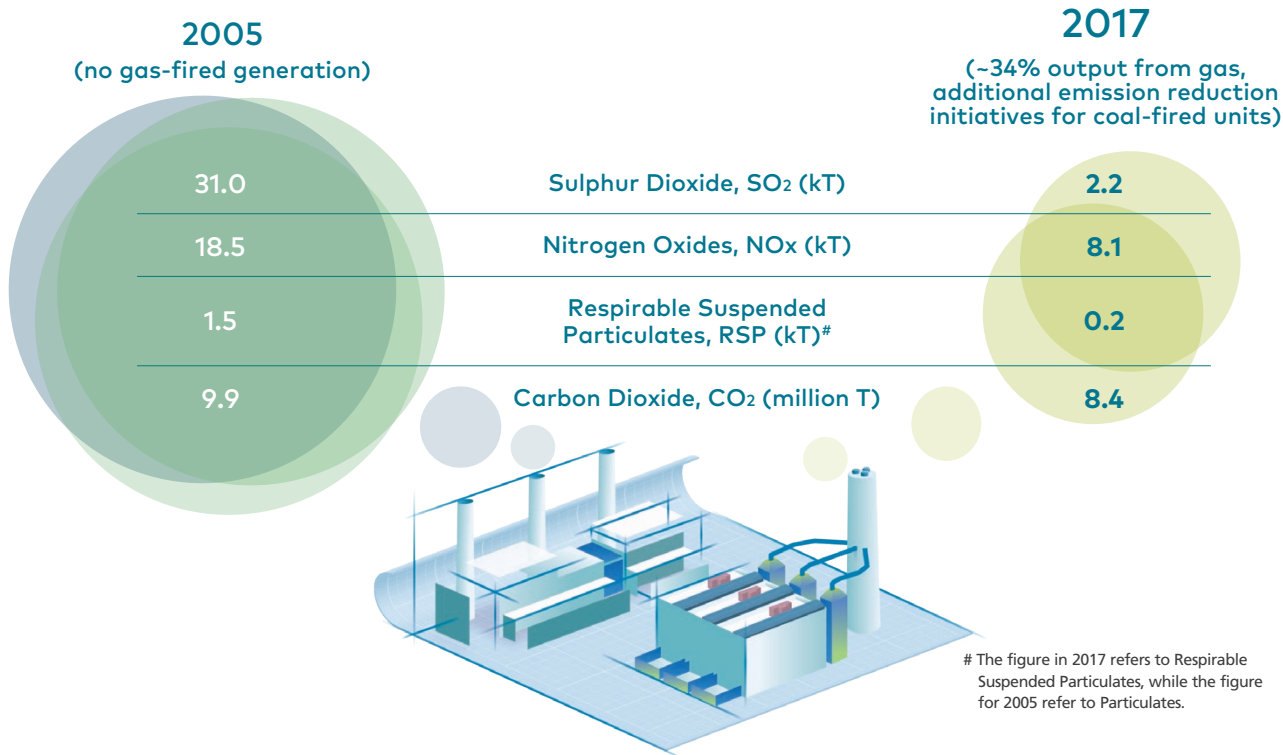
In recent years, we have received awards for environmental excellence, including Energywise and Carbon Reduction Certificates under the Hong Kong Green Organisation Certification Scheme, and platinum awards for our buildings under the Charter on External Lighting organised by the Environment Bureau.

We conduct regular carbon and energy audits of our main buildings to evaluate opportunities for further energy savings. In 2017, we followed up on recommendations from previous audits by installing additional energy meters in our main buildings. Enhanced monitoring of energy consumption patterns will help us fine-tune our energy-saving plans.

We are also in the process of systematically replacing aged chillers in our office buildings with more energy-efficient models. Having completed chiller enhancement projects at Electric Centre and Electric Tower in previous years, during 2017 we initiated a similar project at our headquarters, Hongkong Electric Centre. We aim to replace all aged chillers in the building in phases in 2018.



Emissions at Lamma Power Station



Improving Air Quality

Air pollution in the Pearl River Delta region impacts the health and well-being of all local residents. In Hong Kong, locally produced air emissions come largely from power stations and traffic.

Emissions at Lamma Power Station

HK Electric is progressively reducing emissions in line with Hong Kong's Air Quality Objectives. We operate a network of air quality monitoring stations to continuously monitor the impacts of our operations on ambient air quality, and we publish air quality monitoring statistics on our website.

At Lamma Power Station, we apply technologies such as flue gas desulphurisation plants, low-nitrogen-oxide combustion systems and electrostatic precipitators to limit the emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x) and respirable suspended particulates (RSP), within the emission allowances specified by the Government.

As far as possible, we procure low-sulphur coals with low ash content to help control emissions of both SO₂ and RSP. In 2017, low-sulphur coals accounted for about 28% of the total volume of coal purchased.

By displacing coal with natural gas and RE in power generation, our response to climate change will also contribute to better air quality in Hong Kong.

In 2017, we worked closely with the Government to agree on a set of tighter emission allowances for 2022 onwards. To help us achieve these objectives, we plan to adopt advanced emission reduction technologies for new power generation investments. For instance, both of our new gas-fired units, L10 and L11, will feature Selective Catalytic Reduction and advanced combustion systems that can reduce emissions of NO_x by as much as 90%.

We anticipate that when both new units are in operation, emissions of SO₂, NO_x, and RSP from Lamma Power Station will decrease by at least 75–90% compared with the 2005 levels.

Drive EVs • Charge Easy

We believe that widespread adoption of electric vehicles (EVs) can play an important role in improving roadside air quality in Hong Kong because they produce zero emissions at source.

EV technology continues to advance, with new models coming on the market exhibiting longer driving ranges and greater reliability combined with lower prices. We anticipate that the number of EVs on the road in Hong Kong will continue to rise if the availability and distribution of charging facilities can meet demand.



HK Electric continues to power the Formula E Hong Kong E-Prix, and arranges student ambassadors to join a preview at the pit-lane.

During the year, we launched three new multi-standard quick charging stations and upgraded four existing standard charging stations to dual-mode chargers supporting AC quick charging. Currently, we have 13 public charging stations covering every district on Hong Kong Island. Under normal traffic conditions, EV drivers can access one of our charging stations within 15 minutes' driving distance on Hong Kong Island, and they will continue to enjoy free EV charging services until the end of 2018.

Case Story

Giving Retired EV Batteries a New Lease of Life

EVs are widely recognised as the environmentally friendly choice for road transport, but it is important to mitigate impacts associated with the disposal of EV batteries.

In 2017, engineers of HK Electric came up with two innovative solutions to win the first and third prizes in the open group category of an international competition entitled "Second Life for Retired Batteries from Electric Vehicles" organised by the Environment Bureau.

The winning proposal arose from our on-going study to install a solar power system on Po Toi Island. Members of our Projects Division worked with researchers from the Department of Electrical Engineering of The Hong Kong Polytechnic University to create a hybrid battery energy storage system

Our Low Carbon App and EV mini website provide real-time information to the public about the occupancy status of all 13 charging stations. A pre-booking system for quick charging facilities at our former Operational Headquarters in Ap Lei Chau is now available on a trial basis through the Low Carbon App.

Also in 2017, our EV service team handled 562 enquiries and arranged 84 on-site inspections, providing technical advice to assist residential and commercial building owners in installing EV charging facilities. A total of 26 AC quick charging facilities were installed in various buildings during the year.

We continue to invest in greening our own vehicle fleet by replacing conventional vehicles with EVs. At the end of 2017, we operated 114 EVs representing 40% of our vehicle fleet. We also purchased our first electric bus for commuting within the bounds of Lamma Power Station.



combining new batteries with retired EV batteries. This innovation will not only make the Po Toi solar system feasible despite limited usable space, but will also help preserve the scenery of the island.

The Second Runner-up was a team from our Transmission and Distribution Division with an advanced battery management system that deploys retired EV batteries to provide back-up energy storage similar to an uninterruptible power supply. The system reduces the impact of voltage dip and enhances power supply reliability. We plan to implement a trial using about 130 retired EV battery cells to further investigate the viability of this solution.

Responsible Resource Management

In line with our Environmental Policy, HK Electric strives to ease the environmental impacts of our business by optimising the consumption of resources and reducing waste. We engage our employees on environmental issues and strive to cultivate a 4R-culture – Reduce, Reuse, Recover and Recycle – throughout our organisation.

Water Resources

At Lamma Power Station, we manage our water resources responsibly by following the best practices for our industry. In 2017, about 112,000 m³ of rain water and plant effluent was collected and reused to reduce our overall fresh water consumption.

As part of the on-going development of the new L10 and L11 gas-fired plants, we have installed wastewater storage and treatment facilities to recycle and reuse wastewater produced during bore piling.

In August 2017, we also began construction of a new demineralisation plant that will apply reverse osmosis and electro-deionisation technology to produce pure feed water for boilers of our generating units. The new technology will drastically reduce the consumption of hazardous chemicals, including sulphuric acid and caustic soda used in conventional ion-exchange demineralisation processes.

Waste Management

Our business produces various forms of waste, all of which we manage and dispose of responsibly in compliance with relevant laws and regulations. Ash and gypsum, two by-products from coal-fired power generation, are the main types of non-hazardous waste generated by our operations. These materials are supplied to third parties as inputs for industrial use. We also generate hazardous wastes, such as waste oil, which are recycled or disposed of by licensed contractors under a trip ticket system.



The company receives the "Green Star Label" of the Foodwaste Lean and Green Label Scheme organised by the Green Council.



Case Story

One Man's Waste Becomes Another Man's Treasure

We believe that it is important to engage our employees and their families on environmental issues by encouraging them to adopt environmentally responsible practices in all aspects of their lives at home and at work.

In 2017, we introduced two initiatives to promote reuse of unwanted items. The first is an information platform that matches business units seeking to dispose of office furniture with other business units who can make use of the second-hand items. The second is an online platform which allows employees to pass on their unwanted personal belongings, such as clothes, books or electrical appliances that are still in good condition, rather than throwing them away. Colleagues can access a shared database to preview and select items they are interested in.

Our canteens, which prepare more than a thousand meals for our employees every day, make use of an advance meal booking system to reduce food waste. We practise waste separation and use food-waste eliminators to minimise the volume of food waste that is disposed to landfill sites. Surplus food is donated to Food Angel, which is a well-recognised Hong Kong charity that supports people in need.

We go beyond regulatory compliance in our waste management practices by working with the Government and non-governmental organisations (NGOs) on various recycling initiatives. In recognition of our efforts, we have received Wastewi\$e Certificates under the Hong Kong Green Organisation Certification Scheme, and food-waste management awards from several NGOs. In 2017, we were also invited by the Green Council to share our experience on food-waste management with hotels and restaurants.

Biodiversity

We are committed to conserving the ecological habitat of Lamma Power Station and the surrounding environment, and we have a programme in place to nurture native species of trees and shrubs and to attract local wildlife.

We pay close attention to safeguarding biodiversity in the course of developing new projects, such as the forthcoming improvement of Lamma Power Station Navigation Channel and the proposed offshore LNG terminal. To ensure conservation of the marine ecology in the area of the navigation channel, we are planning to carry out a marine ecological and fisheries baseline review in 2018.



Lamma Power Station is home of many bird species, including this beautiful Grey-backed Thrush.

Case Story

Outstanding Ambassadors Job Shadowing at HK Electric

We believe that one of the best ways to help students with life-planning is to offer them on-the-job experience. In early 2017, three students who attained outstanding achievements in our Happy Green Community Ambassadors programme in 2016 became HK Electric environmental engineers for 1.5 days.

The students were greeted by Mr. Wan Chi-tin, who shared his own experience of starting out as a young engineer and rising to become the Managing Director of HK Electric. Over the course of the day, the students did some rising of their own by climbing up the 110-m chimney of a gas-fired generating unit at Lamma Power Station to check the emission monitoring equipment. They also collected leaves and water samples, and used laboratory equipment to conduct analyses.

Eco-Friendly Lifestyle

To support sustainable development, HK Electric advocates the smart use of energy through green educational programmes, and enhances the environmental awareness of the public by promoting the benefits of an eco-friendly lifestyle.

Education and Awareness

We set aside HK\$2.5 million each year for an Education Fund to promote smart and efficient energy use. Our Smart Power Campaign, launched in 2003, is an anchor programme of the Fund targeting young people.

In 2017, the focus of the Campaign combined life planning with environmental education under the theme "Living out your Happy Green Life". Through different programmes, youngsters were encouraged to develop green attitudes towards their lives. The Government also appreciated our approach and invited us to share our experience in a symposium on "Life Planning" organised by the Education Bureau.

Through our Happy Green Schools network, which had been expanded to 380 member schools, we continued to offer various Other Learning Experience (OLE) activities to students.

The Happy Green Community Ambassador programme, in 2017, provided training to more than 50 secondary school students who in turn acted as ambassadors at roving exhibitions, attracting more than 3,500 visitors.



Reporting back on their impressions of the job shadowing experience, the ambassadors agreed that the work of an environmental engineer is not as easy as they had imagined, but very meaningful. They were grateful for the opportunity to learn more about themselves and the important work that goes into environmental protection when producing electricity.

In 2017, we continued to organise our Green Energy Dreams Come True programme, an annual competition that gives local secondary schools the opportunity to practise project management and presentation skills, with technical support from our engineers. Twelve teams received up to HK\$50,000 each to put their green ideas into practice. The winning team created a playground model to teach young children how kinetic energy works, and another notable project succeeded in generating electricity from green leaves.

Promoting Hong Kong's Eco-Heritage

2017 marked the 12th year of Green Hong Kong Green (GHKG), a programme co-organised by HK Electric and The Conservancy Association that conducts guided tours on Hong Kong and Lamma Islands to raise awareness of local eco-heritage resources.



Eco-tour leaders complete the training for the new eco-heritage route "Wan Chai Kaleidoscope".

In recent years, the programme has taken on a new approach by introducing eco-heritage routes in urban areas that are shorter and more easily accessible. Following the success of our first urban route in Western District launched in 2016, we rolled out a second urban route in Wan Chai in 2017 featuring various eco-heritage treasures, including the historical site of Hong Kong's first power station, which was operated by HK Electric.

During the year, a total of 97 tours of the 10 eco-heritage routes were organised for around 1,300 participants. Night safari tours, available only in the summer months, continued to be the most popular because participants could enjoy close encounters with animals and insects that are rarely seen during the day.

The GHKG App, which features information about all 10 eco-heritage routes, was downloaded more than 8,800 times during the year.

Promoting Eco-Quality Kitchens

Hong Kong people are increasingly conscientious about the environmental impacts of kitchen appliances, and are enthusiastic to learn about products and techniques that are both green and efficient.

For customers who have joined our Eco-Quality Home programme, we organised several activities in 2017, including electric cooking demonstrations and a visit to the Climate Change and My Smart City Experience Centre at the Zero Carbon Building, with interactive exhibits about eco-smart living and smart cities.

For food industry professionals, the benefits of working with electrical appliances in commercial kitchens include enhanced production efficiency and food quality, energy and cost savings, improved health and comfort for employees, and lower fire risk. We work extensively with catering associations and commercial kitchen equipment suppliers to promote these benefits. One popular initiative is the Eco-Chef Training Programme, which we organise in partnership with catering businesses and The Salvation Army.

Support for Green Causes

HK Electric supports a range of environmental campaigns, such as WWF's Earth Hour, Green Walk organised by the World Green Organisation, and Clean Up the World in Hong Kong organised by Green Power.



The Smart Power Campaign mascot proves popular at the Zero Carbon Fun Fair organised by the Environmental Campaign Committee.

Similar to previous years, we hosted a one-month campaign in June to support United Nations' World Environment Day. We invited our colleagues to make low-carbon pledges about what they eat and wear and how they live and move around. We also identified ways for them to donate and recycle unwanted items such as clothes, books and appliances.