

# Green Energy for a Sustainable Future

The Group is conscious of the environmental impact associated with its operations. It is committed to protecting the environment and supporting sustainable development by managing its environmental footprint across its operating markets and conducting its business in an environmentally responsible manner. The Group strives to adopt behavioural change as well as the use of the latest clean technologies, processes, and systems to drive and monitor reduction initiatives. We are on track with our decarbonisation plan replacing coal-fired generating units with gas-fired units.

Our operating companies around the world aim to constantly contribute to the battle against climate change. Many of them are implementing initiatives supporting local governments' commitments to achieve the goals set by the United Nations Framework Convention on Climate Change. Each of our companies engages in a number of activities throughout the year to improve on their own environmental performance through a range of initiatives across all operations.



# Combating Climate Change

## Challenges and Opportunities

Electricity generation is the largest source of greenhouse gas (GHG) emissions in the world. As environmental regulations become increasingly stringent in the coming decades, especially in Europe and Mainland China, electricity and utility companies would require significant investment as the world transitions to a low-carbon economy. Failure in keeping up with the transition may negatively impact returns or even lead to asset write-downs in the long run.

Electricity and utility companies are working with their respective governments to identify solutions for possible future decarbonisation pathways. Through careful planning of infrastructure investments, companies could ensure an energy mix capable of meeting the emissions requirements set forth by regulators together with the implementation of industry-leading technologies and processes. Proactive reduction of GHG emissions in a cost-effective manner can also create a competitive advantage for utilities and mitigate unanticipated regulatory compliance costs.

## Our Commitment

We recognise that investor and stakeholder interest in climate change has increased significantly and will continue to grow. Meeting the growing demand for energy while ensuring that the supply is reliable, affordable, clean and low emission is both a challenge and an opportunity for our industry.

As core participants in the energy sector, we understand that utilities play a key role in achieving the target adopted by many governments which are parties to the Paris Agreement to limit the increase in the planet's temperature to below 2°C, and our operating companies are investing in innovation and green energy to support the fight against climate change. Currently our renewable energy operations include:

- Dali (48-MW) and Laoting (49.5-MW) wind farms – generated 207 GWh of wind power in 2020 which abated 199 kT of CO<sub>2</sub>;
- EDL's global operations abated and avoided 8.9 million tonnes of CO<sub>2</sub> emissions. In 2020, EDL delivered the Agnew Hybrid Renewable Projects in Western Australia comprising 18 MW wind, 4 MW solar and 13 MW/4 MWh battery, and commissioned the Indy High BTU Renewable Natural Gas Plant in Indiana, USA.
- AVR's energy-from-waste and resource recovery – sorted 26,000 tonnes of plastics for reuse;
- AVR's CO<sub>2</sub> capture plant in Duiven, the Netherlands – captured 31 kT of CO<sub>2</sub> and transported it to greenhouses to support cultivation of vegetables, fruits and flowers; AVR is planning to increase the carbon capture and utilization capacity to 100 kT; and
- HK Electric's Feed-in Tariff (FIT) Scheme – about 130 renewable energy installations at schools, residential premises and small to large enterprises were connected to the grid through the FIT Scheme as at end 2020, amounting to a total capacity of around 2.3 MW.

Both our Chairman and CEO have made public commitments in the Annual Report to fully support governments around the world in achieving the goals set by the United Nations Framework Convention on Climate Change.

To put our commitment into practice, we have developed the following strategies in supporting global efforts to decarbonise energy.

### Goals

To address climate change risk and to capitalise on those opportunities arising from it

### Strategy

Decarbonising the generation portfolio by replacing or converting coal-fired units to gas-fired units, and to expand renewable energy, waste to energy, renewable natural gas and carbon capture and utilisation capacity.

To accelerate and support decarbonisation by continuously modernising and digitising electricity networks to accommodate the projected influx of distributed renewable energy sources as well as the anticipated surge in the required charging networks for a massive uptake of electric vehicles.

Decarbonisation of our gas network by blending hydrogen into existing gas distribution networks and ultimately replacing natural gas with hydrogen to achieve the net zero targets set by local governments. (Covered in "Opportunities in Clean Technology" on pages 30 to 31)

## How We Work

### Understanding climate-related risks

We are exposed to both the physical and transition risks of climate change. Physical risks of climate change could come in the form of acute events such as severe tropical cyclones and flooding, or chronic changes such as water stress, prolonged periods of drought and heatwaves that increase the chances of wildfires. In the short term, the acute events could directly damage our facilities and assets and disrupt our service delivery. In the long term, the changes in climate could also gradually damage our assets and lead to asset write-downs.

In addition to the physical risks, climate-related transition risks could have a material adverse effect on the Group's business, financial condition and results of operations, and could adversely impact the Group's reputation. Understanding the location, nature and scale of these potential risks is crucial for effectively mitigating the impact.

Besides assessing at the Group level the material impacts of climate-related risks and opportunities, each business also carries out its own climate impact assessment. For example, UKPN has carried out a flood mapping exercise across its footprint, and site surveys have been undertaken to predict flood depths in extreme events to help design flood protection measures. UKPN has invested more than GBP11 million in permanent flood defences to increase the resilience of equipment that serves more than 2.9 million properties in the last nine years.

WWU has used their Adaptation to Climate Change risk assessment, in line with UK Climate Projections 2009 (UKCP09) models, to determine the future extent of climate change impacts. The output of this model identifies the degree of impact for individual climate change risks and allows WWU to work towards quantifying the relative number of assets that are forecast to be impacted in the future. WWU will then be able to use this to identify future action points where climate change risks become unacceptable and adaptations could be implemented as part of planned works in advance of an impact.



### Responding to the physical and transition risks of climate change

The Group is committed to reducing emissions of GHG and other air pollutants within its operations and supporting the move to a low-carbon future through innovation and adoption of the latest technology and processes alongside environmentally-friendly energy sources. Our target is to reduce our coal-fired generation installed capacity from about 50% of our total generation portfolio in July 2017 to about 22% post-2023. We are working on the following initiatives to help reduce GHG emissions:

#### Connecting renewable energy to the grid

To promote grid-connected renewable energy power systems (REPS), HK Electric purchases all electricity generated by customers' REPS at Feed-in Tariff rates. In 2020, Renewable Energy Certificates covering about 3.5 GWh of zero-carbon electricity generated by REPS of FiT customers and HK Electric's own REPS were purchased by customers to offset their Scope 2 carbon emissions.

UKPN has invested GBP15 million in Active Network Management (including a new intelligent software platform) to enable over 1 GW of additional renewable energy to connect to the network cheaper and faster, which is enough to power more than a quarter of a million homes.

EDL is developing a number of renewable hybrid projects in off-grid, remote communities. Following the success of Coober Pedy Hybrid Renewable Project (4-MW wind generation, 1-MW solar PV, a 1-MW/500-kWh battery) which supplies about 75% of the town's power through renewable energy, EDL has delivered the 56-MW microgrid at Gold Fields' Agnew gold mine incorporating wind, solar and thermal generation and battery storage. This microgrid has surpassed EDL's target of providing Gold Fields with energy that is more than 50% from renewable sources, with 99.99% reliability. A 50% renewable energy fraction cuts 46,400 tonnes of carbon dioxide per year. EDL is about to commence construction on the Jabiru Hybrid Renewable Project in Australia's Northern Territory.



EDL's hybrid renewable microgrid at the Agnew gold mine in Australia successfully demonstrates the potential for renewable energy with storage in the mining sector.

### Carbon capture, utilisation and storage

AVR is the first European energy-from-waste company capable of large-scale CO<sub>2</sub> capture and delivery. After commissioning of the CO<sub>2</sub> capture plant in Duiven in 2019, AVR has started with capture and supply of CO<sub>2</sub> to greenhouse horticulturists, contributing to reduced natural gas usage, therefore making greenhouse horticulture more sustainable. The carbon capture installation has a total capacity of 100,000 tons per year. AVR is planning a similar installation in Rotterdam with a capacity of 500,000 tons per year. Besides, carbon capture and storage in depleted gas fields offshore is foreseen. The Dutch energy-from-waste sector has set a target of reducing CO<sub>2</sub> emissions by 1 million tons by 2030.



AVR's carbon capture plant in Duiven, Netherlands, makes greenhouse horticulture more sustainable while putting CO<sub>2</sub> emissions to productive use.

### Efficient operations

As part of its 2019-2023 Development Plan, HK Electric is in the process of replacing aging coal-fired generating units at Lamma Power Station (LPS) with new gas-fired combined-cycle generating units, known as L10, L11 and L12. L10 was successfully commissioned in February 2020.

As the first gas-fired generating unit in Hong Kong equipped with selective catalytic reduction system, L10 offers excellent thermal efficiency and performance while ensuring air pollutant emission (in particular nitrogen oxides) is minimised. Compared with 2019, HK Electric achieved about 16% carbon reduction from electricity generation in 2020 with L10 in operation. Proportion of gas-fired electricity generation in its total output has also increased from about 30% to about 50%.

Ratchaburi Power adopted a new type gas turbine air inlet filter that improved the plant's cycle efficiency by 0.5%, resulting in improved fuel consumption and cost savings.

Jinwan Power has completed its upgrade and could provide 200 tons of steam-thermal energy per hour per machine set, raising the heat-to-power ratio to 21%. It also expects to raise the capacity to 280 tons per hour per machine set in five years. This would enable the plant to operate at a higher efficiency and achieve co-generation certification to enjoy favourable dispatching arrangements.

### Demand side management

UKPN is investing in innovative and smart technologies to mitigate transition risks by reducing its carbon emission through better management of electricity demand. UKPN through its flagship Flexibility programme uses demand-side response in situations where peak loads cannot be managed within existing firm capacity due to reduction, demand movement or autonomous network management. The deployment of predictive cooling on a number of major transformers in London networks enables UKPN to operate at an extended peak level for longer as transformer oil has been cooled prior to the peak load being experienced.

UKPN has also launched Domestic DSR projects which aim to provide services that deliver the best value to customers and address their changing needs. Three key projects were implemented to increase access for customers to Low Voltage flexibility – the Urban Energy Club, which supports customers living in small flats, Home Response, which explores social innovation for customers living in social housing, and Core4Grid, which provides individual home balancing with low carbon technologies. In 2020, UKPN achieved a world first by enabling domestic customers to participate in the flexibility market, providing demand side response services to the DNO. UKPN undertook a study and appraisal for energy efficiency across the DNO real estate.

United Energy deployed "Summer saver programme" for demand-side load management. Customers were given cash incentives to reduce electricity consumption. In addition, peak demand reduction helped defer network augmentations.

United Energy received funding from the Australian Government to trial voltage-reduction demand response capabilities on their electricity distribution network to help drive grid stability. United Energy used their voltage management system to deliver 30 MW of emergency reserves. This helped prevent power outages for 14,000 customers each hour during heatwave events in summer.

### Reducing air and fugitive emissions

To reduce air emissions, HK Electric used cleaner fuels such as natural gas and low-sulphur coal with lower ash content. In addition, HK Electric continued to make use of emissions reduction facilities such as a selective catalytic reduction system, flue gas desulphurisation plants and low-nitrogen-oxide burner systems to reduce and control air emissions from LPS.

It is expected that in 2023, when its three new gas-fired generating units (L10, L11 and L12) are in operation, the emissions of sulphur dioxide, nitrogen oxides and respirable suspended particulates will decrease by around 75-90% from 2005 levels.

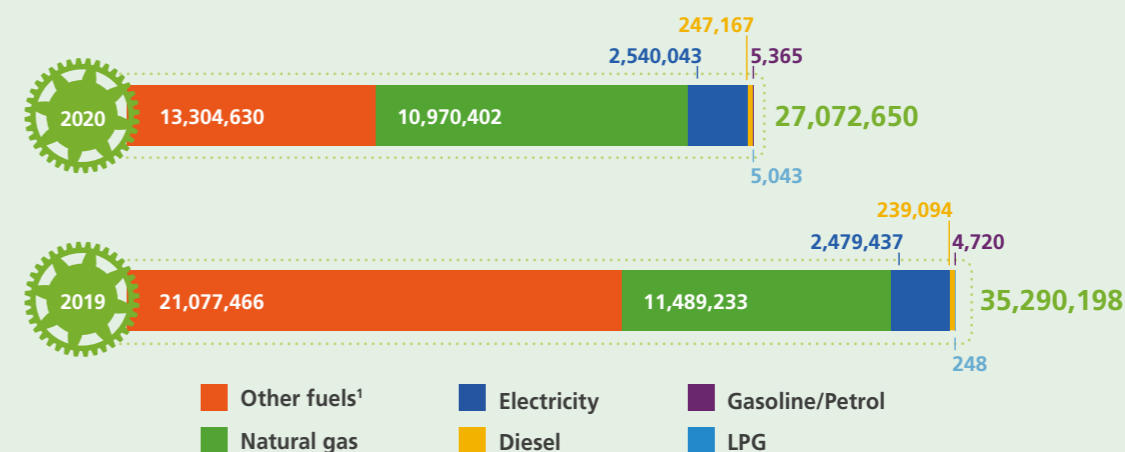
Our gas distribution networks have plans to replace legacy pipe materials (cast iron, unprotected steel and other) in order to reduce fugitive emissions of methane from networks as well as moving toward making

networks hydrogen ready. Other benefits include improved reliability of supply and reduced public risk associated with gas leaks. NGN, WWU and AGIG have replaced 422km, 337km and 417km of old gas pipelines respectively during 2020. NGN and WWU are ahead of their targets to reduce leakage:

- NGN: actual 27% against a target of 18% during the regulatory period from April 2013 to March 2021; and
- WWU: actual 19.7% at March 2020 against its target of 16% by March 2021.

UKPN has been participating in the Ofgem Decarbonisation and Environment Working Group to establish the requirements and features of an Environmental Action Plan. Besides, UKPN has completed the materiality assessment for its Scope 3 emissions which form part of its submission to the Science Based Targets initiative (SBTi) for approval. The assessment result clearly indicates UKPN needs to address the emissions in its supply chain as part of its work on moving the company to a net zero trajectory. Subject experts have participated in UKPN's Critical Friend Panels to discuss and share views on its Green Action Plan (GAP) progress and SBTi Net Zero project.

### Energy consumption ('000 kWh)



Note 1: Other fuels include lignite, residual fuel oil, industrial waste and biomass (e.g. landfill gas, sludge gas, etc).

### Looking forward

We will continue working with industry peers and policymakers to identify possible decarbonisation pathways. We are committed to reducing our coal-fired generation installed from about 50% of our generation portfolio in July 2017 to about 22% post-2023. We will actively look into suitable investment opportunities in clean energy and provide necessary support including funding to our investments to expand their renewable energy portfolio.

In addition to the Group-wide commitment, each business has also pledged to decarbonise. For example:

#### AGIG

- Continue working with Australia's five peak gas bodies to develop Gas Vision 2050 – a pathway to achieve near zero emissions in the gas sector

#### Canadian Power

- Move to 100% capable of gas-firing by 2022
- Convert Sheerness power plant from coal to natural gas firing. The conversion of the first unit was completed in 2020 and the second unit is due to be completed in 2021

#### HK Electric

- Reduce CO<sub>2</sub>e per electricity unit sold to no higher than 0.6 kg/kWh in 2023 from 0.93 kg/kWh in 2005

#### HMLP

- Reduce carbon intensity by 20% by 2025, compared with 2017

#### NGN

- Achieve net zero operational Scope 1 and 2 carbon emissions by 2031 (excluding gas shrinkage) and 2050 (including gas shrinkage), in line with science-based targets

#### UKPN

- Reduce business carbon footprint (BCF) by 2% per annum. Since 2014/15, UKPN has reduced BCF by 25.5%

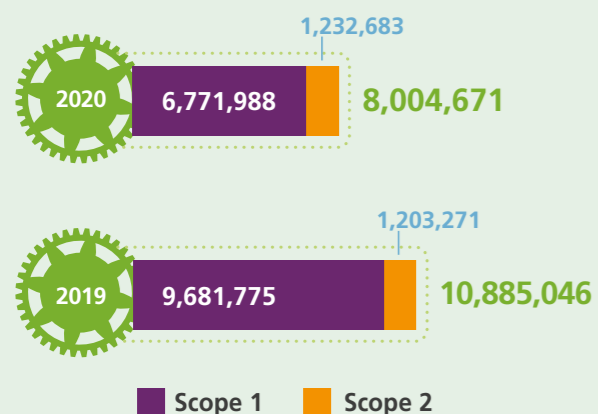
#### VPN

- Construct a 120-MW Bomen Solar Farm and associated network assets

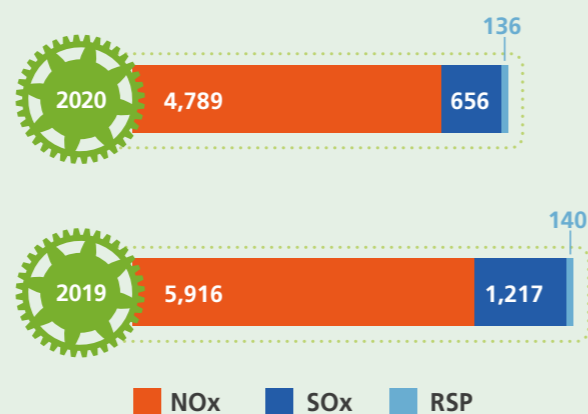
#### WWU

- Reduce GHG emissions by 37.5% by 2035 compared to 2020 levels
- Reduce gas shrinkage by 10% by 2026
- Ensure at least 75% of company vehicles are hybrid or ultra-low-emission vehicles by 2026
- Reduce carbon emissions associated with non-operational travel by 5% by 2026
- Become a net-zero ready carbon emission network by 2035

### GHG Scope 1 and 2 emissions (tCO<sub>2</sub>e)



### Air emissions (tonne)



## Opportunities in Clean Technology

### Challenges and Opportunities

Hydrogen economy is a relatively new concept that can potentially offer a promising path for energy security, along with other environmental and economic benefits. Green hydrogen can drive decarbonisation and is viable with strategic offtake agreements and government support frameworks. However, there are still many challenges to realising a hydrogen economy, as the transition from a conventional petroleum-based energy system to a hydrogen economy involves many uncertainties, such as the development of efficient fuel cell technologies, problems in hydrogen production and distribution infrastructure and the response of petroleum markets. Other factors are cost competitiveness, a good safety system and public acceptance.

With continued technology improvements and cost declines, hydrogen as an energy source could present the Group with new opportunities in providing a cleaner energy alternative to customers.

### Our Commitment

The Group seeks to prepare its electricity and gas networks to support smart cities and the hydrogen economy. We will embrace the viability of a hydrogen economy with gas networks working on hydrogen blending, and seek to introduce hydrogen in gas distribution networks where applicable. We will also support governments in different jurisdictions to turn into smart cities by rolling out smart meters, provide adequate EV charging facilities, and educate the community on sustainability, energy efficiency, and renewable energy.



### How We Work

#### Hydrogen economy

Power Assets is a member of the Hydrogen Council and is working actively with industry peers along the entire product chain and policy makers to demonstrate and promote hydrogen as a reliable, clean and safe fuel for achieving the net zero targets set by various jurisdictions. In the gas distribution sector, NGN and WWU are founding members promoting the H21 (hydrogen in the 21st Century) concept and related projects. H21 is a collaborative gas industry programme focused on demonstrating how converting the UK gas network to carry 100% hydrogen can tackle the UK's decarbonisation challenges. H21 is now focused on delivering two key pieces of work, to enable a first policy decision on hydrogen to be made.

- H21 – construction work of the Spadeadam micro network and the Redcar test site commenced and will be completed in early 2021, with testing commencing shortly afterwards. These tests aim to give confidence to the industry and UK policy makers that conversion of the gas networks to 100% hydrogen is achievable and safe.
- HyDeploy – a 16-month live demonstration of up to a 20% blend of hydrogen into the gas network is taking place within Keele University's private gas network and will be completed in March 2021. Following this HyDeploy2 will start blending up to a 20% blend of hydrogen into NGN's domestic gas network in April 2021. This will provide 670 properties on NGN's gas network with a hydrogen blend for 10 months and aims to demonstrate that this level of blend is safe to use both within the existing network and with existing domestic gas appliances – allowing carbon emissions to be reduced at no significant extra cost to the customer.

NGN plays a leading role in the H21 project in Buxton which seeks to repurpose the gas network to carry hydrogen, delivering clean energy to homes and businesses in England.

WWU has assessed the combined energy demands and researched hydrogen supply and hybrid heating within the UK with the Hybrid-Hydrogen project. The research project is studying how to incorporate these two technology vectors into the transition to net-zero carbon emissions. This allows wider regulatory and policy stakeholders to be engaged and provides long-term savings to customers with better long-term planning decisions.

AGN and Multinet Gas progressed the construction of a 1.25-MW hydrogen electrolyser plant at the Tonsley Innovation District in South Australia for the Hydrogen Park SA (HyP SA) project. HyP SA is the first Australian project to produce renewable hydrogen for blending with natural gas and supply to domestic customers via AGIG's existing gas distribution network in South Australia. A 5% hydrogen blend is the first step to lower GHG emissions and the next step is to extend the hydrogen footprint with projects considering up to 10% hydrogen blend before 100% conversion. The HyP SA project also supplies to industry via tube trailers and aims to supply the transport sector in the future. This project will be used to analyse and develop business models for the use of "green" hydrogen utilising excess solar energy during the daytime and the excess wind energy during the night to progressively decarbonise gas supply. Its importance is reflected through receipt of the 2020 Australian Engineering Excellence Award for South Australia and the 2020 Australian Pipeline and Gas Association Environment Award.

To expand AGN's renewable gas footprint into Queensland, the company has announced the construction of Hydrogen Park Gladstone (HyP Gladstone) with a grant funding of AUD1.7 million provided by Queensland Government in February 2020. This AUD4.2 million HyP Gladstone renewable hydrogen production facility involving the installation of a 175-kW electrolyser, is able to deliver up to 10% blended hydrogen across the city's total 770 residential, small commercial and industrial customer base. The project is currently focusing on customer engagement, detailed engineering and design, and is expected to begin production in Q3 2022.

#### Smart Cities

WWU continued development work on the Pathfinder 2050 model that allows cities, regions and countries to evaluate future scenarios of low-carbon supplies for heat, power and transport, allowing them to view the impact of increased integration of the gas and electricity networks in terms of costs and CO<sub>2</sub> reduction, collaborating with other industry players to share these insights. In addition, a new investment model was developed to access how the gas network was impacted by changes to customer behaviour and the installation of new technologies, such as hybrid heating systems that allow customers to arbitrage between natural gas and electricity.

UKPN is developing systems to collect and use both voltage-related data and smart meter energy consumption data to enable further improvements in the efficiency and cost-effectiveness of its electricity distribution network to provide a superior service to its customers. As of end 2020, there are approximately 3 million smart meters (equivalent to 40% of all domestic customers) installed in UKPN Regions.

HK Electric is in support of the Hong Kong government's vision to turn Hong Kong into a smart green city. It has commenced a full-scale rollout of smart meters in phases across its supply territory. It is expected that upon completion of the programme in 2025, smart meters will have been installed in every home and business throughout the network.

United Energy has been chosen as the only network in Victoria to take part in a new EV smart charging trial. This trial is supported by a grant of AUD835,000 from the Australian Renewable Energy Agency and will see smart chargers installed across the residential, commercial and industrial parts of the network. The trial will remotely monitor and control the chargers via Origin Energy's existing platform for managing distributed energy. Smart chargers will allow control of EV charging in order to avoid negative impacts on the grid, and maximise the use and value of renewable energy. The AUD2.9 million-trial looks to help the energy sector better understand EV driver behaviour and whether drivers are comfortable with a third party having control of the charging process.

## Preserving Natural Environment

### Challenges and Opportunities

Preserving biodiversity is extremely important and energy and utility players that have operations in ecologically sensitive areas are subject to extensive environmental impact assessments and checking by the local regulators for project approval.

The possible negative impacts of existing assets and infrastructure projects such as power plants, transmission towers and wires, oil and gas pipelines and oil tanks on the surrounding ecosystem would also lead to scrutiny from regulators. Therefore careful project planning, design, and operation is a must for the Group to minimise its impact on the local ecosystem and biodiversity.

### Our Commitment

We are committed to protecting the environment and biodiversity, and supporting sustainable development by conducting our business in an environmentally responsible manner.

We aim to minimise the impact of our operations on the environment while addressing the global concern about climate change. We comply fully with all applicable laws and regulations and endeavour to integrate environmental considerations into all aspects of our business operations.

As a player in an essential utility sector in numerous markets around the world, we are also committed to supporting local governments in achieving the goals set by the United Nations Framework Convention on Climate Change. For more information, please refer to “Combating Climate Change” on pages 24 to 29, and “Opportunities in Clean Technology” on pages 30 to 31.

### How We Work

#### Environmental management system

Power Assets is implementing an Environmental Management System (EMS) with an aim to contribute to the ‘environmental pillar’ of the company’s sustainability development. This EMS serves to ensure continual environmental improvement, monitor compliance with relevant laws and regulations, fulfil supply-chain requirements, promote staff environmental awareness and increase financial savings resulting from resource saving and cost reduction. Most of our business units have their EMS with details of each company given as below:

HK Electric has three ISO14001:2015-certified EMS in place, which covers the generation, transmission, and distribution of electricity to Hong Kong Island and Lamma Island, and the development of power infrastructure. Other businesses with ISO14001:2015-certified EMS include NGN, WWU, UKPN, Seabank Power, AVR, VPN, Jinwan Power and Ratchaburi Power. The EMS of SAPN is also developed in line with ISO14001.

Environmental awareness is one of the strategic focuses of our [Environmental Policy](#) and forms an integral part of our EMS. UKPN conducts Working in the Environment training that highlights the potential impacts of its business on the environment. The course helps colleagues understand how to manage environmental issues and where to get information to alleviate or resolve such issues. In 2019/20, 76 employees attended the course, taking the total number to 303 by the end of March 2020.

#### Protecting biodiversity

It is part of our [Environmental Policy](#) to protect the biodiversity and habitats in the area around our projects. We seek to minimise and mitigate the impact of our developments before we begin a project, and continuously monitor the potential impact of operating projects on biodiversity.

In addition to controlling the impacts of air and noise emissions, excessive illumination and human disturbance to plants and animals, HK Electric also has a planting programme in place to promote biodiversity through the cultivation of native trees and shrub species, and attract local wildlife.

UKPN has committed to a Networks Green Action Plan to enhance biodiversity around the sites, in particular substation sites. As part of the Green Action Plan initiative, UKPN identified 100 sites where it believes it can make a difference and has set a target of improving the biodiversity potential by at least 20%. UKPN partnered with ecological experts (ADAS and Wildlife Trusts) to assess the sites and determine a baseline biodiversity measurement. Following each survey, a biodiversity management plan was prepared with site-specific measures to enhance the biodiversity

potential. In 2020 the main focus was on determining the 100 sites and setting plans. By 2021, UKPN aims to increase the biodiversity value by up to 30% at 100 sites to actively contribute towards minimising species decline and promoting net gain.

To ensure that works can be designed to have no significant impacts on wildlife and biodiversity, NGN carefully plans necessary works in areas of known biodiversity sensitivity, such as Special Areas of Conservation or Sites of Special Scientific Interest, avoiding such areas wherever possible. Site-specific ecological assessments (desktop and site surveys) are undertaken as necessary to minimise the impact of work carried out. The target area includes land owned by NGN and by third parties. This process often includes discussions with national regulators to obtain permissions/consents for works and agreement on mitigation measures. As for WWU, project-specific works are undertaken to avoid detrimental impacts on biodiversity, with local and limited improvements applied.



SAPN has been working with Greening Australia and the Department of Environment and Water to improve biodiversity outcomes associated with SAPN's operations and infrastructure. Initiatives include revegetation at the Kangaroo Island Power Station, investigating new types of wildlife diverters, mitigation of street light pollution and the relocation of a significant raptor nest near Kingscote.

CitiPower and Powercor are continually pursuing bushfire risk reduction best practice through new technology trials and adoption:

- High voltage cover conductor (LoSAG) in the Powercor Network – 50-km trial installation.
- Early fault detection technology continuously monitors disturbances along overhead conductors and aims to trigger an inspection response prior to a defect condition manifesting into a permanent fault.
- Light Detection and Ranging (LiDAR) is used to conduct an annual vegetation inspection programme. This technology is more accurate than a ground-based visual inspection, and assists with data-driven assessment of vegetation growth to help optimise treatment cycles and prevent encroachment on to the minimum clearance space.



• Drones with powerful cameras and thermal imaging devices patrol powerlines across dense forest to keep network infrastructure safe from bush fire risk.

### Water management

Water is a basic and irreplaceable natural resource. Based on the water risk framework of the World Resources Institute's (WRI) publication on financial risks from water constraints on power generation, we currently have no production plants/sites located in water-stressed areas and our operations are considered of low risk. Despite this, we have devised a plan for water conservation which includes reusing wastewater and rainwater at our power stations, adopting water efficiency appliances in our premises and preserving water quality by reducing discharge.

HK Electric strives to reduce freshwater consumption at LPS through the collection and reuse of rainwater and plant processing water. In 2020, more than 123,000 m<sup>3</sup> of water was collected for reuse. Smart water meters also enable the company to monitor water use in real time and identify areas for improvement.

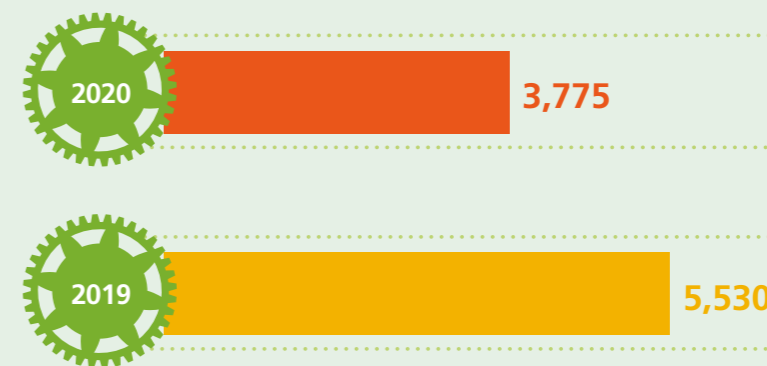
UKPN is implementing water efficiency measures that have resulted in a 15% reduction in the water use at its offices. A trial has been launched at the head office to install cistern hippos to the toilet facilities, and push-tap installation is planned to minimise water wastage.

Ratchaburi Power uses heat recovery steam generator (HRSG) blow down for watering to reduce water usage. The cycle of cooling water is also optimised to reduce raw water use and water discharge.

Jinwan power plant modified its setup to use a dry cleaning process of flushing water for its coal pulveriser pyrite system.

We will continue to pursue opportunities to reduce water usage across our businesses in future. In particular, UKPN aims to reduce existing water consumption at the top six depots by 10-15% by 2021.

### Water consumption in past two years ('000 m<sup>3</sup>)



### Managing waste and effluent

Another strategic objective of our [Environmental Policy](#) is the sound management of waste and effluent. In order to continuously improve, we look for opportunities to implement reuse and recycle initiatives that result in net positive impacts on the environment.

#### Proper disposal

To expand its range of environmental services, AVR launched one of the largest plastic separation facilities in the Netherlands, with a capacity of 430,000 tonnes. At its Rozenburg facility, the company also extended its biomass processing capabilities to provide, apart from electricity, heat and steam to key customers, while at the same time investigating the feasibility of increasing the amount of hazardous waste processed.

To ensure adequate management and storage of chemicals, EDL has greatly improved waste tracking and reporting processes and is working on reducing waste generation, particularly in the areas of engine oil, oily water, and coolants. At NGN, approximately 99.5% of waste by weight is excavation spoil. Spoil is excavated, segregated by type on-site and assessed

for contamination. Clean spoil is sent off-site to recycling centres for processing into recycled aggregate. Contaminated soil is segregated, tested, classified and then sent to the appropriate facility for treatment and/or disposal. Jinwan achieved flue gas wastewater zero-discharge at the end of 2020 and is also modifying its coal pulveriser pyrite system to use a dried clearing system instead of flushing water. This can reduce the amount of effluent produced. The modification work was completed in January 2021.



• Ratchaburi Power monitors water quality at drainage points to protect the community.

### Hazardous waste management

We are extremely careful about managing waste generated from our operations, including the by-products of energy generations. Our collective efforts to reduce waste involve our employees, contractors, suppliers, regulators and other third parties. We advocate waste reduction at the source and encourage the reuse and recycling of waste for other projects. Waste management plans have been formulated and implemented to enable recycling and reuse, and proper storage, collection, treatment and disposal of waste. Temporary wastewater storage and treatment facilities have been installed at power plant construction sites to recycle wastewater generated from bore piling work to reduce wastewater discharge. Furthermore, our power plants have been collecting generation by-products including ash and gypsum for industrial use, such as manufacturing of cement.

At WWU, hazardous solid waste is stored securely at depots within locked units or managed open storage areas. Waste is segregated into clearly-defined hazardous waste streams at each depot.

SAPN conducts substation audits each year to assess its oil-filled assets (such as high voltage transformers and insulators) against safety, condition and environmental criteria. They also check for PCB (polychlorinated biphenyl) contamination from old transformers and circuit breakers. Substations located close to homes, offices, waterways or conservation areas, or considered high risk, may require the installation of bunding (a type of wall) around transformers to protect the surrounding area from a leak.

HMLP continues to reduce the probability and consequence of a pipeline incident with advancements in pipeline integrity management, operational integrity management, control room management, and innovative technology. Fibre optic cables supplement existing leak detection systems along new pipeline segments helping to monitor temperature, strain, and acoustics to pinpoint a leak. Drones with thermal imaging are available to substitute regular aerial flights. An extensive geohazard programme is complemented by radar-equipped satellites and slope inclinometers to detect ground movements.

### Reduce, reuse and recycle

The Group is implementing the “4R” Policy – reduce, reuse, recover and recycle materials and resources. It collects ash and gypsum from power plants for industrial use and limits the amount of excavated spoil sent to landfill by using recycled aggregates rather than virgin aggregates.

According to its Environmental Policy, HK Electric seeks to reduce, reuse, recover and recycle the waste generated. Waste generated from the construction activities associated with the gas-fired generating units, L11 and L12 generators at the LPS are recycled or properly disposed of by different methods. Temporary wastewater storage and treatment facilities have been installed on-site to recycle wastewater generated from bore piling work to reduce wastewater discharge.

### Looking forward

In 2021, we will continue to strive to reduce waste sent to landfill. Our focus on waste includes reducing, reusing, recovering and recycling materials and resources. Many of our businesses have made formal commitments to reduce waste. For example:

#### HK Electric

- Collect at least 100,000 m<sup>3</sup> of plant effluent and rainwater for reuse at LPS in 2021.

#### Seabank Power

- Investigate new technologies and the ability to reduce the amount of back-up biocide dosing being used in chemicals for the secondary treated sewage water used as process cooling water.

#### UKPN

- Divert more than 90% of the waste from landfills and recycle more than 80% of the waste from the top six sites by December 2021. To achieve this target, UKPN is progressing with plans to pilot best-practice recycling which involves establishing improved monitoring and measuring recycling practices, and initiatives such as the enhanced behavioural campaign and the roll-out of new fit for purpose bins.

#### WWU

- Divert at least 80% of excavated spoil materials, which accounts for over 95% of total waste generated by WWU, from landfill by 2026.

## Regulatory Compliance

We regard compliance with laws and regulations as one of our top priorities and there are established policies and accountability mechanisms to ensure compliance in all aspects of our operations. Our management is committed to staying abreast of the latest regulatory developments and providing all necessary training for relevant personnel. We also dedicate extensive efforts to ensure there are effective monitoring and detection measures to track compliance.

During the reporting period, we were not aware of any non-compliance with laws and regulations having a significant impact on the Group relating to air and GHG emissions, discharge into water and land, and generation of hazardous and non-hazardous wastes.

