



SPgroup

Empowering the Future of Energy



Sustainability Review FY2020/2021

Scope of review

This is the annual sustainability review published by SP Group [SP] for the financial year 1 April 2020 to 31 March 2021 [“FY20/21”]. The scope of this review covers SP’s Singapore-based operations.

Sustainability Strategy

SP’s mission is to deliver reliable and efficient utilities services to enhance the economy and the quality of life of our customers. This mission is rooted in our core values of commitment, integrity, passion and teamwork.

In FY20/21, we maintained our focus on upholding reliability while we charted new paths for the business with Strategy 2030, a 10-year roadmap to create a low carbon, smart energy Singapore and become the leading sustainable energy solutions player in Asia Pacific.

Sustainability is central to achieving our mission and business objectives in a responsible and committed manner. As a leading energy utilities company, we have anchored our sustainability strategy on the United Nation’s Sustainable Development Goal [SDG] 7 to ensure access to reliable, sustainable and modern energy for all.

In the past year, we have added SDG 9 to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.

With this, the specific targets that the Group aims to support are grouped under the two focus areas of Clean and Smart Energy and Reliable and Sustainable Infrastructure.

Clean and Smart Energy:



SDG 7.1 – Universal Access to Modern Energy [Energy access]



SDG 7.2 – Increase Global Percentage of Renewable Energy [Renewable Energy]



SDG 7.3 – Double the Improvement in Energy Efficiency [Energy Efficiency]

Reliable and Sustainable Infrastructure:



SDG 9.1 – Develop Sustainable, Resilient and Inclusive Infrastructures [Reliable Infrastructure]



SDG 9.4 – Update all Industries and Infrastructure for Sustainability [Sustainable Infrastructure]

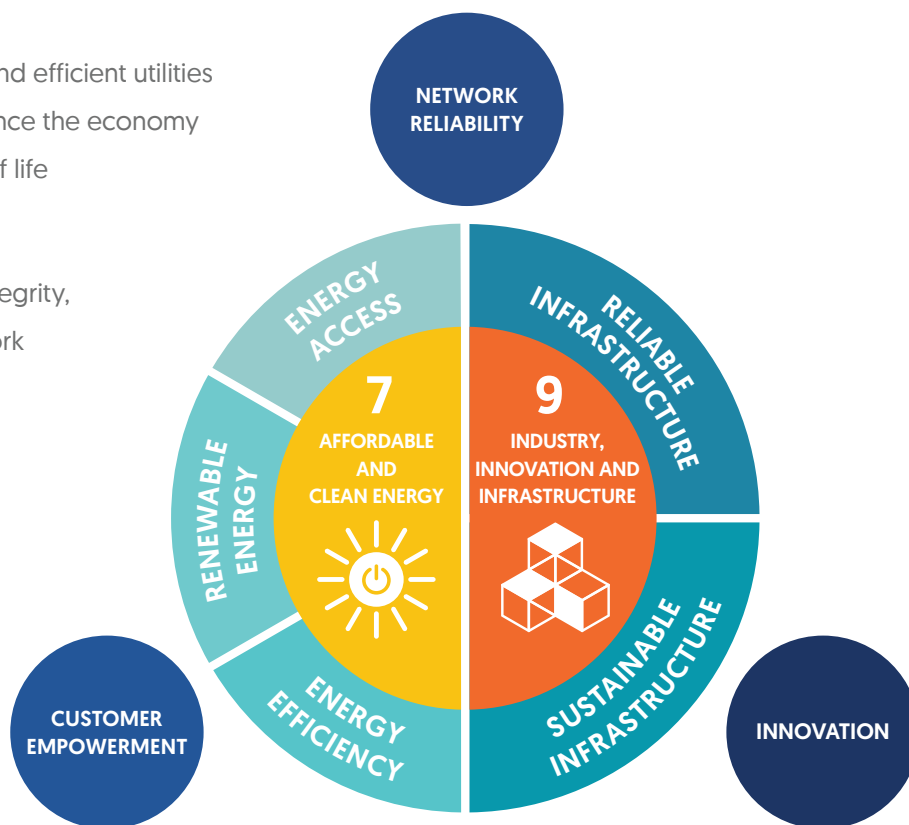
We have also identified three material topics that support our actions towards the achievement of the targets of SDG 7 and SDG 9: 1) Network Reliability, 2) Innovation and 3) Customer Empowerment.

Mission:

Deliver reliable and efficient utilities services to enhance the economy and the quality of life

Core Values:

Commitment, Integrity, Passion, Teamwork



Creating a sustainable future

We aspire to be a leading utilities company in a sustainable future. To achieve this, we invest in innovative technology and infrastructure to ensure that we continue to deliver energy to customers safely and reliably amidst an evolving energy landscape. The following strategic thrusts form the pillars to our future:

1. Upholding our position as a reliable and efficient grid operator

With the proliferation of distributed and intermittent energy sources, we continue to invest in innovative technologies to integrate renewables to maintain grid stability and reliability.

2. Providing Sustainable Energy Solutions

To create a low carbon, smart energy Singapore, we extend our efforts beyond our own operations to empower both residential, commercial and industrial customers to make changes to their daily habits and operations, with the aim of creating a larger impact. Innovative solutions such as district cooling, centralised cooling system solutions in new HDB towns and promoting electromobility are key to achieving this goal.

3. Be a leading Sustainable Energy Solutions player in Asia Pacific

Leveraging our strengths and experience to enable a sustainable energy future for customers in Singapore, we are bringing our solutions and experiences to overseas markets such as China and Vietnam to benefit more customers in the region.

Integrating sustainable financing

To deepen the integration of our sustainability ambitions within our financing strategy, we have recently established a Green Financing Framework¹ that is benchmarked against relevant international principles and guidelines. Under the Framework, the Group and its subsidiaries will be able to issue green financing instruments to finance and/or refinance eligible green projects in four categories, namely: 1) clean transportation, 2) energy efficiency projects, 3) renewable energy and 4) green buildings. This allows investors and lenders to have greater visibility on the use of proceeds and the positive environmental impact of the Group's investments in sustainable energy solutions and projects that are funded by green financing instruments.

FY20/21 environmental performance

SP is committed to reducing the environmental impact of our business operations. Since 2019, we have undertaken annual data collection exercise to calculate the greenhouse gas (GHG) emissions from our business activities following the principles in the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard [revised edition]* and *GHG Protocol Scope 2 Guidance*.

	Absolute, tonnesCO ₂ e		Intensity, kgCO ₂ e/MWh sold	
	FY19/20	FY20/21	FY19/20	FY20/21
Emissions				
Scope 1	25,966	21,098	0.54	0.45
Scope 2	375,987 ²	383,846	7.83	8.17

The bulk of SP's GHG emissions in Scope 2 resulted from the dissipated energy emissions from technical losses from the transmission system and distribution network in Singapore. While this emission is relatively stable and inherent in the operations of the network, SP Group is committed to identify opportunities to reduce the emissions from other key business activities. In the coming years, we will explore new technologies to help us develop our decarbonisation roadmap to reduce our emissions to meet our carbon reduction target. This roadmap will also include an identification of the climate-related risks and opportunities to help us plan for more sustainable and resilient operations into the future.

With the launch of My Green Credits™ on the SP Utilities app, SP has pledged to cover 100 per cent of the electricity consumption at our Singapore headquarters with Renewable Energy Certificates (RECs) from October 2020 onwards.

These actions are in support of the "30-30-30" target that was set to add at least 30 per cent value to our customers and reduce our carbon footprint by 30 per cent, by 2030. With FY18/19 as the baseline year where

¹SP's Green Financing Framework can be accessed here: <https://spgrp.sg/SPGreenFinancingFramework>

²Data restated after internal review

applicable, selected performance indicators are measured and tracked in relation to our material topics of network reliability, innovation and customer empowerment.

In FY20/21, our System Average Interruption Duration Index (SAIDI) performance for electricity network recorded an all-time best of 0.15 minute, an improvement from 0.56 minute in the previous year. Commonly used as a reliability indicator by electricity companies, SAIDI measures the average outage duration experienced by each customer served. Our improvement reflects the continuous efforts we have put in place to ensure our customers are provided with reliable electricity supply.

We have also facilitated the switch for 49 per cent of residential customers and 47 per cent of small business customers in the Open Electricity Market, enabling them to enjoy savings of 20 to 30 per cent off the regulated tariff. Customers also have the option of a non-standard price plan to buy electricity from the wholesale electricity market.

SP's low carbon initiatives such as district cooling, solar and electromobility have enabled customers to avoid more than 28,000 tonnesCO₂e in FY20/21, equivalent to planting almost 1.4 million rain trees³ or taking more than 6,000 cars off the road for a year⁴. Measuring this progress against the target of helping customers reduce their carbon footprint, these initiatives have achieved 18 per cent increase in the CO₂ avoided since the baseline year of 2018. There was a slight reduction as compared to the previous year's reduction of 19 per cent due to a decrease in demand of the various sustainable energy solutions amidst the Covid-19 situation in Singapore last year.

³One mature rain tree absorbs 0.0201 tonnesCO₂ a year - data from My Carbon Footprint study by South Pole

⁴From US EPA Greenhouse Gas Equivalencies Calculator

Contributing to SDG 7 and 9 targets

SDG Target by 2030	Material topic	Our key contributions
7.1 Energy access Ensure universal access to affordable, reliable and modern energy services.	Innovation	<ul style="list-style-type: none"> Increasing electric vehicle charging stations
	Customer Empowerment	<ul style="list-style-type: none"> Enabling access to the Open Electricity Market by empowering customers with options for electricity packages and to enjoy savings
7.2 Renewable energy Increase substantially the share of renewable energy in the global energy mix.	Innovation	<ul style="list-style-type: none"> Deploying solar PV projects Testing green hydrogen Issuing and trading of Renewable Energy Certificates
	Customer Empowerment	<ul style="list-style-type: none"> Launch of My Green Credits™ on the SP Utilities app to enable households to match their electricity consumption with an equivalent amount of green energy produced
7.3 Energy efficiency Double the global rate of improvement in energy efficiency.	Innovation	<ul style="list-style-type: none"> Deploying energy saving solutions like GET™ TenantCare
	Customer Empowerment	<ul style="list-style-type: none"> Deploying smart technology and SP Utilities app to access half-hourly electricity usage Spreading environmental awareness through Eco-Boards, GreenUP and My Carbon Footprint Deploying smart technologies for Tengah smart energy town
9.1 Reliable infrastructure Develop quality, reliable, sustainable, and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.	Network Reliability	<ul style="list-style-type: none"> Investing in network infrastructure upgrades Deploying smart grid technologies Developing Asset Health Digital Twin to monitor equipment health Constructing the first large-scale underground substation in Southeast Asia to optimise space in land-scarce Singapore
	Innovation	<ul style="list-style-type: none"> Deploying district cooling and energy saving solutions Developing urban micro-grid
9.4 Sustainable infrastructure Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.	Network Reliability	<ul style="list-style-type: none"> Capacity upgrade for the Interconnector between Singapore and Peninsular Malaysia to support a regional grid energy import pilot Recommissioning of Toh Tuck Gasholder Developing Distributed Energy Resources Management System (DERMS) to enable the effective integration of renewables Developing utility-scale energy storage system

Network Reliability

Why this is material

SP serves a large customer base of 1.6 million customers in Singapore, with a rising expectation of uninterrupted power and a high-quality maintenance framework. We invest in capabilities to uphold reliable, efficient power supply to households and businesses.

Network reliability is mission critical to SP as we strive to deliver excellence in our service provision and operations and align to the identified targets under SDG 9.

Management Approach

Network maintenance

Despite Singapore having one of the best electricity and gas network systems in the world, supply interruption is inevitable and may occur due to various reasons including network failure, damage by third parties, faulty equipment at customer sites or issues with the source of the supply.



Operations run 24/7 at SP's distribution control centre, the nerve centre of Singapore's power grid to ensure supply reliability.

Electricity network

To minimise the possibility of supply interruption, SP follows a systematic regime of maintenance, timely replacement of ageing equipment and close monitoring of equipment performance. For example, our Asset Sensing and Analytics team monitors and checks the health of our network around the clock. Any anomalies detected will trigger a response for the team to carry out rectification works to ensure the continued well-being of the equipment.

Our specialists keep a close eye on about 11,800 substations and over 28,000km of cables in the grid. They conduct regular health screening of all electrical assets on the network and recommend deeper investigations or treatment when necessary.

To enhance speed and accuracy in predicting anomalies, we have implemented online asset sensing and analysis for newly installed 230kV and 400kV cable joints, and for all 400kV, 230kV and new 66kV switchgears. We are in the process of doing the same for critical 22kV substation's switchgear which will be completed by 2022. We also carry out physical monitoring every three to six months. This measures the electrical and acoustic signal and temperature of the equipment when the condition checks are being conducted.

If a power failure occurs, we take four remediation actions to minimise the impact and downtime.

<p>1. Remote switching</p>	<p>When a power fault is detected, this first course of action disconnects the affected equipment from the network and reconnects it to an alternative supply source. Since 2019, we have implemented remote switching capabilities for all 6.6kV distribution networks substations, allowing for quicker restoration should a supply interruption occur.</p>
<p>2. Manual switching</p>	<p>This is conducted when remote switching is unable to restore power supply. Power faults in low-voltage networks, such as damage to over ground boxes that are used to transmit electricity to customers, are usually resolved through manual switching.</p>
<p>3. Mobile generators</p>	<p>These generators are immediately deployed when power faults are reported and are used to provide temporary electricity supply while the network issues are being resolved.</p>
<p>4. Cable jointing</p>	<p>This is conducted when switching is unable to resolve the power fault and the mobile generators cannot access the substation where the fault has occurred.</p>

Gas network

SP owns and operates the gas network that supplies gas to industrial, commercial and residential customers. The high pressure gas transmission system transports the main fuel source for Singapore's power generation plants.

An asset life cycle approach to asset management is adopted to manage risk and ensure that the gas network is developed, maintained and operated in a safe and reliable manner. The gas network is monitored round the clock in a system control centre. A supervisory control and data acquisition (SCADA) system is deployed on the transmission system to avail remote monitoring and operations capability, which enables us to respond immediately to incidents. When incidents occur, response is centrally managed to ensure that performance recovery is quick and directed, thus minimising disruption to customers.

A key component we monitor closely is the network pressure. This is done by deploying pressure sensors across the entire transmission network. SP's gas network operations team monitors the pressure readings to ensure that the network pressure at different nodes is maintained within an optimal range.

To enhance the remote monitoring capability and productivity, we have developed a prototype machine learning solution based on Deep Learning autoencoders that can learn from a vast amount of historical data of transmission

pressure readings to detect deviations from the expected pressure levels and alert the operations team of any anomaly in the gas network.

Regular inspections and maintenance are also conducted on our assets to maintain reliability. An asset renewal programme tracks asset performance and replaces deteriorating assets efficiently. Patrol and leak survey of the pipelines are conducted to detect third party activities and gas leaks respectively.

Dedicated planning of assets, selection of materials, project management and strict testing requirements are conducted to maintain the integrity of the gas network. This enables us to uphold reliable and safe supply of gas to customers.



Conducting regular checks to ensure optimal gas supply pressure for customers.

International collaboration

In ensuring a more secure, accessible and sustainable energy future, SP is an active member of several international and regional working groups to benchmark and share best practices on grid operations.

As part of the International Utility Working Group, SP is one of the utilities companies in the 10 member countries that meet annually to address topics on grid reliability and security, integrating clean energy sources and meeting the digital needs of customers.

Regionally, SP represents Singapore at the meetings of the Heads of ASEAN Power Utilities/Authorities (HAPUA). HAPUA's key objectives include strengthening regional energy security through interconnection development and enhancing the quality and reliability of electricity supply system. SP is the Chair of the Working Group #3 that focuses on Distribution, Power Reliability and Quality.

Initiatives

Reliable Infrastructure – SDG 9.1

Investing in network infrastructure upgrades

Planning and investing in network infrastructure upgrades are key to ensuring customers have reliable and safe access to electricity and gas.

We have a long-term asset renewal strategy – based on the performance, condition and age of our equipment – to ensure that our electricity network remains resilient.

As part of our accelerated gas mains renewal programme, we have replaced aging ductile iron pipelines with more durable polyethylene pipes. This significantly reduces the risk of gas leaks and improves gas safety.

To secure reliable and efficient electricity supply for Singapore in the longer term, we have built cross-island underground transmission cable tunnels. Besides enabling us to better plan for future network requirements, we can install, repair and replace aging assets efficiently, without digging up the roads, which may inconvenience the public. This ensures that Singapore continues to be equipped with optimal electricity supply infrastructure and maintains its position as having one of the best performing electricity networks in the world.

Smart Grid Index

We have developed the world's first Smart Grid Index (SGI) to help utilities measure and advance in key dimensions of smart grid development. The SGI, which has received strong endorsement from industry experts and stakeholders, measures the smartness of power grids globally in seven key dimensions: 1) supply reliability; 2) monitoring and control; 3) data analytics; 4) integration of Distributed Energy Resources (DER); 5) green energy; 6) security, and 7) customer empowerment and satisfaction. The SGI allows utilities to understand their strengths and areas they can improve in.

Today, the SGI measures and benchmarks grid smartness across 85 utilities from 37 countries/markets. In 2020, utilities in Asia Pacific nations made significant improvements in the rankings with an overall improvement by more than five percentage points from the score in 2019. Globally, there is increasing focus on data analytics, with an average of more than 11 percentage points growth. For further details on the benchmarking scores, please refer to <https://www.spgroup.com.sg/sp-powergrid/overview/smart-grid-index>

In 2020, SP Group improved by almost 9 percentage points from the 2019 score, mainly in the areas of supply reliability and customer empowerment and satisfaction. This was due to its efforts to ensure near-zero downtime in network reliability, provide half-hourly electricity usage with smart meters and achieving higher customer satisfaction scores.

Asset Health Digital Twin

Harnessing the power of digitalisation, we are applying concepts of digital twin, using digital representation of physical assets to optimise maintenance and renewal, and enhance the reliability of our electricity network. This progressive development aims to put information about asset health and alerts at the fingertips of our officers, enabling them to respond swiftly according to asset conditions. This will strengthen our capabilities in failure prevention and enhance the reliability of the electricity network for our customers.

Construction of large-scale underground substation

The Group announced in early 2021 the construction of Southeast Asia's first large-scale underground electrical substation in Labrador, to develop sustainable infrastructure and optimise space in land-scarce Singapore. As part of the Urban Redevelopment Authority's underground Master Plan 2019, the 230kV Labrador underground substation is scheduled to be completed in 2024. It occupies a land-size of three-hectares, about the area of four football fields. To ensure maximum land optimisation, the land above it will be used for a 34-storey commercial development.

The underground substation at Labrador will be integrated with a 34-storey commercial building, as a part of the larger Greater Southern Waterfront.



Building a substation underground would be more resource-intensive and require specialised engineering capabilities as compared to the usual above-ground substations. However, the long-term benefits of building substations underground outweigh the costs. In addition to optimising land resources for other purposes, underground substations have a lower risk of being exposed and damaged. This will enhance asset and network security.

Sustainable Infrastructure - SDG 9.4

Interconnector between Singapore and Malaysia

With the regional power grid identified as one of the ‘Four Switches’ in the Singapore Energy Story for the next 50 years, SP is actively supporting the upgrade of infrastructure to tap on regional power grids for cleaner energy resources and further diversify Singapore’s energy supply. We have upgraded the previous two 250 megavolt amperes (MVA) interconnector undersea cables between Singapore and Peninsular Malaysia to a capacity of two 550 MVA in August 2020. With this upgrade, 100 megawatt (MW) of the Interconnector capacity could be set aside for the two-year trial import of electricity from Malaysia as announced in early 2021.

Recommissioning of Toh Tuck Gasholder

The Toh Tuck Gasholder is critical in managing the town gas supply pressure to consumers during peak hours. We have spent 24 months to enhance the gasholder and successfully recommissioned the gasholder in January 2021. The gasholder will contribute to gas pressure stability as well as cater for future demand.

DERMS to enable effective integration of renewables

To cater to potential demand for renewable energy sources and maintain reliability in a distributed energy landscape, we have piloted the Distributed Energy Resources Management System (DERMS) to manage the influx of solar photovoltaic, energy storage systems and electric vehicles connected to our electricity network. Through real-time monitoring and smart control capabilities, integration of these distributed energy resources can be optimised while ensuring the reliability of our electricity network.

Energy storage systems

Energy Storage System (ESS) can be the key to managing intermittency from solar energy and other network applications. ESS provides quick response when solar installations are affected by cloud cover to reduce solar intermittency. In collaboration with the Energy Market Authority of Singapore and industry partners, we have led the deployment of the first-ever utility-scale ESS at a substation in Woodlands. Designed for local conditions, this will enable us to incorporate more renewables and other sustainable energy solutions into our electricity grid.

Performance

There are two key indicators that our industry measures when assessing performance on network reliability: 1) SAIDI, a system index of average duration of interruption in the power supply indicated in minutes per customers, and 2) System Average Interruption Frequency Index (SAIFI), a system index of average frequency of interruptions in the power supply.

In FY2020/2021, our SAIDI for the electricity network improved by over 73 per cent.

		FY18/19	FY19/20	FY20/21
Electricity	SAIDI (min)	0.87	0.56	0.15
	SAIFI	0.0307	0.0366	0.0073
Gas	SAIDI (min)	0.0932	0.2637	0.4223
	SAIFI	0.0014	0.0019	0.0024

To ensure minimal service disruption to our gas network, we have been actively replacing aging ductile iron pipelines with more durable polyethylene pipes to improve our gas SAIFI and SAIDI performance.

Future outlook

To meet our “30-30-30” target to add at least 30 per cent value to our customers and reduce our carbon footprint by 30 per cent by 2030 and uphold supply reliability, we actively invest in infrastructure, technology and engineering capabilities. We continually look for innovative and cost-effective ways to do our work faster, better and more safely, and empower our staff with the knowledge they need to increase productivity and bring value to our customers and stakeholders.

Innovation

Why this is material

Singapore has pledged to reduce its Emissions Intensity by 36 per cent from 2005 levels by 2030. It has committed to enhance its nationally determined contribution (NDC) to the absolute peak emissions level of 65 million tonnes of carbon dioxide equivalent around 2030. By 2050, Singapore aims to halve the amount of emissions it produces from its 2030 peak, with the view to achieving net-zero emissions as soon as viable in the second half of the century. In putting the targets into action, the Government has announced the Singapore Green Plan 2030, a whole-of-nation movement, to advance Singapore's national agenda on sustainable development.

Innovation and new technologies are central to facilitating this transition. SP can be a key facilitator and enabler for this change. Our investments in climate friendly innovations will not only power a greener tomorrow for our business, but also benefit the entire ecosystem, including organisations and individuals trying to reduce their own footprint.

Management Approach

To keep at the forefront of new technologies, we tap on the global innovation ecosystem for exposure, test new solutions and build new capabilities to deliver value-added solutions to our customers.

Involvement in Innovation Ecosystem

We have been actively engaged in the global innovation ecosystem through initiatives such as the Free Electrons Global Energy Startup Programme. In partnership with eight other global utilities, SP invites promising energy-related start-ups to apply for the programme which runs annually. Into its fifth edition in 2021, Free Electrons has provided numerous opportunities for pilot projects, commercial deployments, investments, learning opportunities, and deals to date exceeding US\$50 million.

The Group invests in venture capital funds globally to access the innovation ecosystems and keep abreast of market and technology developments. Our venture capital funds provide SP with deal flow access to start-ups globally including Asia, USA and Europe.

Through the innovation ecosystem, SP has been actively identifying relevant and promising technologies to run pilots. This approach allows us to trial and validate new technologies to build new capabilities in developing innovative solutions.

Research and Development

SP Group-NTU Joint Lab

SP has embarked on S\$30 million in research and education initiatives with Nanyang Technological University (NTU), Singapore, to enhance the resilience of Singapore's electricity network, improve the reliability and efficiency

of supply to customers, and nurture experts for the energy sector. Under this collaboration, the SP Group-NTU Joint Lab is exploring energy-related projects in the areas of asset management and network operations. Located on the NTU Smart Campus, the joint lab will house 60 researchers, 85 undergraduates and postgraduate students, and serve as a training platform for SP's engineers.

The lab will conduct studies on equipment components and materials to gauge the equipment's degradation and lifespan. This helps to optimise equipment maintenance and replacement and achieve network reliability in a cost and operationally effective manner. Researchers from SP and NTU will design and develop a unique scalable system – one of the first in the world – that can detect and pre-empt equipment fault by sensing electrical and sound anomalies within power distribution substations. The research will leverage Artificial Intelligence (AI) and machine learning to conduct comprehensive real-time monitoring and perform trend analysis to predict future network problems before they appear.

Vehicle-to-Grid Technology

To boost Singapore's electric mobility capabilities, enabling its energy system to integrate more renewable energy, we are also exploring smart charging (V1G) and vehicle-to grid (V2G) feasibility in Singapore through a strategic investment in The Mobility House AG (TMH).

Operating from Munich, Zurich and Belmont (California), TMH is a technology company that provides a software capable of integrating open charging stations through non-proprietary communication protocol. With its hardware-agnostic Charging and Energy Management system, ChargePilot, TMH created the basis for a uni- and bi-directional integration of EVs into the power grid. The collaboration between SP and TMH leads the way for V2G as an integral solution towards transport electrification, paving the way for a zero-emission future.

With the Singapore government's target to increase solar penetration to reach 2 GigaWattpeak (GWp) by 2030, integrating V2G technology into the national grid can be the key to managing the intermittency of renewables while maintaining grid stability and reliability.

Initiatives

Energy Access – SDG 7.1

Electric Vehicle (EV) Charging

The switch to low-carbon EVs is seen as an increasingly viable route for the decarbonisation of the transportation sector globally. With our geographic size, economic landscape and existing infrastructure, Singapore is well placed to adopt green mobility, with SP driving this change.

Over the past three years, SP has been partnering organisations to set up EV charging stations across the island, to support the nation's target to build 60,000 electric vehicle charging points by 2030. As of end March 2021, the high-speed EV charging network increased to 340 points across 71 locations in Singapore.



SP's direct current (DC) fast charging points for electric vehicles (EVs).

EV drivers can locate our charging points – the largest public network in Singapore - easily via the SP Utilities app. Through the app, users can start and stop charging, and pay for the electricity used.

Working with Chevron Singapore Pte. Ltd., which markets the Caltex™ brand, SP will be offering fast EV charging at selected Caltex service stations to provide on-the-go convenience to electric vehicle motorists. Identified Caltex service stations will be equipped with 50kW direct current (DC) fast chargers that can charge up an EV in as short as 30 minutes, versus a few hours required by the more commonly available alternating current (AC) chargers. One of the stations will have two 50kW DC charging points that are designed to allow a compatible car to charge up to a speed of 100kW, provided only one car is utilising the charging points. The chargers will be installed by the second quarter of 2021 and will be incorporated on the SP Utilities app for ease of use.

SP supports the development of electromobility in Singapore in line with the Government's announcement to have all vehicles run on cleaner energy by 2040. In order to promote electromobility, SP has been collaborating with Goldbell and SMRT subsidiary Strides Transportation to extend our charging points to their customers. Assisting customers in their conversion to EVs is instrumental to wide scale adoption in Singapore.

Renewable Energy – SDG 7.2

Solar PV

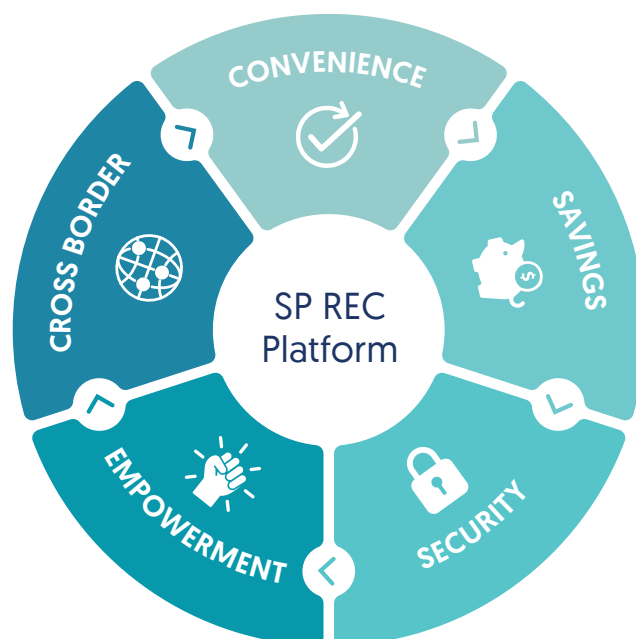
SP is looking at ways to harness and deploy energy efficiently. The Group has installed solar photovoltaic (PV) panels at our headquarters and district offices and developed storage systems. This has enabled us to work with partners in the community and industrial customers to achieve similar sustainable outcomes. The Integrated Energy Solutions (IES) system includes features like the energy storage capabilities, energy sensors and a real-time digital platform to monitor, analyse and optimise energy usage.

One such digital energy solution was developed at Sembcorp Marine's Tuas Boulevard Yard's steel fabrication facility to lower its carbon footprint. SP installed 4.5 MegaWattpeak (MWp) solar panels at the facility to provide up to 30 per cent of electricity consumed during peak load.

Renewable Energy Certificates (RECs) Platform

SP has a one-stop digital Renewable Energy Certificates (REC) platform, the first such blockchain-powered marketplace in the world. This removes trading barriers, enabling both big and small customers to achieve their green targets seamlessly and securely. SP's platform is also accredited by the International REC Standard Foundation as the first authorised local issuer of I-RECs in the Asia Pacific. This provides customers greater assurance of the integrity of each I-REC issued in Singapore.

In early 2021, SP was presented with the inaugural Renewable Energy Markets™ Asia Award for smart energy solutions that expand clean energy access in Asia.



Energy efficiency – SDG 7.3

Smart Building Solutions

SP actively explores new technologies to support the energy needs of buildings and districts. Our Green Energy Tech (GET™) is a suite of solutions that integrates different building systems and diverse data sources to create a seamless, sustainable energy management experience for our customers. Powered by EnergyTech, the Internet of things (IoT) and AI, GET™ enables building owners and facility managers to make smarter decisions that improve building performance, sustainability and occupant well-being.

GET™ Control	Self-learning building intelligence that utilises AI and IoT to optimise and regulate air conditioning and maximise energy efficiency based on changes in occupancy and ambient weather conditions.
	This solution has been deployed at DBS Asia Hub at Changi Business Park since February 2020.
GET™ TenantCare	Smart and automated tenant submetering solution that enables landlords and owners of offices, malls and campuses to efficiently manage utilities consumption in both tenant and common spaces.
	This project has been deployed at Changi Airport, HDB Connection One and the Nanyang Technological University

Reliable Infrastructure - SDG 9.1

District Cooling and Energy Saving Solutions

SP continues to operate the world's largest underground district cooling system, located at Marina Bay. Here, chillers centrally produce chilled water during off-peak periods, store the chilled water using a thermal energy storage system, and supply the chilled water for air conditioning use at the buildings in the district. If renewable

energy that is used to power the chillers suddenly fluctuates, the lithium ion battery will immediately discharge energy to balance the supply, hence overcoming the challenge of inconsistent renewable energy in a cost-effective way. The system serves more than 20 developments in Marina Bay and is 40 per cent more efficient than conventional chillers.

Urban Micro-Grid

SP is working with Singapore Institute of Technology (SIT) to build Singapore's first multi-energy urban micro-grid at the university's campus in Punggol Digital District, with a long-term target to achieve zero-emission and ability to operate independently from the national grid in times of emergency.

The micro-grid, specially designed for Singapore's tropical climate, will integrate gas, electricity and thermal energy into a unified smart energy network through multiple phases of execution. It will enable SIT to tap green energy sources such as solar electricity, solar thermal and deploy energy storage technologies, micro-grid controller, smart metering and energy digital management system to optimise energy and reduce carbon emissions. Once achieved, the research and work done on the system can help SIT save energy and eliminate carbon emissions which is equivalent to removing close to 2,000 vehicles off the roads.

As a distributed energy system, the micro-grid is designed to have the function to operate independently from the national grid in times of emergency. Insights from the research collaboration in the SIT@Punggol campus will help to develop innovative solutions to enable a more reliable and efficient energy system to meet Singapore's future needs where customers can save energy and cost while enjoying a high quality, sustainable lifestyle. The collaboration will also facilitate future research and development in smart energy networks and will provide SIT students a platform to gain first-hand experience in honing engineering skills and expertise in micro-grids. The Group plans to work with SIT@Punggol to extend the research work in subsequent phases to study and develop more energy savings solution for campus applications.

Performance

SP's low carbon initiatives have enabled our customers to avoid more than 28,000 tonnesCO₂ in FY20/21, equivalent to planting almost 1.4 million rain trees⁵ or taking more than 6,000 cars off the road for a year⁶. Measuring this progress against the target of helping our customers reduce their carbon footprint, these initiatives have achieved 18 per cent increase in the CO₂ avoided since the baseline year of 2018.

Solar Panels – Renewable Energy

For our customers, a total of 4.5 MWp of solar panels were installed as of end March 2021. Based on an average estimated generation yield in Singapore, the panels have helped the customers avoided more than 2,000 tonnesCO₂e, equivalent to planting more than 100,000 rain trees or taking more than 450 vehicles off the road.

⁵One mature rain tree absorbs 0.0201 tonnesCO₂ a year - data from My Carbon Footprint study by South Pole

⁶From US EPA Greenhouse Gas Equivalencies Calculator

Across our premises, we have installed almost 1 MWp of solar panels to access renewable energy. Collectively, they have helped us to avoid close to 200 tonnesCO₂e in FY20/21.

District Cooling – Energy Efficiency

2020 was a pandemic year that saw a decrease in the electricity demand in the office buildings in Marina Bay area due to increased work-from-home arrangements. This resulted in the reduction of the carbon emissions avoidance as compared to the baseline year of 2018. However, the chillers within the district cooling plant were working more efficiently than previous years, with the efficiency factor improving by about two per cent since the baseline year. This reduces the electricity required to cool one refrigerant ton. Besides energy savings, the carbon emissions avoidance amounted to more than 20,000 tonnesCO₂e, equivalent to planting more than 1 million rain trees and taking more than 4,500 cars off the road in FY20/21.

Electric Vehicles – Clean Transportation

With the 340 charging points across 71 locations in Singapore as of end March 2021, up from 200 points in 2019. Compared to the carbon emissions from a typical internal combustion engine vehicle, the electricity sold from the charging points helped EV customers avoid an estimated amount of more than 900 tonnesCO₂e, increasing more than 23-fold compared to our baseline year of 2018.

Internally, we have gradually converted our fleet of service vehicles from diesel engines to electric. As of March 2021, we have converted around 17 per cent of them to EVs, avoiding an estimated total of more than 75 tonnesCO₂e since we started with the conversion.

Future outlook

We will continue our active investment in innovative technology to bring about greater grid reliability and more sustainable energy solutions to our customers. In line with our strategic focus towards 2030, we are leveraging our experience in Singapore to extend our low carbon, smart energy solutions to targeted countries in Asia Pacific for a more sustainable world. We have secured our second district cooling project at Guangzhou Knowledge City and have acquired a 40 per cent stake in Sino-French Energy Services Co. Ltd in Chongqing. In addition, we have signed MOUs with State Grid Shanghai and State Grid Chongqing to bring sustainable energy solutions to these cities. Recently, we have signed a joint venture agreement with Jinko Power to acquire and invest in renewable assets and develop integrated energy solutions in China.

Customer Empowerment

Why this is material

The transition towards a clean energy economy will largely be driven by end-user consumption. Given that SP provides electricity and gas transmission and distribution services to customers in Singapore, customer education and empowerment will support Singapore's target to transition to a low-carbon future. Beyond this, education and empowerment of customers can result in energy and cost savings for our customers.

Management Approach

Our initiatives for the community and our customers are aligned with our mission – to improve quality of life and create sustainable solutions for the community, today and for future generations.

Volunteerism is an integral part of the SP's DNA. Our staff volunteers, known as SP Heart Workers, drive outreach activities for the vulnerable and underserved throughout the year. The SP Heartware Fund (the Fund), established in 2005, supports services for vulnerable seniors, in partnership with Community Chest. These include befriending, rehabilitation, counselling and caregiver support. SP underwrites all fund-raising and operational costs of the Fund and programmes, so that all donations will go fully to the social service organisations supported by the Fund.

In partnership with Temasek, SP has contributed towards various initiatives to protect and keep Singapore safe during the COVID-19 pandemic last year. We were part of Temasek Foundation initiatives to provide free hand sanitiser and reusable face masks to all residents in Singapore. Our SP Heart Workers helped with distribution at a collection centre and our call centre managed these projects' public phone hotline.

Empowerment through Technology

To provide greater convenience to our customer base, we have embarked on a digital transformation journey. This has resulted in digital products that power internal business units and energy tech products that are available to our customers.

With energy tech as a tool to drive sustainability, the primary goals are to 1) inform, 2) enable and 3) add value.



1) Inform –

The aim is to educate and empower our customers by providing data, information and recommendations to help them make good decisions.



2) Enable –

Our aim here is to provide our customers with the ability to carry out their decisions. This is done through selected methods such as allowing customers to take direct control over the settings of their SP products, using data and AI to provide recommendations and advices and using automation to provide faster, more accurate responses.



3) Add Value –

We aim to provide economic value to our customers, in order to push our sustainability agenda.

Initiatives

Energy Access – SDG 7.1

Open Electricity Market

In supporting the Open Electricity Market where customers can choose to buy electricity from retailers, SP helps customers make the switch which can enable them to save between 20 to 30 per cent off the regulated tariff.

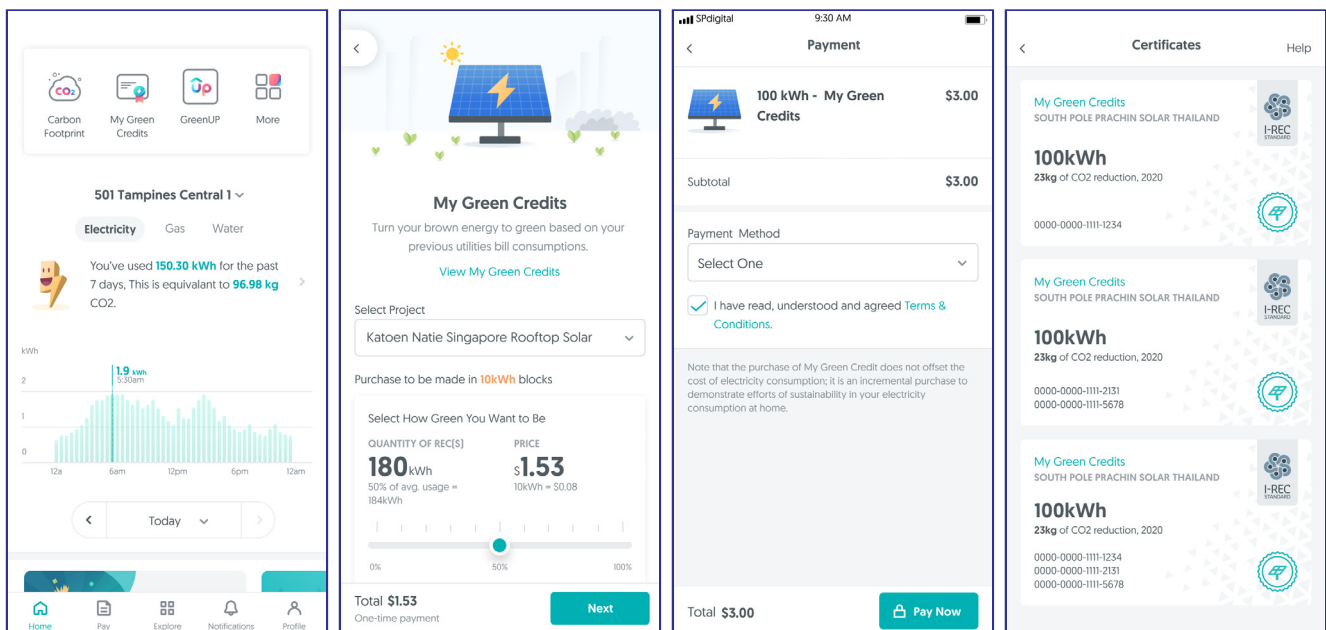
To demonstrate our commitment, SP has rolled out a price comparison feature on the SP Utilities app, whereby customers can see all the various price plans at a glance. This makes it easier for customers to select price plans that best suit their consumption needs.

Renewable energy – SDG 7.2

My Green Credits™

Expanding from SP's experience in the management of its REC platform, a new feature, My Green Credits™, was launched in October 2020 to provide everyone in Singapore with easy access to renewable energy. This feature aims to make it affordable and convenient for anyone in Singapore to match their electricity consumption with an equivalent amount of green energy produced by purchasing RECs in the form of "green credits".

Usually available in multiples of megawatt-hour (MWh), the RECs available for purchase from local and overseas projects on My Green Credits™ are broken down into kilowatt-hours (kWh) which makes them become more accessible to residential customers and individuals and offers the choice to "green" any amount from zero to 100 per cent of monthly electricity consumption. The purchase of these certificates drives the growth of renewable energy and allows customers to play their part in creating a low carbon, smart energy Singapore.



Step 1: Click on My Green Credits™ on the SP Utilities App.

Step 2: Select the preferred green project to support and the percentage of electricity consumption to "green".

Step 3: Select payment method and complete the purchase.

A unique Renewable Energy Certificate will be generated, stating the amount of carbon dioxide emissions you have avoided.

Customer journey on My Green Credits™ for anyone who wishes to "green" their electricity consumption

Energy efficiency – SDG 7.3

Smart Technology

SP is increasingly shifting its focus to use data science and AI to deliver efficient energy solutions to our customers. We refer to this as an “Energy Brain”. This Energy Brain uses intelligence gathered from a large volume of consumption data from both residential homes and business to provide our customers with data-driven solutions.⁷

Beyond this, we are increasing our customer empowerment by installing smart electricity meters at all households, allowing residents to access their half-hourly electricity usage through our SP Utilities app. These advanced meters allow residents to gain a better picture of their consumption patterns, enabling them to implement reduction and efficiency measures in a meaningful manner.

Environmental Awareness

In March 2020, SP launched the enhanced Carbon Footprint calculator, called My Carbon Footprint. It enables everyone in Singapore to be more aware of the environmental impact of their daily actions. First launched in December 2019, the initial version allows users to view their carbon emissions resulting from their electricity consumption. The calculator that is available on the SP Utilities app allows everyone in Singapore to measure their environmental impact from their daily lifestyle choices according to their household profile, mode and duration of commute, frequency of holiday travel, spending habits and food consumption.

To make it more accessible for users on laptops and tablets to access My Carbon Footprint, we have also designed and launched the web-based version of the calculator in August 2020. Similar to the app version, this web version allows users to easily calculate the size of their carbon footprint by answering a few simple questions. This is especially useful when used in a classroom setting for students to gain access to the calculator without having the need to download the SP Utilities app and registering for an account. As of end March 2021, across both platforms, we have completed almost 60,000 carbon footprint calculations for the users.

SP has launched initiatives that allow customers to adopt a more sustainable lifestyle through their daily actions. GreenUP, found on the SP Utilities app, aims to educate and empower our customer base on the message of sustainability in a fun and interactive way. To date, users have completed over 2.9 million activities cumulatively since launch in September 2019.

In 2020, we worked with more than 30 like-minded partners who came onboard the GreenUP sustainability programme to build various challenges to help the app users and the partners’ customers to start practising green habits like forgoing disposable cutlery when ordering food or bringing their own cups when buying coffee.

⁷<https://www.poweringthenation.sg/innovation/Data-science-and-AI-deliver-efficient-energy-solutions-to-customers>



Tengah will be Singapore's model of a digitally inter-connected smart energy town.

Spotlight: Tengah – Singapore's eco-friendly smart energy town

Tengah, HDB's 24th public housing estate is set to be the model showcase of a digitally inter-connected smart energy town where eco-innovations are deployed across HDB blocks and commercial and community facilities, to bring magnified benefits to residents and town operators.

With the Singapore government's plan to make every HDB estate an eco-town by 2030, SP aims to play a central role in enabling everyone to make conscious decisions to lower their carbon footprint and integrate sustainability into the everyday lives of Singaporeans.



Centralised Cooling System Powered By The Sun

At Tengah, residents can opt for central cooling or stick to conventional air conditioning. Centralised cooling is a smart, eco-friendly cooling technology that replaces inefficient conventional cooling methods. Modular chiller plants placed on top of the HDB roof tops will supply chilled water direct from the riser to the fan coil unit in the homes, replacing the need for the installation of condensers.

With the usage of centralised cooling, Tengah can be 30 to 40 per cent more energy efficient than similar estates in Singapore. This is estimated to result in at least energy savings of 30GWh per year, which could power 6,300 four-room flats annually and remove 800,000m³ of carbon from the air or equivalent to about having 400,000 cars off the road annually.

To maximise the limited space available in Tengah, SP is deploying both conventional and vertical solar panels (known as building-integrated photovoltaics, BIPV). Tengah will likely have the largest aggregated installation of BIPV in Singapore when fully developed.



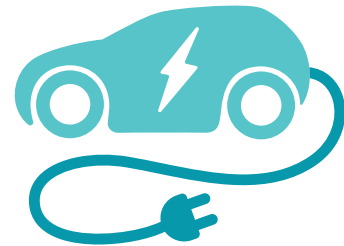
Sustainable Lifestyle App

Residents will be able to live an eco-friendly and hassle-free lifestyle by using the MyTengah app. They will be able to understand their household utilities consumption, intelligently control their Centralised Cooling usage, browse and purchase energy efficient appliances, and many more.

Convenient EV Charging

Electric vehicle drivers will be well served by parking facilities all across Tengah having their parking lots equipped with EV charging points from SP. Drivers will be able to find stations, charge, and pay conveniently using the SP Utilities app.

By 2030, 10 per cent of all parking lots in Tengah will be equipped with EV charging stations contributing towards the national goal of 60,000 EV charging points.



Sustainability Displays

Eco-Boards are digital displays to help residents be more aware of their block's impact on the environment. Installed at the lift lobby, these boards will also provide residents with green tips to lower their electricity and water consumption and will encourage sustainable behaviour with utilities-saving competitions between blocks.

Performance

Customer Empowerment

As of 31 March 2021, 49 per cent of households and 47 per cent of eligible businesses have switched to buying electricity from a retailer of their choice. They have since enjoyed savings of about 20 per cent to 30 per cent off the regulated tariff. Our customers can also opt for a non-standard price plan to buy electricity from the wholesale electricity market. Under this arrangement, the customer buys electricity at the wholesale electricity price which varies every half hour depending on the prevailing demand and supply situation in Singapore's wholesale electricity market.

Customers are empowered with their utility consumption data via the SP Utilities app. With more than 1.2 million app downloads, customers are submitting their meter readings, viewing their bills and paying directly via the SP

Utilities app. Customers can pay with all credit cards from over 380 banks and enjoy rebates and rewards offered by banking partners for utilities payment through the app. We have processed over 1 million unique transactions through the app since 2019, giving customers greater convenience.

SP has also installed over 500,000 smart meters nationwide as of 31 March 2021 and intends to complete installation for all 1.4 million households by 2024.

As of end March 2021, more than 3,500 Tengah households have signed up for the centralised cooling system, which could help homeowners save as much as 30 per cent in life cycle costs.

SP Heart Workers preparing the items in the welcome and learning packs for the SP Kids at Heart launch in June 2021.



Future outlook

SP's overarching goal is to empower everyone with the knowledge and tools to foster a sustainable future for all. We will continue to harness digital technology to provide our customers with the information and means to lower their electricity consumption and adopt a more sustainable lifestyle.

We are also committed to giving back to the community while working towards our environmental goals, the Group will be doubling its annual funding to S\$3 million for programmes and expanding its reach to help children, in addition to vulnerable seniors. Under the new SP Kids at Heart programme that was launched in June 2021, SP Group aims to support young children from low-income families in their learning journey. Kickstarting the initiative, SP Group is donating S\$1 million to provide educational tools, books and toys in the form of learning and development packs for about 2,000 KidSTART children for a year. The funds will also enable these children to receive electronic devices such as tablets and internet routers to support their online engagement and learning during the pandemic. In addition, SP will provide grocery vouchers and other financial assistance packages including tools and equipment that enable a more conducive home learning environment.

