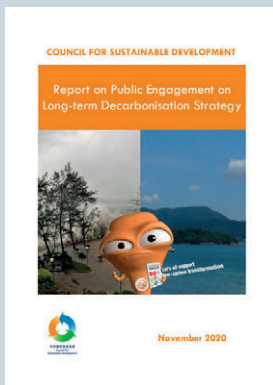


## Report on Long-term Decarbonisation Strategy



At the invitation of the Government, the Council for Sustainable Development (SDC) launched a territory-wide public engagement exercise on the long-term decarbonisation strategy of Hong Kong by adopting a bottom-up and stakeholder-oriented approach, so as to

enhance public awareness of the impact of carbon emissions and gauge the views of the community.

In November 2020, SDC submitted a report to the Government, identifying six overarching objectives for Hong Kong's decarbonisation strategy, namely driving societal change towards low-carbon lifestyles; accelerating the shift to zero-carbon energy; promoting a sustainable built environment; promoting transitions towards low-carbon transport systems; unlocking green and sustainable finance potential for low-carbon transition; and steering innovations in climate change mitigation, adaptation and resilience. SDC's report provides important reference for Hong Kong's strategies on decarbonisation and climate change adaptation.



The Council for Sustainable Development published the Report on Public Engagement on Long-term Decarbonisation Strategy in November 2020

# Net-zero Electricity Generation

## Long-term target : Net-zero carbon emissions in electricity generation before 2050

4.3.1 At present, fossil fuels, including natural gas and coal, account for over 70% of Hong Kong's fuel mix for electricity generation. Under the overall strategy of achieving carbon neutrality, we must progressively increase the use of zero-carbon energy for electricity generation before 2050. In searching for suitable zero-carbon energy, four important factors should be taken into account : safety, reliability, affordability and environmental performance.



Safety



Reliability



Affordability



Environmental performance

4.3.2 Due to limitations of land and natural resources, many major cities in the world are unable to completely rely on zero-carbon electricity generated locally. For example, in many European cities, the plans to achieve carbon neutrality in electricity generation focus on the following three areas: replacing the existing fossil fuels progressively with new zero-carbon energy for electricity generation, striving to develop RE such as solar energy, and importing zero-carbon electricity from surrounding areas. We can also follow this direction in reducing carbon emissions from the electricity generation sector.

4.3.3 On RE development, we can increase RE supply through government-developed facilities, investment by power companies and encouraging public participation. Our goal is to increase the share of RE in the fuel mix for electricity generation from the existing less than 1% to 15% before 2050. Specifically, the Government can strive to develop more advanced waste-to-energy facilities to turn waste into electricity. Moreover, in view of the limited land-based RE resources, we may explore the use of space and potential on the sea to build wind farms. The Government will also continue to take the lead in RE development and create favourable conditions for the private sector to do so.

4.3.4 As RE such as solar and wind energy is intermittent by nature, using RE as the main source for electricity generation has its shortcomings. Setting up large-scale electricity storage facilities will take up additional land and reduce efficiency. In view of this, many countries and cities have high hopes for the development of new zero-carbon energy, such as hydrogen produced by RE (green hydrogen). However, many technologies covering the production, transportation or application of zero-carbon energy are still at the R&D stage, and have yet to be developed into mature, reliable and price-competitive options. With the imminent threat of climate change supported by evidence, the whole world must act quickly to reduce carbon emissions, and cannot afford to just wait for the development of new technologies. Having regard to considerations of maturity, reliability and affordability, many countries have included nuclear energy as one of the technologies for helping achieve carbon neutrality by the middle of this century. At present, about a quarter of Hong Kong's electricity is generated from nuclear energy.

4.3.5 Apart from developing RE as far as possible, we will continue to increase the use of natural gas with lower carbon emissions and zero-carbon energy to replace coal for electricity generation in the medium term. We will also explore the supply of new zero-carbon energy by collaborating with neighbouring regions to participate in and operate zero-carbon energy projects near Hong Kong through joint ventures and joint development, etc. Priority will be given to RE where practicable, noting the concern of some over the increased use of nuclear energy. However, noting the limited potential of RE development in Hong Kong, the strong demand for RE by our country and neighbouring areas striving to achieve carbon neutrality

as well as the uncertainties involved in new zero-carbon energy development, we must explore all practicable options and cannot rule out any kind of zero-carbon energy, including increasing the use of nuclear energy in the fuel mix as part of the transition to achieve carbon neutrality.

4.3.6 Maintaining a certain proportion of local power generation for reliable electricity supply is important. Therefore, we must, at the same time, explore and try out other types of zero-carbon energy (e.g. hydrogen energy) for electricity generation in Hong Kong, and progressively increase their application. The Government and the power companies are actively studying the development and application of new energy such as hydrogen, including importing hydrogen or other forms of new energy for use as fuels, so that they may be adopted for trial and application in Hong Kong when the technologies become relatively mature. We hope that technological advancement will allow Hong Kong to achieve net-zero electricity generation before 2050 by the adoption of hydrogen or other forms of zero-carbon energy and technologies in local electricity generation.

### What is zero-carbon energy ?

Zero-carbon energy refers to energy which does not generate carbon emissions during their production or usage. Zero-carbon energy under application in Hong Kong currently includes solar, wind and nuclear energy. We are also closely monitoring the development of new zero-carbon energy (e.g. green hydrogen), and will seize the opportunity to adopt such energy as the technologies become relatively mature.



The solar energy generation system installed by HK Electric at its Lamna Power Station

## Medium-term targets: Phasing out coal for electricity generation • Developing RE

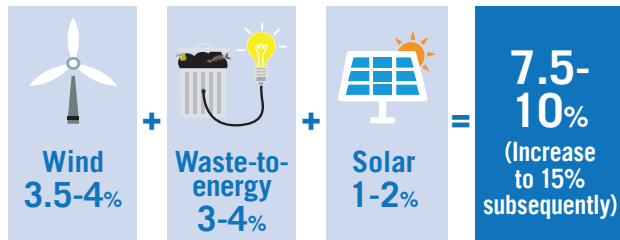
4.3.7 Coal, accounting for around a quarter in the current fuel mix for electricity generation, emits the highest level of carbon emissions. Hong Kong has ceased to build coal-fired generation units since 1997 and has been gradually phasing out the existing units. By 2035, we will cease using coal for daily electricity generation and will only keep it for providing backup support. Coal will be replaced by natural gas with lower carbon emissions and zero-carbon energy (e.g. RE and nuclear energy) by then.

4.3.8 To expedite transformation to low-carbon energy, we are committed to increasing the share of RE in the fuel mix for electricity generation from less than 1% at present to 7.5% to 10% by 2035.

4.3.9 To achieve this target, we will strive to develop more advanced waste-to-energy facilities, including the infrastructure for recycling of food waste and construction of another large-scale integrated waste management facility. It is estimated that around 3% to 4% of Hong Kong's electricity demand would be met by the electricity generated by such facilities by 2035.

4.3.10 The Government and the two power companies are reviewing proposals to develop offshore wind farms. The two power companies expect that improvement in the design of wind farms and the adoption of new technologies can increase the amount of electricity generated and the economic benefits. Our preliminary estimate shows that by 2035, the wind energy generated would be able to meet around 3.5% to 4% of Hong Kong's electricity demand.

### RE Potential (Until 2035)



4.3.11 The Government has introduced with the power companies the FiT Scheme in recent years to encourage the community to develop distributed RE, such as solar energy. The Government has also developed a wide range of RE projects in various premises, such as reservoirs, restored landfills, government buildings and other suitable facilities. With the continuous technological advancement and the active participation of the community, we expect that solar energy would be able to meet around 1% to 2% of Hong Kong's electricity demand by 2035, and the total share of RE in Hong Kong's fuel mix would reach 7.5% to 10%.



An offshore wind farm at the GBA

4.3.12 The Government will continue to take the lead in developing RE and strive to incorporate RE technologies in all capital works projects. We will update the Government circular on Green Government Buildings and raise the requirements of applying RE technologies in new government buildings. For instance, the proportion of available roof space for installing RE systems will be increased from the current 10% to 25%. We will also continue to install RE systems in existing government buildings (including outdoor parking lots) as far as possible.

4.3.13 Reservoirs in the open air offer more space and potential for installing solar energy generation systems. Building on the success of the pilot projects of floating solar energy generation systems at Shek Pik Reservoir and Plover Cove Reservoir, the Water Supplies Department (WSD) plans to install larger floating solar energy generation systems with a generating capacity of 5-10 megawatts (MW) each at various reservoirs, including Plover Cove Reservoir, Shek Pik Reservoir and Tai Lam Chung Reservoir. In addition, WSD has embarked on a study on installing a floating solar energy generation system with a generating capacity of over 100 MW at Plover Cove Reservoir. The project is estimated to generate more than 100 million kWh of electricity a year, meeting about 0.2% of Hong Kong's electricity demand. The Government is also exploring the feasibility of installing floating or other appropriate types of solar energy generation systems in suitable water channels.

4.3.14 We will also make use of landfills to generate RE. Apart from utilising landfill gas for electricity generation, we are actively exploring the installation of solar energy generation systems at restored landfills. For instance, EPD will

launch a pilot scheme on solar energy generation at the South East New Territories Landfill in Tseung Kwan O.

4.3.15 Since May 2011, the Housing Authority has been installing solar energy generation systems at domestic blocks of new public rental housing estates where it is technically feasible and the rooftop conditions permit, with the target to provide at least 1.5% of the communal electricity consumption. In addition to new domestic blocks, the Government will explore the installation of solar energy generation systems on the rooftops of domestic blocks of existing public rental housing estates where technically feasible.



The solar energy generation system installed by the Housing Authority at Shui Chuen O Estate

4.3.16 To assist the private sector in developing and applying RE, the Government will explore ways to facilitate the installation of RE systems by the private sector on their land and properties, such as measures to facilitate installation of solar energy generation systems by the private sector in open car parks. Coupled with the FIT Scheme, this can help foster the development of RE.



The floating solar energy generation system at Shek Pik Reservoir

4.3.17 The Government, together with the power companies, will also explore ways to enhance regional cooperation on zero-carbon energy and identify sources of zero-carbon energy in neighbouring regions, including seeking joint investment and development opportunities for participating in and operating zero-carbon energy projects near Hong Kong. We will also keep abreast of developments in technologies that utilise RE for electricity generation.

4.3.18 To achieve the target of reducing the total carbon emissions by 50% from the 2005 level before 2035, more options are needed for raising the share of zero-carbon energy in the fuel mix for electricity generation to about 60% to 70%.

### Implementation of food waste and sewage sludge co-digestion to enhance waste-to-energy transformation

The Food Waste/Sewage Sludge Anaerobic Co-digestion Trial Scheme, jointly launched by Drainage Services Department (DSD) and EPD at Tai Po Sewage Treatment Works (STW), was commissioned in May 2019 to receive food waste for food waste/sewage sludge anaerobic co-digestion. Apart from increasing the biogas yield and reducing the amount of digestate and carbon emissions from the Tai Po STW, the pilot scheme can also enhance Hong Kong's food waste treatment capacity and turn waste into electricity. Under this trial scheme, up to 50 tonnes of food waste can be treated per day, and the energy to be generated annually is estimated to be about 950 000 kWh.



Facility for food waste/sewage sludge anaerobic co-digestion at Tai Po STW

The second Food Waste/Sewage Sludge Anaerobic Co-digestion Trial Scheme will be conducted at Shatin STW, in which the treatment of food waste from commercial, industrial and domestic sources will be tested. The estimated food waste treatment capacity is 50 tonnes per day, and the relevant works are expected to be completed at the end of 2022.

### Development of innovative RE technology for better utilisation of existing resources

Flexible thin-film solar PV panels are malleable and suitable for application on curved surfaces and surfaces of different shapes, facilitating the wider application of solar PV systems. Starting from 2019, DSD has installed in phases the high-efficiency Copper Indium Gallium Selenide (CIGS) thin-film solar PV system on the curved sedimentation tank covers, occupying an area of about 30 000 m<sup>2</sup> at Stonecutters Island STW, to supply electricity for the plant. The works project will be completed in 2024-25. Upon completion, this thin-film solar PV installation will be the largest of its kind in Hong Kong, with a total installed generation capacity of over 1 MW.



The thin-film solar PV system at Stonecutters STW

Besides, through the water tunnel under the Tolo Harbour Effluent Export Scheme, the effluent generated from DSD's Tai Po STW and Shatin STW is discharged into Victoria Harbour via Kai Tak River together with the collected rainwater, and the average flow rate is more than 4 m<sup>3</sup>/s. DSD is studying options for better utilisation of water flow by installing a hydro turbine system, with a view to generating electricity for use by suitable government facilities in the Wong Tai Sin District.