Santos

Climate Change Report

Report highlights

Industry-leading targets

+ Santos to achieve net-zero emissions by 2040.
+ 26-30 per cent reduction from 2019-20 emissions and emissions intensity by 2030.
+ Reduce customer emissions by more than one million tonnes per annum by 2030.

Zero-emission technologies: carbon capture and storage (CCS)

+ Moomba CCS Project ready for final investment decision: the world's second largest CCS project with lowest unit cost at less than A$30 per tonne.
+ Ability to store 1.7 million tonnes of CO2 per annum with potential of up to 20 million.

Nature-based offsets

+ West Arnhem Land Fire Abatement project – ongoing investment in a world-leading carbon offset project.

Zero-emission technologies: clean hydrogen

+ Pathway to cleaner fuels enabled by low-cost CCS.
+ Established new Midstream Infrastructure and Low-carbon Fuels division.

Reducing operational emissions

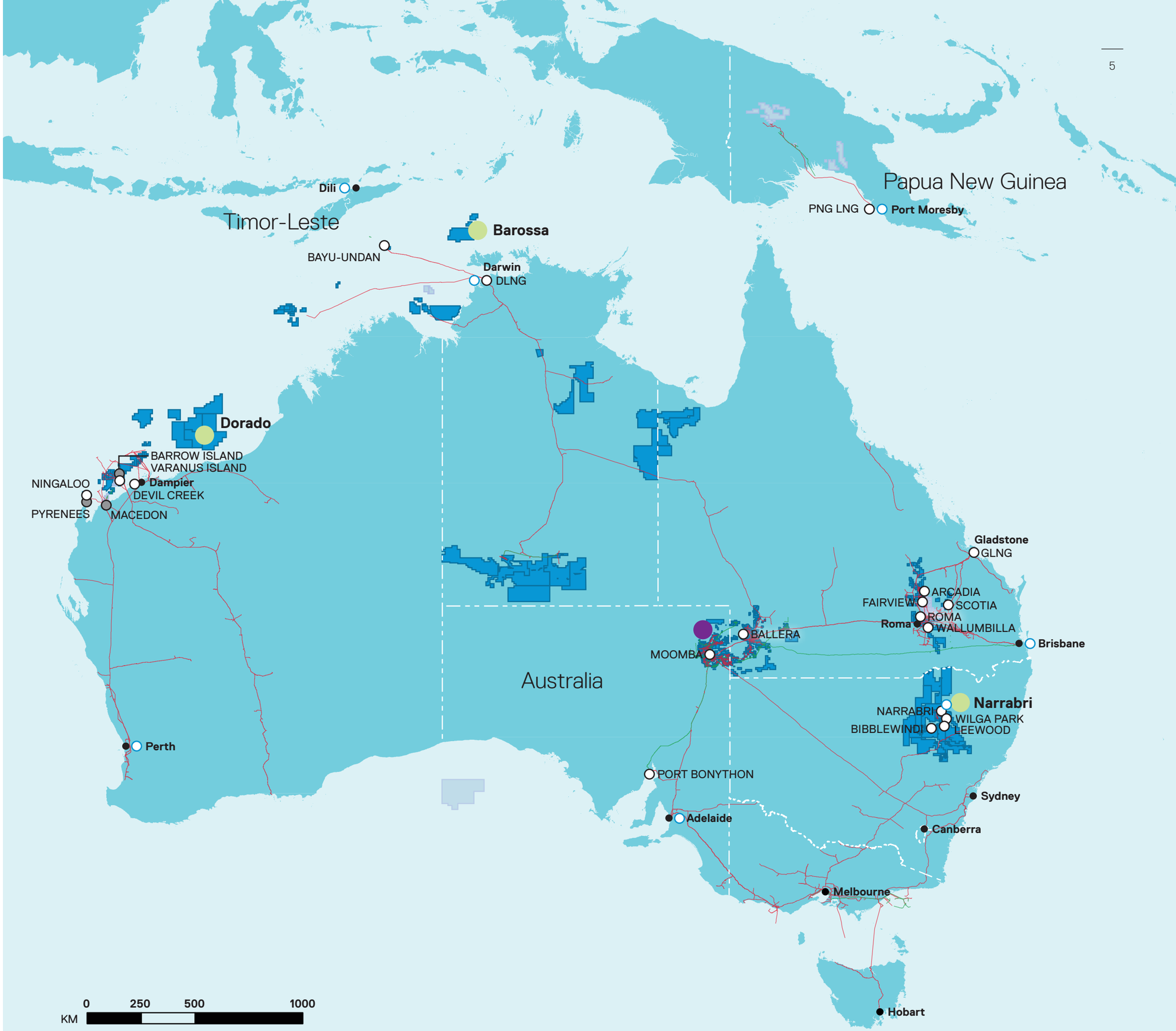
+ Emissions intensity reduced 20 per cent in the past 5 years.
+ Stringent management and reporting of emissions.
+ Continuing integration of renewable energy in Cooper Basin operations building on 5.5 megawatts of solar electricity and 4 megawatts of battery storage already installed.

Contents

We acknowledge the Traditional Owners of the land on which our operations exist and on which we work. We recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past, present and emerging.

santos.com/sustainability

About us
Santos locations



- Office locations
- Operated facilities
- Non-operated facilities
- Planned project location
- Planned Carbon Capture and Storage
- Santos operated acreage
- Santos non-operated acreage

CEO statement

It is with great pleasure I present the 2021 Santos Climate Change Report, which outlines our commitment to managing climate risk and delivering a sustainable business model in a low-carbon world.

As a proudly Australian energy producer, Santos has improved the lives of people throughout Australia and Asia for more than 65 years by providing safe, clean, reliable products. With assets spanning Australia, Papua New Guinea and Timor-Leste, our focus is continuing and expanding this mission through cleaner, low-cost fuels.

Critical within this vision is management of emissions. This, our fourth annual climate change report referencing the recommendations of the G20's Task Force on Climate-related Financial Disclosures (TCFD), continues our track record of transparent reporting of our climate change commitments and actions.

Our first report in 2018 set a benchmark for climate change action in three key areas:

i. **Ambition** - we set a net-zero 2050 aspiration.

ii. **Transparency** - we were an Australian leader in releasing a report aligned with recommendations of the TCFD.

iii. **Performance** - we expanded our Energy Solutions team, tasked with driving wide-ranging and progressive emission reduction opportunities.

This approach embedded climate change management within our business strategy and has delivered clear results, reducing our emissions intensity and commercialising step-change abatement technologies.

SANTOS NET-ZERO EMISSIONS 2040

We are proud to introduce new emission reduction targets, placing us once again at the forefront of the energy industry in meeting the climate challenge:

Santos will reduce its Scope 1 and 2 emissions 26-30 per cent by 2030 and to net-zero by 2040.

Santos' role in this low-carbon journey is built around natural gas, which produces half the greenhouse gas emissions of coal when used to generate electricity.[1] It is the perfect partner for renewable energy sources and can be made even cleaner with carbon capture and storage (CCS), eventually allowing low-cost zero-emission hydrogen, a fuel of the future.

Since our last report, the impact of the COVID-19 pandemic has given Santos' mission even greater relevance. As the world continues to respond and establish a pathway to recovery, cleaner fuels are central in addressing two key objectives: lifting the developing world from poverty and reducing emissions to meet global climate change goals.

Gas is critical to a clean recovery, with coal-to-gas switching able to contribute almost 10 per cent of the emission reductions required to limit global temperature rise to under 2 degrees.[2]

With low-cost growth opportunities across our portfolio, Santos is in a strong position to take advantage of the role that natural gas will play in regional and global decarbonisation. And gas is just the beginning of the journey.

In parallel, at Santos we are evolving our business to drive deeper emission abatement through our leading position in the critical technology of CCS. This will drastically lower our operating emissions and provide permanent, low-cost CO2 abatement for other industries. Eventually, it will unlock production of zero-emission hydrogen produced from natural gas, by sequestering the CO2 emissions released during the process.

This proven technology can produce clean hydrogen for half the cost of hydrogen created with electricity (electrolysis), while using half the volume of water. Our existing LNG customer base in Asia will be the hydrogen customers of the future, and as they transition to new clean fuels, Santos will transition with them.

This transition is supplemented by our continued investment in operational efficiency, renewables integration and the highest quality nature-based carbon offset projects to reduce our emissions on the journey to net-zero.

Santos' commitment to clean, low-cost fuels across the energy horizon positions the company to not just be resilient, but to thrive in a low-carbon future.

KEVIN GALLAGHER
Managing Director and Chief Executive Officer
February 2021

1. IEA, The Role of Gas in Today's Energy Transitions, 2019.
2. IEA, The Role of Gas in Today's Energy Transitions, 2019.

Executive summary

Santos' strategy is built around five core asset hubs in Australia, Timor-Leste and Papua New Guinea. It recognises the intrinsic role of natural gas, carbon capture and storage (CCS) and the potential for clean hydrogen as an alternative energy source in a global future where temperature increase is limited to well below 2 degrees Celsius.

In this future, modelled by the International Energy Agency (IEA) as the 'Sustainable Development Scenario' ('SDS'), global natural gas demand is forecast to grow to a quarter of global energy demand and remain strong for at least two decades. This is driven primarily by demand growth in the Asia Pacific region,[3] where Santos operates and markets our products.

Deployment of CCS technology is forecast to grow more than 30 times current levels by 2030 and 60 times by 2040.[4] Clean hydrogen demand is expected to increase more than 20 times by 2030 to 18 million tonnes and over 100 times by 2040 to 75 million tonnes.[5] This is equivalent to 215 million tonnes of oil, and more than the current global output of wind and solar energy today.

Aligned with our strategy, Santos is positioned to be a leading domestic and export supplier of natural gas and liquified natural gas (LNG) with progressively lower emissions through our world-leading CCS project. Moving forward, these core capabilities enable us to accelerate development of clean, zero-emission hydrogen, to fulfill future needs of our customers.

In this, our fourth TCFD-aligned climate change report, Santos' clean fuels trajectory is reflected in progress on our existing 2025 emissions reduction targets and our strong new 2030 and 2040 emissions reduction targets.

Zero-emission hydrogen produced from gas with CCS is a proven technology which can be achieved at half the cost of electrolysis, while using half the volume of water.

3. IEA, World Energy Outlook 2020.
4. IEA, Energy Technology Perspectives, 2020.
5. IEA, World Energy Outlook 2020.

METRICS AND TARGETS

- Santos has set a new medium-term target to reduce Scope 1 and 2 emissions and emissions intensity by 26-30 per cent by 2030 from our 2019-20 financial year baseline in keeping with Australia's Paris Agreement commitment.
- In addition, the company has a further medium-term target to **reduce customer Scope 1 and 2 emissions by more than 1 million tonnes per annum by 2030 through direct switching to cleaner fuels.**
- Santos has set a new long-term target of achieving **net-zero Scope 1 and 2 emissions by 2040.**
- This strong ambition is enabled by excellent progress against previous targets and commercialising of step-change technology in CCS.
- Santos transparently reports its greenhouse gas emissions, including fugitive emissions.

STRATEGY

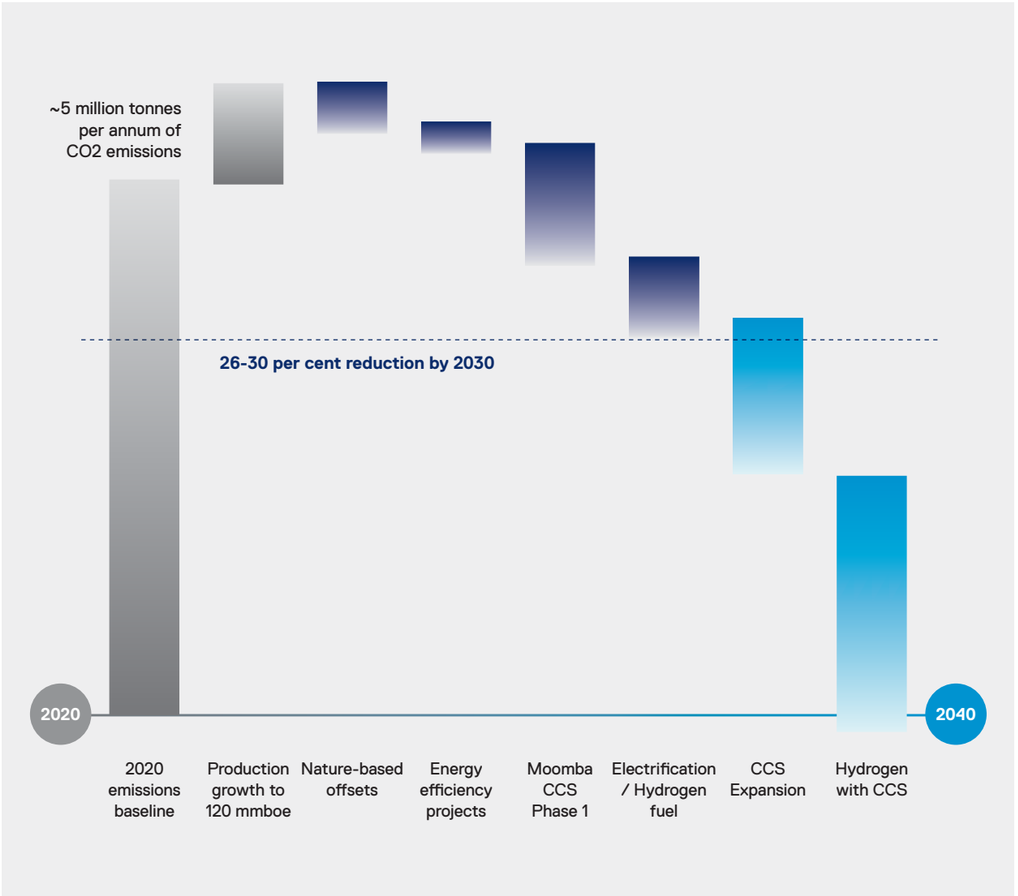
- Climate change considerations, reducing global greenhouse gas emissions and improving air quality are intrinsic to our strategy.
- Natural gas has a key role to play in a lower-carbon future as it produces 50 per cent less greenhouse gas emissions than coal when used to generate electricity, can significantly improve air quality and is the perfect partner for renewable energy.
- CCS and zero-emission hydrogen have critical roles in meeting global climate change goals, with exponential growth of clean fuels required over the next 20 years.
- Santos' natural gas-focused portfolio is economically resilient under all the International Energy Agency's World Energy Outlook 2018 scenarios.
- Santos' CCS project is ready to execute, delivering a technology critical to global climate goals at globally significant scale and low cost.
- Santos' unique opportunities in CCS and clean hydrogen enable us to capture additional upside from the transition to a low-carbon world.

GOVERNANCE AND RISK MANAGEMENT

- Santos has had a Climate Change Policy since 2008, guiding management of emissions and climate change risks.
- A dedicated Environment, Health, Safety and Sustainability Committee of the Santos Board is responsible for monitoring and reviewing the company's approach to climate change and management of climate change risks.
- Climate change is incorporated into Santos' Enterprise Material Risk Profile and risk management processes and practices.
- Santos' Executive Committee includes a role dedicated to leadership of the company's environmental, social and corporate governance (ESG), including sustainability and climate change.
- Key indicators are included in the Short-Term Incentive Scorecard which link climate-related performance to remuneration outcomes for the Executive Committee.

Roadmap to net-zero 2040

Figure 1 Roadmap to net-zero 2040



At Santos, we have a clear, tangible pathway to reach our 2030 and 2040 targets.

The road to 2030

From our 2019-20 financial year baseline emissions of 5 million tonnes of carbon dioxide equivalent (MtCO2e), by 2030 we will reduce our emissions by 26-30 per cent through a series of carbon abatement, emissions reduction and offset initiatives, many already effectively established.

Our planned growth projects mean that our emissions will rise over the 2020-2025 period and our emission reduction initiatives factor this growth into our reductions, as shown on the roadmap.

Roadmap to 2030 initiatives include:

+ Nature-based offsets: We will maintain and expand our successful offset programs, including the West Arnhem Land Fire Abatement project detailed on page 30-31.
+ Energy efficiency projects: We will deliver operational efficiencies and emission reductions by 2025, as promised, of 5 per cent from 2016-17 levels in our Cooper Basin and Queensland operations.
+ Moomba CCS Phase 1: Following the implementation of an approved methodology for CCS to earn Australian Carbon Credit Units (ACCUs), we will implement a CCS project at Moomba in the Cooper Basin, to capture 1.7 million tonnes of CO2 per annum. This will be the second-largest CCS project in the world, with the lowest cost, at less than A$30 per tonne.
+ Electrification: Following this, work is progressing to validate concept studies to install centralised electrification of our Cooper Basin assets, which currently use gas for power generation. Centralising power in this huge area results in efficiencies and enables a higher penetration of renewable energy by consolidating demand and enabling heat recovery.
+ Hydrogen fuel: Once power is centralised, there is potential for an economically viable hydrogen plant to be constructed to convert our natural gas to hydrogen. We will capture and store the CO2 produced in our Moomba CCS facility, so the hydrogen we use will be carbon neutral.

The road to 2040

+ A working hydrogen facility would allow us to commence supplying hydrogen to domestic and export customers, as and when they require it.
+ Initially, we are studying options to blend up to 10 per cent hydrogen with natural gas which would not require new pipelines or infrastructure, reducing our customers' CO2 emissions.
+ Once an export pipeline for hydrogen is built, we could export hydrogen from the Cooper Basin. The hydrogen that is sold to customers could have no emissions in its production ('Scope 1 and 2') or its end use ('Scope 3').
+ In parallel, we intend to work with other companies and industries to capture and store their CO2 in the Moomba CCS project, which has a capacity of up to 20 million tonnes of CO2 per annum.
+ Our CCS is targeting a cost of less than A$30 per tonne of CO2 and our studies have shown that we could produce hydrogen at less than the Australian Government target of A$2/kg of hydrogen, well before 2030.

For Santos, net-zero 2040 is a business opportunity, not a business burden.

1

Introduction

The energy challenge

Two parallel challenges of our age are energy and sustainability. The world has an insatiable demand for energy because it fuels human development; people's opportunity to realise their potential, lead long and healthy lives, be educated and enjoy a decent standard of living.

The criticality of energy in global progress is recognised by its prominence within the United Nations' Sustainable Development Goals. A vision for driving human development, the 17 goals cover indicators such as education, clean water access, gender equality, agriculture, security, and biodiversity. Acknowledged as underpinning all of these is goal seven, 'affordable and clean energy'.[6]

As energy access grows, human development accelerates. But almost two billion people, more than 25 per cent of the world's population, still live in poverty on less than US$3.20 per day, all of them in non-OECD[8] countries.[9]

Just under one billion people still have no electricity and another billion have access to unreliable electricity. This energy poverty reduces opportunities and has dramatic health impacts. More than 40 per cent of the world's people still rely on polluting and unhealthy fuels for cooking.[10] The World Health Organization estimates that eight million people die every year from outdoor and household air pollution, linked to inefficient energy use in every sector of human activity including coal-fired power plants, industry and agriculture.[11]

> Energy is the golden thread that connects economic growth, social equity and environmental sustainability.
>
> Widespread energy poverty condemns billions to darkness, to ill health, to missed opportunities. Energy poverty is a threat to the achievement of the Millennium Development Goals. It is inequitable and unsustainable.
>
> **Ban Ki-moon, Former United Nations Secretary General.**[7]

Just under one billion people still have **no electricity**.[12]

6. United Nations, 2030 Agenda for Sustainable Development, 2015.
7. United Nations, Sustainable Energy for All, ourworld.unu.edu/en/un-launches-decade-long-sustainable-energy-for-all-initiative.
8. OECD is the common acronym for the Organisation for Economic Co-operation and Development, an inter-governmental economic organisation with 37 member countries.
9. World Bank, Piecing together the poverty puzzle, 2018.
10. United Nation, unstats.un.org/sdg.
11. World Health Organisation, who.int/health-topics/air-pollution.
12. IEA, World Energy Outlook 2018.

Clean combustible fuels such as natural gas and hydrogen are **critical to meeting global energy demand** while achieving climate goals.

To meet the needs of this large proportion of the world's population, massive expansion of affordable and reliable energy is recognised as critical. This includes clean fuels for cooking, such as gas and electricity.[13]

However, the energy challenge must be addressed in a sustainable way; that is, ensuring a safe climate for future generations. This means driving emissions down in both existing energy systems and in meeting new energy demand.

Part of this task can be achieved by technology advances and consumers using energy more efficiently. This can moderate growth in energy demand even as the economy expands, allowing society to do more with less.

Most critically however, the carbon intensity of existing and future energy demand must continue to fall, spurred by cleaner fuels and new technology changes. This extends beyond just energy for power; emissions from industrial processes such as steel and cement, and the transport and land sectors must also be addressed.

Whilst expansion of renewables will be an important contributor to this trend, electricity currently makes up just 20 per cent of energy consumed and the world relies on hydrocarbon fuels for 80 per cent of its primary energy. These fuels will therefore be in demand for decades and making them progressively cleaner is the key to meeting global climate goals.

As a fuels company, Santos' core and emerging business is playing a key role in the transition to a low-carbon future in three ways.

13. United Nation, unstats.un.org/sdg7.
14. World Health Organisation, who.int/health-topics/air-pollution (2018).

Eight million people die every year from outdoor and household air pollution.[14]

First, increasing the supply of natural gas into Asia and Australia is displacing coal and decarbonising the engine room of global growth, while facilitating more renewable energy by 'firming' (providing electricity when there is no sun or wind).

Secondly, our deployment of step-change technology in CCS sees us poised to reach new horizons for emission reduction: capturing our emissions and those of other industries and accelerating economic feasibility of clean hydrogen, a fuel of the future for power, industry and transport.

Thirdly, Santos continues to reduce our own carbon footprint through energy efficiency innovation, integrating renewables into our operations and investing in nature-based carbon offset projects.

Meeting the twin challenges of human development and climate change requires acceleration of lower-emission technologies across all of these areas. Santos is proud to be leading the way within our sector, developing the clean fuels required to limit temperature rise to below 2 degrees Celsius, while supplying the reliable, affordable energy needed to improve human health and lift more of the world's people out of poverty.

Energy access is critical to meeting global UN Sustainable Development Goals.

Taskforce on Climate-related Financial Disclosures

This is Santos' fourth annual report aligned with the G20's Taskforce on Climate-Related Financial Disclosures (TCFD) recommendations.

Our previous climate change reports can be accessed via our website, santos.com.

This report addresses the themes recommended by the TCFD as outlined below.

METRICS AND TARGETS

The metrics and targets used to assess and manage relevant climate-related risks and opportunities.

STRATEGY

The actual and potential impacts of climate-related risks and opportunities on the organisation's businesses, strategy and financial planning.

GOVERNANCE

The organisation's governance around climate-related risks and opportunities.

RISK MANAGEMENT

The processes used by the organisation to identify, assess, and manage climate-related risks.

Santos' Climate Change Policy

OUR COMMITMENT

Santos recognises the science of climate change and supports the objective of limiting global temperature rise to less than 2 degrees Celsius.

Our strategy focuses on natural gas which we believe will continue to play a key role in a low CO2 future.

We are committed to being part of the solution by supporting the twin objectives of limiting greenhouse gas emissions while providing access to reliable and affordable energy to domestic and global markets.

GOVERNANCE

The Environment Health Safety & Sustainability Committee is responsible for reviewing the effectiveness of this policy.

OUR ACTIONS

We will:

- Work with governments and stakeholders in the design of climate change regulation and policies.
- Factor carbon pricing and greenhouse gas emissions into all business decision-making.
- Set greenhouse gas emission targets consistent with the objective of limiting global temperature rise to less than 2 degrees Celsius.
- Identify and pursue opportunities to reduce greenhouse gas emissions within our operations and through the supply chain.
- Identify and pursue opportunities to offset greenhouse gas emissions where relevant in further support of achievement of emissions targets.
- Identify, manage and mitigate climate change risks for our activities.
- Report on the Company's climate change governance, strategy, risk management and targets and metrics in a transparent manner.

2

Metrics and targets

Santos has set a new long-term target of achieving net-zero emissions by 2040.

Santos has set three new targets for 2030.

Santos has existing 2025 targets and is making excellent progress against these targets.

Santos transparently reports its greenhouse gas emissions, including fugitive emissions.

New emissions targets

In December 2020 we announced a commitment to three new targets for 2030 and a new net-zero emissions target for 2040:

Net-zero

Santos will target net-zero Scope 1 and 2 emissions by 2040.

Step-change technology: Hydrogen

Once regulatory matters are finalised, Santos will use CCS technology to accelerate the economic feasibility of clean hydrogen and deliver a step-change in emissions reduction by 2030.

Scope 1 & 2 emissions reductions

Santos will reduce absolute Scope 1 and Scope 2 emissions and emissions intensity from 2019-20 levels by 26-30% by 2030, in keeping with Australia's Paris Agreement commitment.

Customers' Scope 1 & 2

Santos will actively work with customers to reduce their Scope 1 and 2 emissions by more than one million tonnes CO2e per annum by 2030 through direct switching to cleaner fuels.

These targets will be achieved through large-scale emissions reduction projects including CCS, electrification and renewables integration, nature-based offsets, and accelerating the economic feasibility of clean hydrogen.

Our studies show that by using CCS, we have a pathway to produce zero-emission hydrogen at less than the Australian Government target of A$2/kg well before 2030.

Progress toward 2025 emissions targets'

In our 2019 Climate Change Report we set 2025 targets aligned with our natural gas-focused corporate strategy and our commitment to limiting greenhouse gas emissions.

Santos continues to make excellent progress against these targets.

2025 target 1

Reduction of global emissions through liquefied natural gas export growth

Our target is to grow liquefied natural gas exports to at least 4.5 million tonnes per annum by 2025.

Progress

Santos is ahead of progress in delivering LNG growth plans, with 2020 LNG exports of 4.3 million tonnes, 45% higher than 2019.

+ In the Northern Territory, progress continues towards a final investment decision on Barossa targeted for the first half of 2021.
+ GLNG in Queensland delivered a record over six million tonnes of liquefied natural gas sales in 2020. GLNG capacity of 8.6 million tonnes per annum provides opportunity for further liquefied natural gas sales growth in the future.

2025 target 2

Economically reduce emissions from our base operations

Our target is to reduce emissions by more than five per cent across operations in the Cooper Basin and Queensland current at the 2016-17 baseline by 2025

Progress

Santos is currently ahead of the progress needed to achieve this target, with executed projects delivering over 160 ktCO2e per annum of emissions reduction to date, or over 2.7% reduction, compared to the 5% reduction target.

Throughout 2020 and 2021, new projects are reducing fuel, flare and vent by over two terajoules per day and emissions by almost 100,000 tonnes of CO2 emissions per year. These include:

+ 10 additional solar and battery conversions of wells in 2020 with a further 24 scheduled in 2021.
+ Solar and battery-powered microgrid for the Charo field in the Cooper Basin will reduce Charo's fuel usage by 35 per cent.

2025 target 3

Pursue step-change emissions reductions technology

Our target is to assess the feasibility and, if feasible, invest in technology and innovation which can deliver a step-change in emissions.

Progress

Santos is ahead of our plan in achieving this target. The Moomba CCS program has now completed testing and is technically ready for final investment decision, awaiting finalisation of an approved methodology for CCS to earn Australian Carbon Credit Units (ACCUs), expected in 2021.

Once implemented, Moomba CCS will be one of the world's largest CCS projects at the lowest cost, storing 1.7 million tonnes of CO2 per annum at less than A$30/tonne. The Cooper Basin has the potential to store up to 20 million tonnes per annum, with costs expected to decrease with scale.

Case study

Moomba CCS and zero-emission hydrogen

In 2020 Santos continued to progress our globally significant Moomba CCS project which is now ready for final investment decision pending finalisation of an approved methodology for CCS to earn Australian Carbon Credit Units (ACCUs).

Front-end engineering design is complete for the capture, compression, dehydration (removing any water) and storage of CO2 from the Moomba plant. As part of this phase of the project, Santos successfully injected approximately 100 tonnes of CO2 deep underground into depleted gas reservoirs where it originally came from and has been safely stored for more than 50 million years.

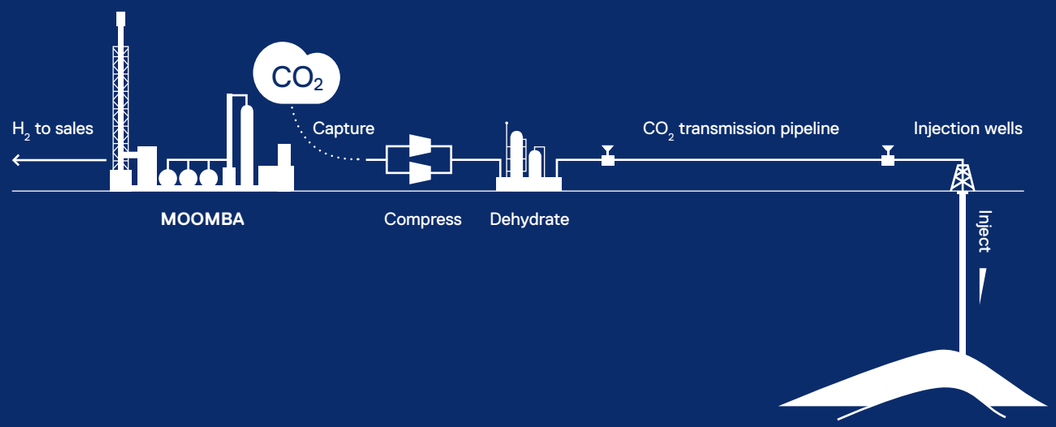
Phase one of the Moomba CCS project aims to inject up to 1.7 million tonnes of CO2 emissions per annum from the Moomba Gas Plant.

This will support commerciality for the project, which is expected to cost approximately A$30 per tonne of CO2 captured.

Appropriate policy settings will accelerate further CCS deployment in the Cooper Basin, which has the capacity to store up to 20 million tonnes of CO2 per annum and become a large-scale, commercial CCS hub. The Cooper Basin will be able to offset emissions not only from oil and gas, but from other industries such as power generation, steel, cement and chemicals and enable clean hydrogen production at significantly lower cost than produced via electrolysis.

CCS is recognised as a safe, well-established solution for permanent, large-scale emissions reduction and clean hydrogen production, the keys to economy-wide decarbonisation.

Figure 4 Schematic of CCS infrastructure in the context of the Cooper Basin and opportunity to support hydrogen growth



Successful CCS trial, Moomba, South Australia October 2020

3

Santos' strategy and climate change

Climate change considerations, reducing global greenhouse gas emissions and improving air quality are intrinsic to our business strategy.

Natural gas has a key role to play in a lower-carbon future as it produces 50 per cent less greenhouse gas emissions than coal when used to generate electricity,[15] can significantly improve air quality and is the perfect partner for renewable energy.

Santos is poised to be a world leader in CCS, a critical technology to limit global temperature increases to below 2 degrees Celsius.

Santos' low-cost, high-capacity CCS project positions us to be a key player in an emerging clean hydrogen market by capturing the CO2 emissions produced making hydrogen from our natural gas.

Santos' natural gas-focused portfolio is economically resilient under all the International Energy Agency's World Energy Outlook 2018 scenarios.

Our Vision and portfolio

Santos' natural gas portfolio puts the company in a strong position to supply growing regional demand. Our Vision is to be Australia's leading natural gas company by 2025, supplying reliable, affordable and cleaner energy to improve the lives of people in Australia and Asia.

We aspire to reduce emissions and improve air quality across Asia and Australia by replacing coal with natural gas, firming renewable energy, capturing and storing CO2 and accelerating the economic feasibility of clean hydrogen, an important fuel of the future.

Figure 3 Santos' clear and consistent Transform, Build and Grow Strategy

Since 2016, Santos has had a focused strategy to transform, build and grow the business based on five core, long-life asset hubs in the Cooper Basin, Western Australia, Northern Australia & Timor-Leste, Queensland & New South Wales, and Papua New Guinea, as shown on Figure 3 and pages 4-5.

Our strategy is delivering outstanding results across the business, with cumulative free cash flow of more than US$3.5 billion over the last 4 years.

15. IEA, The Role of Gas in Today's Energy Transitions, 2019.

The role of cleaner fuels in a less than 2 degrees Celsius future

The International Energy Agency's (IEA) Sustainable Development Scenario, under which global temperature growth is limited to well below 2 degrees, forecasts gas to remain almost a quarter of global energy demand in 2040. Over the same period, the SDS requires CCS to rise from the current 40 million tonnes of CO2 per year to over two billion tonnes per year and clean hydrogen demand to increase over 100 times to 215 million tonnes of oil equivalent.[16]

As global action on climate change continues to gather momentum, clean fuels are acknowledged as having a central role, particularly in the Asia-Pacific region where Santos markets its products.

Hydrocarbon-based energy comprises 80 per cent of global energy demand, and technology to make these fuels cleaner and ultimately zero-emission is therefore imperative to meeting climate goals.

Central to this process is expanded use of natural gas, where demand remains strong for several decades. By displacing coal, which has on average twice the emissions as natural gas when used for electricity generation, gas can abate 1.2 gigatonnes of CO2 and bring global power sector emissions down by 10 per cent, providing 8 per cent[17] of the additional emission reductions required in the Sustainable Development Scenario.

The recent experience of developed nations clearly demonstrates the positive impact of gas on emissions. In the United States, the displacement of coal with affordable gas is credited with underpinning its 21 per cent drop in power sector emissions since 2010.[18] The IEA estimates up to 400 million tonnes of CO2 could be avoided by further switching, or 20 per cent of total US power sector emissions. Coal-to-gas switching is essential to the US' decarbonisation in the Sustainable Development Scenario (SDS), providing almost a quarter of all emission reductions required.[19]

In the United Kingdom, coal-to-gas switching has contributed to a drop of 50 per cent in the emissions intensity of power generation since 2010.[20] This has supported a drop in the UK's total emissions of 32 per cent since 2008 and more than 50 per cent since 1990, overachieving on targets already at the leading edge of developed nations.[21]

Emulating these successes is a priority for the expanding high-carbon economies of Asia, where liquefied natural gas imports continue to rise rapidly, driven by efforts to reduce coal use and improve air quality. Under the SDS, Asia-Pacific gas demand is forecast to grow 50 per cent to 2040, from 11 per cent to 18 per cent of final energy demand,[22] led by growth in China, now the world's second largest liquefied natural gas buyer.

Moving forward, as emission reduction targets tighten, gas demand is supplemented by drastic growth in CCS and emergence of clean hydrogen. With all the flexible qualities of gas but producing no emissions, hydrogen can be used in steel and fertiliser production, transport, heating, power generation and as a form of electricity storage.

Recognising its importance to a sustainable energy future, governments across the world are making huge investments and designing policy to support the nascent hydrogen economy through infrastructure, demand and expertise. Many have been enhanced as part of the COVID-19 recovery. In Europe, Germany has begun a US$10 billion hydrogen strategy and France has committed US$2 billion in their relief package. Importantly, regional neighbours and existing Santos customers in Korea and Japan are investing billions in hydrogen infrastructure, while China has announced aggressive hydrogen vehicle policies[23] expected to be accelerated to meet their recent net-zero 2060 pledge.[24]

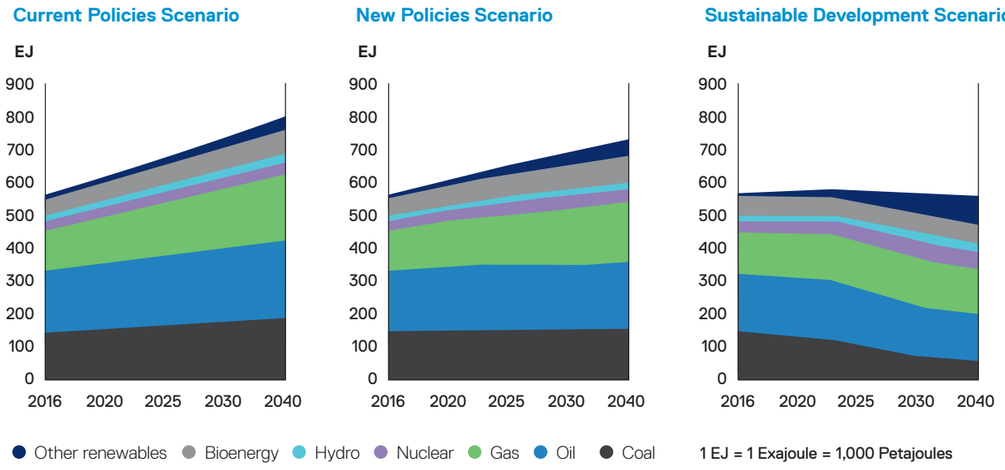
16. IEA, CCUS in Clean Energy Transitions, 2020.
17. IEA, The Role of Gas in Today's Energy Transitions, 2019.
18. IEA, The Role of Gas in Today's Energy Transitions, 2019.
19. IEA, The Role of Gas in Today's Energy Transitions, 2019.
20. IEA, The Role of Gas in Today's Energy Transitions, 2019.
21. Climate Action Tracker, 2020.
22. IEA, World Energy Outlook 2020.
23. IEA, Hydrogen Tracking Report, 2021 www.iea.org/reports/hydrogen.
24. Goldman Sachs, China Net Zero: The Clean Tech Revolution, 2021.

In its SDS, the IEA forecasts aggressive growth in low-carbon hydrogen to over 75 million tonnes (215 million tonnes of oil equivalent) by 2040, more than the current global output of wind and solar today.[25] Crucially, producing clean hydrogen from natural gas with CCS is by far the lowest cost method and forecast to maintain this advantage until well beyond 2030.[26]

Cleaner fuels are set to drive global climate action and Santos has the assets, expertise and customer base to seize the opportunities now and into the future.

The IEA expects natural gas to grow to supply a quarter of all global energy demand in 2040 in all 2018 scenarios.

Figure 4 Global energy demand under the IEA 2018 scenarios



Hydrocarbon fuels makes up **80 per cent of global energy consumption**.[27]

25. IEA, World Energy Outlook 2020.
26. IEA, World Energy Outlook 2020.
27. IEA, World Energy Outlook, 2020.

Santos is part of the climate solution

As the world moves to a lower-carbon future to meet shared goals for limiting greenhouse gas concentration in the atmosphere, Santos is focused on reducing both our own emissions and those of our customers.

This significant commitment, embodied in our industry-leading net-zero 2040 target, is made possible by our unique portfolio of assets, technical expertise, and low-cost operating model.

Already an established exporter of liquefied natural gas to markets including China, Japan, Malaysia and South Korea, Santos has a key role in our region's decarbonisation journey which we aim to increase, growing liquefied natural gas exports to 4.5 million tonnes annually by 2025. Other developing Asian economies pursuing economic growth will create more demand for liquefied natural gas as a cleaner fuel than coal for power generation, cooking and heat, and to firm renewables.

Across our operations, we are successfully reducing emissions through our suite of initiatives in energy efficiency, electrification, integration of renewables and nature-based carbon offsets.

Going forward, Santos' investment in the step-change technology of CCS will allow us to drastically reduce the emissions not just from our own operations, but those of our customers, through safe and permanent storage of their CO2, or by supplying clean hydrogen.

CCS is a proven technology in operation for more than 50 years. More than 20 CCS projects exist across the world, in countries such as Canada, the USA and Norway, storing around 40 million tonnes per year of CO2. While this is well short of what is required to reach climate goals, momentum is building. 30 commercial facilities have been announced since 2017, with investment potential of around US$27 billion.[28] Governments across the world are investing in CCS as a core component of emission reduction efforts, including climate policy leader the UK, which is investing US$1.3 billion in CCS by 2030 as part of their 'Green Industrial Revolution' plan.[29]

Low-cost, permanent CO2 abatement through CCS such as Santos' Moomba project can remove emissions from energy and heavy industry, responsible for a large proportion of global greenhouse gas emissions, while enabling production of clean hydrogen, crucial to decarbonising other industrial processes and the transport sector.

As the world continues its seismic shift to a low-carbon future, Santos is positioned to seize the opportunities within the climate challenge.

The role of clean hydrogen in a lower-carbon future

Santos is committed to a lower-carbon future and in 2020 announced its target to achieve net-zero emissions by 2040. Central to this goal is progressing the Moomba CCS project, which is now technically complete and ready for a final investment decision once the methodology for Australian Carbon Credit Units (ACCUs) is finalised by government.

CCS is a mature technology recognised as a safe, permanent solution for large-scale emissions reduction. The lowest-cost and most common way to produce hydrogen today is by splitting natural gas molecules (carbon and hydrogen). When used in conjunction with CCS, the hydrogen produced can be carbon neutral and also eliminates scope 3 emissions.

What is hydrogen energy?

Hydrogen is the most common substance in the universe, but on earth usually occurs in combination with other elements, for example with oxygen as water or with carbon as methane. By itself it is a versatile carrier of energy, able to be stored as a gas or liquid.

The world already produces 70 million tonnes of hydrogen each year. It is safe, clean, reliable and flexible, just like natural gas. However, the vast majority of this is not currently carbon neutral.

Hydrogen can be used for all the same things that natural gas is currently used for – from heating homes, cooking and electricity to powering cars, trucks, buses and trains. In addition, it can replace coal in high-emitting industrial processes such as steelmaking, which are major contributors to global emissions.

28. IEA, CCUS in Clean Energy Transitions, 2020.
29. Refer UK Government Publications, gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution, 2020.

Why hydrogen?

Hydrogen produces no CO2 emissions when burned. When used as a fuel, the only by-product is water.

The majority of the hydrogen produced in the world today is from natural gas. This process uses half as much water and is three times cheaper than generating hydrogen from water and electricity. While generating hydrogen from natural gas produces CO2, it can be captured and stored, such as through Santos' Moomba CCS project.

Australia's clean fuels opportunity

Hydrogen, along with natural gas, presents a major opportunity for both Santos and Australia to produce a clean and reliable fuel that will help Australia and the world transition to lower CO2 emissions.

Carbon capture and clean hydrogen are essential for decarbonising 'hard to abate' sectors (industrial processes, heavy transport and aviation) comprising a large proportion of global emissions.[30] In May 2020, following a rigorous review process by an expert technical panel,[31] the Australian Government announced low-cost hydrogen and CCS as two of the five key investment priorities in their 'Low Emissions Technology Roadmap'.[32]

This follows ongoing support from Australian federal and state governments to grow a clean, innovative, safe and competitive hydrogen industry, including A$150 million in funding for hydrogen projects since 2015.

Australia's strategic support for CCS and hydrogen mirrors the international movement to progress these technologies to meet climate change goals. For example, the Norwegian Government in July 2020 earmarked US$1.8 billion to the US$3.5 billion 'Longship' CCS project, and governments across the world are committing billions on strategies to produce and utilise clean hydrogen led by Germany, France, Korea, Japan and China.[33]

Santos has the resources, capabilities and track record supplying clean, reliable energy to lead this transition for the homes and industries of Australia and the world.

Hydrogen is already blended into gas networks and being used to power some vehicles overseas. Blending up to 10 per cent hydrogen into the existing natural gas network could be the first step in providing clean energy to Australian homes and industry. Forecasts indicate that demand for hydrogen could more than double in the next decade in Australia.[34]

Hydrogen production is a natural extension of what Santos already does. Our company has a proven, safe and low-cost operational history and access to all the ingredients required for hydrogen production, including natural gas, water and the ability to store CO2 produced in the process. In addition, this transition will leverage the skills and competencies in our existing business of subsurface and operational excellence in major hazard facilities, as well as fuel marketing.

With appropriate policy settings to accelerate CCS deployment, the Cooper Basin could become a large-scale, commercial CCS hub capturing emissions from oil and gas production and enabling large-scale clean hydrogen production in Australia at low cost.

The Cooper Basin has a bright future with significant hydrogen production potential. Once large-scale development of hydrogen from electricity and water (electrolysis) is established and technology improves,[35] Santos has a further opportunity to introduce hydrogen production from electrolysis, using the Cooper Basin's world-class solar and viable wind resources. This will take advantage of markets and infrastructure developed in the shorter term by our low-cost clean hydrogen produced from natural gas with CCS.

30. IEA, Energy Technology Perspectives, 2017.
31. Department of Industry, Science, Energy and Resources, Examining additional sources of low-cost abatement: expert panel report, May 2020.
32. Department of Industry, Science, Energy and Resources, First Low Emissions Technology Statement, May 2020.
33. IEA, World Energy Outlook 2020.
34. Deloitte, ERRATUM, Australian and Global Hydrogen Demand Growth Scenario Analysis, COAG Energy Council – National Hydrogen Taskforce, May 2020.
35. Bloomberg New Energy Finance, Hydrogen: The economics of production from renewables, August 2019.

Case study

West Arnhem Land Fire Abatement

The West Arnhem Land Fire Abatement (WALFA) project is a world-renowned fire management program that began as a collaboration between Santos-operated Darwin LNG, the Northern Territory Government, the Northern Land Council and the Djelk, Warddeken, Mimal, Jawoyn and Adjumarllal ranger groups of Western Arnhem Land.

Northern Australia is one of the most fire-prone environments on earth – almost half of the savanna region burns every year and is a major contributor to the Northern Territory's greenhouse gas emissions. Without management, bigger, hotter, catastrophic fires destroy or retard large flora, seriously impacting the rich, endemic biodiversity of the area as well as ancient cultural sites.

For thousands of years, Indigenous owners had managed the issue through strategic mosaic burning until their displacement after European settlement

The WALFA project sees Indigenous rangers practice traditional fire management with the aid of satellite fire mapping and helicopters, across 28,000 square kilometres.

Through strategic early season 'cool' burns in mosaic patterns, they prevent the instance and intensity of later season fires.

Since its inception in 2006, WALFA has achieved a cumulative total abatement of over two million tonnes CO2e, making it one of the largest greenhouse gas offset programs in Australia.

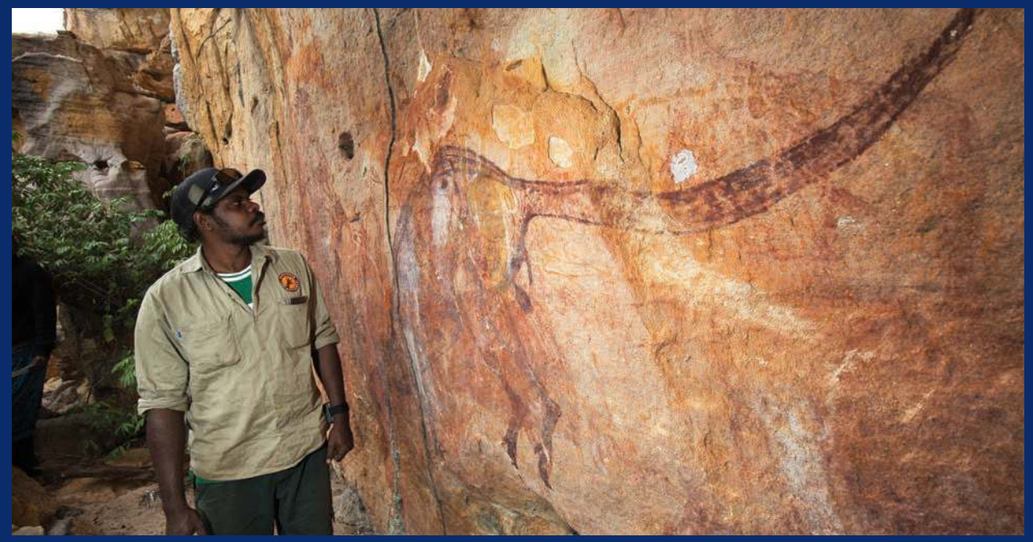
It has also resulted in the conservation of rainforest vegetation, protection of local wildlife and rock art sites, and facilitated reinvigoration of cultural aspects of land management, while supporting more than 300 Indigenous jobs per year.

The success of WALFA has been the catalyst for over 80 other projects across northern Australia, with savanna burning now recognised as a key pillar of bipartisan emissions reductions policies.

Australian Carbon Credit Units (ACCUs) earned through these programs are sold to fund other social and environmental projects, including establishing schools. Darwin LNG continues to support the WALFA project though the purchase of ACCUs.

The United Nations has recognised WALFA as the best example in the world of Indigenous communities working in the carbon market, and pilot programs are underway in other nations such as Botswana.

Rangers conduct fire management in Western Arnhem Land, Northern Territory, Australia



A strategic focus on resilience in a lower-carbon future

Santos has been incorporating greenhouse gas emissions and carbon pricing into economic planning and decision making for over 10 years.

Santos tests existing and new projects against various carbon policy assumptions, using a base case carbon price consistent with Australia's emissions reduction policy, currently the Safeguard Mechanism.

These carbon price assumptions are refreshed annually along with other corporate economic assumptions.

The Santos investment screening and decision-making processes consider the greenhouse gas emissions from all projects and the economic impact that a carbon price would have on our business. Sensitivity analyses are performed against the Safeguard Mechanism and other policy scenarios.

Scenario analysis also considers a range of energy mix futures. These scenarios are used to understand the demand for Santos' products and how this changes under different emissions reduction policies.

Managing emissions under Australia's Safeguard Mechanism

Santos' Australian assets are subject to the emissions reduction policy known as the Safeguard Mechanism, which places a cap (baseline) on emissions from facilities emitting greater than 100,000 tonnes of CO2 equivalent annually. Under this policy, annual emissions for each facility are compared against the facility's baseline, and responsible entities must purchase and surrender Australian Carbon Credit Units (ACCUs) for any emissions above the baseline for the year.

Santos has 12 operated facilities, comprising 90 per cent of our operated emissions, covered by the Safeguard Mechanism.

Aligned with our commitment to reducing emissions, all Santos operated assets subject to the Safeguard Mechanism are operating below their designated facility baselines, as shown in Figure 5.

The emissions and associated baselines in Northern Australia and Western Australia are from assets acquired from Quadrant Energy in 2018 and ConocoPhillips' Australia West business in 2020 respectively. Prior to the acquisition these emissions and baselines were separately reported by those organisations.

Focus on emissions reduction

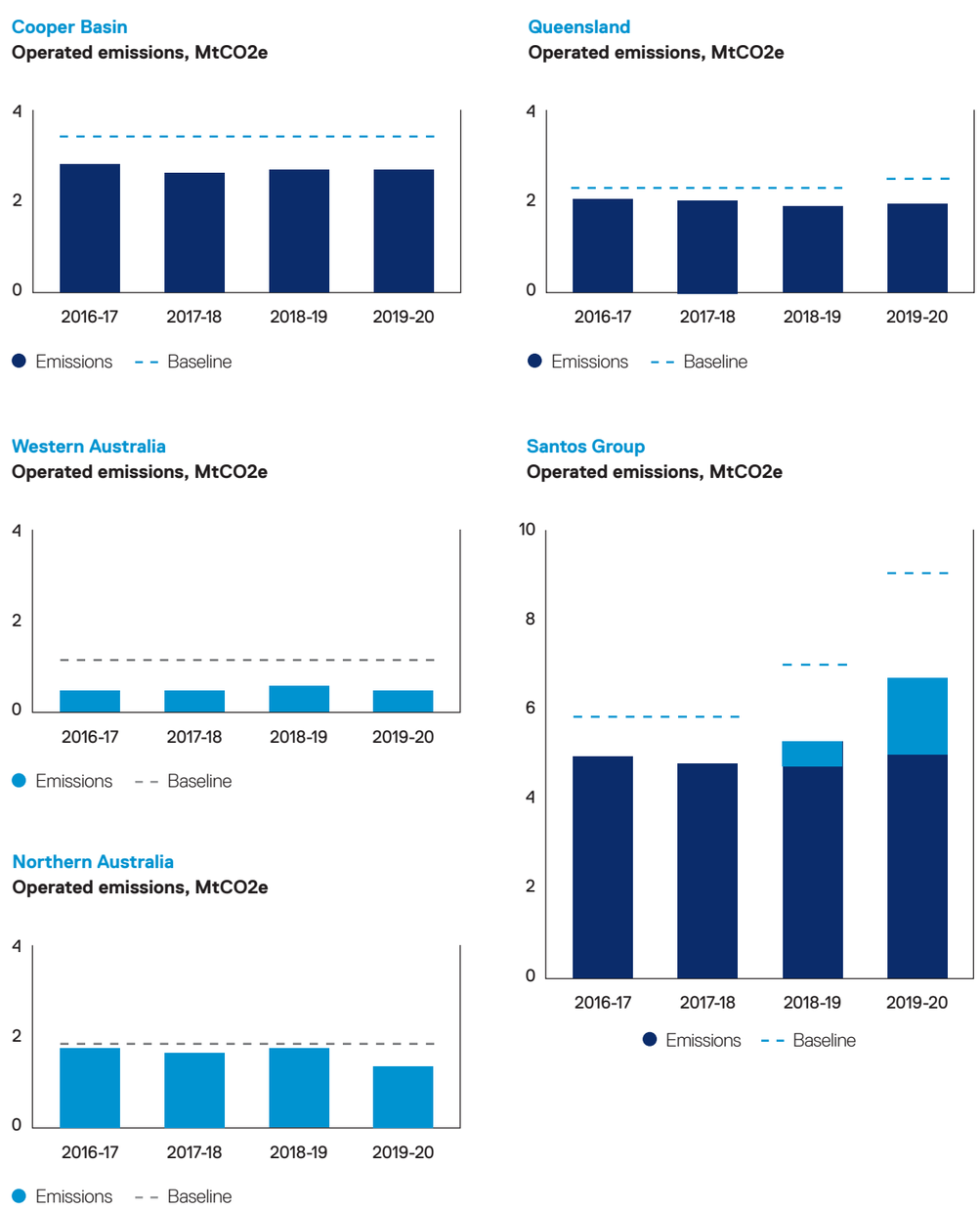
Our greenhouse gas emissions sources include vehicle and equipment fuel combustion, venting, flaring and fugitive emissions (minor leaks).

We are constantly looking at ways to reduce emissions as part of standard operations. Every molecule of gas that is not consumed through fuel, flaring or venting can potentially be supplied to the market. Consistent with this approach, Santos established the Energy Solutions team in 2017 to focus on:

+ Reducing fuel gas, flaring and venting to enable more sales gas.
+ Reducing waste and emissions by pursuing economic uses for by-products such as CO2, produced water and salt.
+ Growing natural gas demand by commercialising gas through new technologies and new market opportunities, including firming for intermittent renewable energy systems.

In 2020 the Energy Solutions team became part of the Midstream Infrastructure and Low-carbon Fuels function of our business, which is focused on zero-emission technologies, reducing operational emissions and our low-carbon fuels trajectory.

Figure 5 Santos operated facilities subject to the Safeguard Mechanism



Scenario modelling

Scenario analysis is a standard part of Santos' strategic planning process, analysing the impact of emerging trends and changes in the future energy mix, market conditions, technology, consumer behaviour and policy settings.

In our inaugural 2018 Climate Change Report, Santos modelled the impact of changing climate policy on the company's portfolio of assets, consistent with the requirements of the TCFD. Santos used the IEA's scenarios from the Energy Technology Perspectives 2017 to understand the economic resilience of our portfolio under different climate change policies.

We subsequently modelled the impact using the IEA's scenarios from the 2018 World Energy Outlook.

In November 2020, the IEA released the 2020 World Energy Outlook (WEO). The 2020 WEO provided two scenarios with detailed modelling:

+ Stated Policies Scenario (STEPS)
  Reflects all of today's announced policy intentions and targets where they are backed up by detailed measures;
+ Sustainable Development Scenario (SDS)
  A surge in clean energy policies and investment puts the energy system on track to achieve sustainable energy objectives in full, including the Paris Agreement, energy access and air quality goals,

and a further 2 scenarios with limited modelling information provided:

+ The Delayed Recovery Scenario (DRS)
  Same policy assumptions as in the STEPS, but prolonged pandemic causes lasting damage to economic prospects;
+ The Net-Zero Emissions by 2050 case (NZE2050)
  Extends the SDS analysis to meet net-zero by 2050.

The role of natural gas in the energy mix and the carbon pricing assumptions in the 2020 Sustainable Development Scenario are broadly comparable with the 2018 SDS scenario. As such, our 2021 Climate Change Report continues to use the IEA 2018 WEO scenarios. Santos continues to review credible forecasts and update its scenario analysis for material changes. Santos intends to use the WEO 2020 scenarios in the 2022 reporting.

International Energy Agency scenarios

The IEA is a global intergovernmental organisation that provides energy and climate policy advice including scenarios for future global energy demand and climate change.

For the 2020 and 2021 Climate Change Reports, Santos has used the Sustainable Development Scenario published in the IEA 2018 World Energy Outlook. Under this scenario, expected temperature rise is 1.7 to 1.8 degrees Celsius by 2100, consistent with global aspirations to limit temperature rise to well below 2 degrees Celsius.

Santos uses this scenario to test the economic resilience of our portfolio, because it provides a robust test of the resilience of our business, with total energy demand remaining flat.

Current Policies Scenario (CPS)

Based solely on existing laws and regulations.

Total energy demand projected to grow by 41 per cent and natural gas by 59 per cent by 2040.

New Policies Scenario (NPS)

Incorporates announced policy ambitions and includes Paris commitments.

Expected temperature rise of ~2.7°C by 2100.

Total energy demand projected to grow by 29 per cent and natural gas by 47 per cent by 2040.

Sustainable Development Scenario (SDS)

Scenario designed to support universal access to energy; reduce air pollution; combat climate change; and includes a water dimension.

Expected temperature rise of ~1.7 to 1.8°C by 2100, consistent with the global goal to limit temperature rise to well below 2°C.

Total energy demand projected to remain flat, but natural gas demand increases by 14 per cent by 2040.

CCS technologies will play an important role in meeting energy and climate goals, requiring > 2000 million tonnes CO2 to be captured annually by 2040.

While the future may differ from forecast scenarios, modelling discrete scenarios provides us with relevant insights and understanding of potential trends and opportunities that enable Santos to ensure business resilience and create value for our shareholders, stakeholders and communities where we operate.

Santos' base oil and gas price assumptions take into account the impact of a changing energy mix over the longer term and are more conservative than the IEA's WEO oil and gas price assumptions under each of their 2018 scenarios. The IEA scenarios use higher carbon price assumptions to reflect the more stringent climate change policies required to limit global temperature rise.

Under the IEA scenarios, all emissions incur a carbon price, whereas the Santos base case reflects Australia's current carbon policy, the Safeguard Mechanism. Under the Safeguard Mechanism, only emissions above the agreed baseline for each facility incur a carbon offset cost.

As oil and gas demand continues to grow under the Current Policies and New Policies Scenarios, prices are projected to increase in real terms from today's levels to incentivise the development of new supply. The oil price is projected to return to above US$90/bbl in real terms by the middle of next decade. The price for gas delivered into Japan is projected to rise above US$10/MMBtu in real terms by 2030. The carbon price gradually increases in these scenarios.

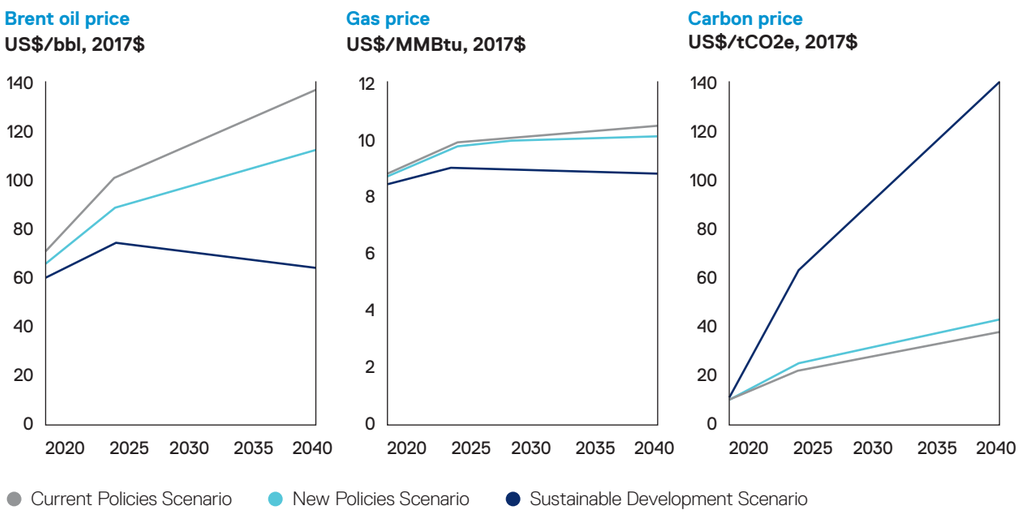
The Sustainable Development Scenario provides an integrated strategy to achieve energy access, air quality, climate goals and water access. Under the Sustainable Development Scenario, temperature is expected to rise by 1.7 to 1.8 degrees Celsius by 2100, in line with the Paris Agreement ambition of limiting global temperature rise to well below 2 degrees Celsius.

Delivering this future requires rapid improvement and deployment of technology in the innovation pipeline, including significant growth in bioenergy and the implementation of large-scale CCS.

This is modelled through very high carbon price assumptions reaching US$140/tCO2e by 2040. Under this scenario, oil prices decline in real terms from 2025 but continue to average above US$60/bbl through to 2040. Gas prices rise to 2025 before slowly decreasing in real terms to around US$8/MMBtu delivered into Japan by 2040.

Figure 6 shows the oil, gas and carbon price assumptions under each of the IEA's 2018 World Energy Outlook scenarios.

Figure 6 Oil, gas and carbon price assumptions under the CPS, NPS and SDS scenarios from the IEA 2018 Scenarios[36]



36 No change in portfolio assumed between scenarios.

Scenario analysis demonstrates strong net present value and earnings outcomes

Value of our pre-growth portfolio

Santos' pre-growth portfolio represents assets currently in production and reflects our published reserves position.

The portfolio does not include the acquisition of ConocoPhillips' Australia-West business. That acquisition was completed on 28 May 2020, subsequent to the completion of the scenario analysis.

The net present value of our pre-growth portfolio is economically resilient under the IEA's Sustainable Development Scenario and more robust under other scenarios which have a higher natural gas demand outlook, maintaining value in excess of, or close to Santos' current portfolio valuations. The Santos scenario shown for reference in this section is consistent with the assumptions published in our 2019 half-year results.

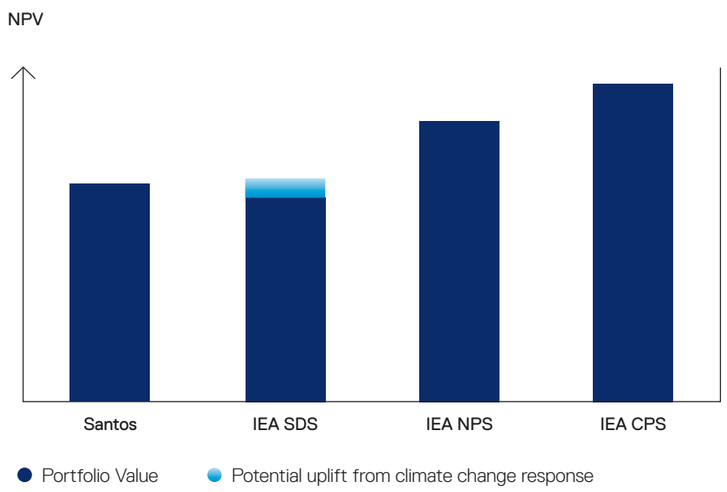
The company's relative portfolio value under each scenario is shown in Figure 7.

Although value is impacted by significant carbon costs under the Sustainable Development Scenario, this can potentially be offset by investment in emission reductions across our portfolio and incorporating zero-emission products and services into our portfolio as shown in light blue in the chart below.

Santos is already pursuing activities that both lower our emissions and add value to our portfolio, including:

+ Conversion of existing operations to run partially or fully on renewable power to reduce fuel usage. This reduces the emissions from operations and helps to improve reliability, as there is less equipment to maintain. Fuel saved is then available for sale to the market.
+ Implementing the Moomba CCS project which takes advantage of our core competencies and infrastructure position, and will be critical in meeting greenhouse gas emission targets in the longer-term.
+ Pursuing economic uses for our by-products, such as CO2 extracted from our product stream to convert a waste product into a new source of revenue.
+ Using CCS technology to accelerate the economic feasibility of clean hydrogen.

Figure 7 Relative value of pre-growth portfolio under Santos and IEA assumptions[37]



37 No change in portfolio assumed between scenarios.

Earnings of our growth portfolio

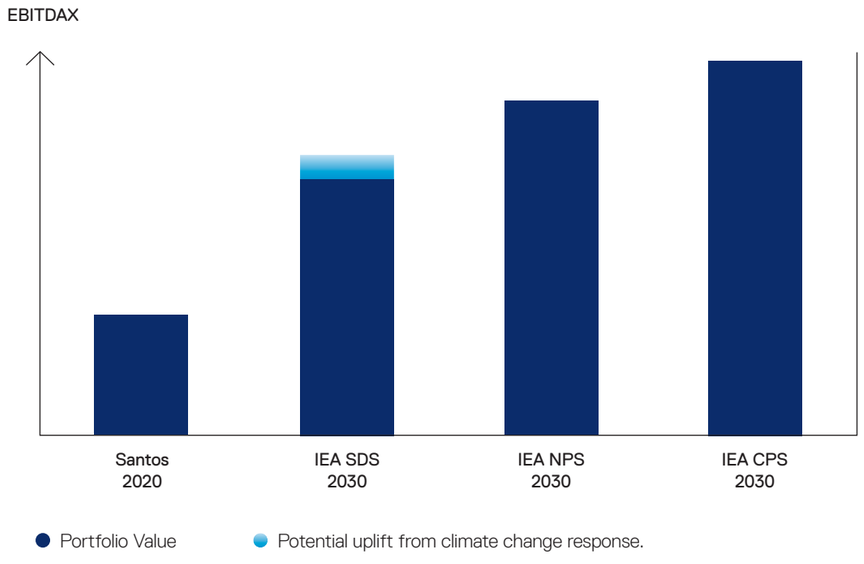
Santos' growth portfolio includes the pre-growth portfolio plus liquefied natural gas backfill and expansion opportunities, for our existing Australian infrastructure position, new onshore gas developments and a new offshore oil and gas development. These opportunities take advantage of Santos' disciplined low-cost operating model and are consistent with the development of our contingent resources position.

Santos' growth portfolio continues to be economically resilient under the IEA's 2018 Sustainable Development Scenario and more robust under other scenarios which have a higher natural gas demand outlook.

Figure 8 shows the relative earnings as per the scenario analysis in 2019.

Similar to the valuation impact, the earnings impact from high carbon costs under the Sustainable Development Scenario can potentially be offset by investment in emission reductions across our portfolio and incorporating zero-emission products and services into our portfolio in the form of clean hydrogen and CO2 storage for third parties.

Figure 8 Relative earnings of growth portfolio (including existing pre-growth portfolio) under Santos and IEA assumptions[38]



38 No change in portfolio assumed between scenarios.

Emissions measurement and reporting

Australia has a comprehensive greenhouse gas reporting scheme, established by the National Greenhouse and Energy Reporting Act 2007 (NGER). The NGER Act is supported by the National Greenhouse and Energy Reporting (Measurement) Determination 2008, which provides methods and criteria for calculating greenhouse gas emissions and energy data under the NGER Act.

The NGER reporting framework covers

+ Scope 1 and Scope 2 emissions, and energy produced and consumed.
+ Greenhouse gases including CO2, methane (CH4) and nitrous oxide (N2O).
+ Emission sources including the combustion of fuels for energy and fugitive emissions from the extraction of natural gas.

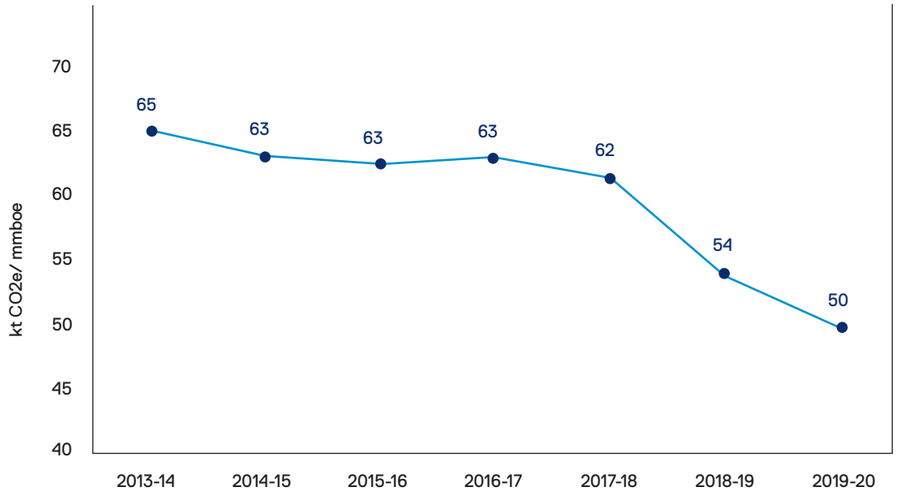
Santos has been reporting under the NGER framework since its inception in 2008. In addition, our Scope 1 greenhouse gas emissions are independently audited each year. Table 1 shows the latest 2019-20 data and comparison over the prior six years.

On 28 May 2020, Santos completed the acquisition of ConocoPhillips' northern Australia and Timor-Leste assets. The 2019-20 dataset incorporates these assets, which were previously separately reported by ConocoPhillips.

Santos' operated Scope 1 emission sources consist of fuel combustion (60 per cent); flare, vent and CO2 removal (39 per cent); and fugitive emissions (minor losses) (less than one per cent).

Santos' emissions intensity continues to trend lower, reducing by 20 per cent in the past five years, as shown in Figure 9.

Figure 9 Santos emissions intensity (Scope 1, equity share)



Santos' operated Scope 2 emission sources consist of electricity purchased for our operations in Fairview and Roma in Queensland, Port Bonython processing facility near Whyalla in South Australia and minor amounts for other activities including office buildings. Emissions are calculated from electricity purchased multiplied by prescribed state-based electricity emission factors.

Santos' operated Scope 3 emissions are reported as the emissions associated with the combustion of our products. The calculations assume that all products are combusted as a fuel, even though a portion of Santos' products are used as a feedstock, for example ethane produced by Santos is used as a feedstock in the manufacture of polyethylene.

Table 1
Greenhouse gas emissions data[39]

Greenhouse gas (GHG) emissions and energy consumption (Santos gross operated, unless otherwise stated, financial years)								
	Units	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**
Direct energy consumption	PJ	32	34	48	65	65	71	87
Indirect energy consumption	PJ	0.18	0.19	0.19	1.47	1.85	2.54	2.63
Scope 1 (Quadrant acquisition)	*MtCO2e*						*0.62*	*0.56*
Scope 1 (Conoco acquisition)	*MtCO2e*							*1.85*
Scope 1 (Santos ex acquisitions)	*MtCO2e*	*3.94*	*4.35*	*5.04*	*5.82*	*5.49*	*5.21*	*5.32*
Scope 1 (direct GHG emissions)	MtCO2e	3.94	4.35	5.04	5.82	5.49	5.83	7.74
Scope 2 (purchased electricity)	MtCO2e	0.03	0.03	0.03	0.31	0.39	0.53	0.57
Scope 3 (product use)	MtCO2e	18.0	15.5	18.8	20.4	20.0	24.5	28.6
Scope 1 (Santos equity share)	MtCO2e	3.36	3.63	3.79	3.79	3.57	3.65	3.85
Scope 1 intensity (Santos equity share)	ktCO2e/mmboe	65	63	63	63	62	54	50
Scope 2 (Santos equity share)	MtCO2e				0.13	0.16	0.20	0.22
Scope 3 (Santos equity share)	MtCO2e				19.2	18.4	21.6	24.3
Further details of Scope 1 emissions and flared and vented hydrocarbon (Santos gross operated)								
Emissions of CO2	MtCO2e	3.49	3.86	4.51	5.09	4.99	5.35	7.29
Emissions of CH4	MtCO2e	0.45	0.48	0.53	0.72	0.49	0.47	0.44
Emissions of N2O	MtCO2e	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Emissions from fuel	MtCO2e	1.70	1.67	2.38	3.19	3.18	3.37	4.64
Emissions from flare	MtCO2e	0.30	0.54	0.38	0.25	0.18	0.29	0.45
Emissions from vent	MtCO2e	0.30	0.30	0.30	0.31	0.24	0.15	0.13
Emissions from CO2 removal	MtCO2e	1.62	1.81	1.94	2.03	1.85	1.98	2.45
Emissions from fugitives	MtCO2e	0.02	0.02	0.03	0.04	0.04	0.04	0.06
Volume of flared hydrocarbon	Million m3	94.1	212.2	134.8	93.8	56.8	96.5	88.7
Volume of vented hydrocarbon	Million m3	35.4	38.0	45.0	38.7	33.0	26.2	24.8
Basis for 2030 emissions reduction target[40]								
Scope 1 & 2 emissions (Santos equity share)	MtCO2e							5.0
Scope 1 & 2 intensity (Santos equity share)	ktCO2e/mmboe							55

39. Emissions and energy are reported on an Australian financial year basis in accordance with the National Greenhouse and Energy Report Act, 2007. Scope 1 emissions occur from sources controlled by the Company, for example emissions from fuel, flare and vent; Scope 2 emissions are indirect, mainly electricity consumption; Scope 3 emissions represent indirect emissions when our products are combusted by our customers to produce energy.
40. Emissions reduction target based on 2019-20 emissions & intensity (Santos equity share, grossed up for post Conoco acquisition equity in acquired assets for full year).

Fugitive emissions management

Fugitive emissions are minor natural gas (methane) losses from oil and gas plants, for example, from valves on pipelines and within gas plants or wells.

Santos takes a holistic, systematic and data-based approach to managing its greenhouse gas emissions. All emissions, including fugitive emissions, are transparently reported using the rigorous National Greenhouse and Energy Reporting Act 2007 (known as the 'NGER') framework.

Defining fugitive emissions

Within the oil and gas industry, the term 'fugitive emissions' refers specifically to minor natural gas losses that 'passively escape' from operations.

In other reporting contexts, the term 'fugitive emissions' sometimes includes a broader series of activities including not just minor losses, but flaring (controlled burning of natural gas), venting (releasing natural gas without burning) and carbon dioxide removal (separating and removing carbon dioxide from unprocessed natural gas).

All emissions sources have specified calculation rules within the NGER framework and are reported under that framework to the Australian Government annually.

Santos transparently reports emissions in each annual climate change report, including emissions broken down by flaring, venting, carbon dioxide removal and fugitives as shown on Table 1 on page 40.

The Australian Government periodically publishes emissions inventory reports. These reports use the wider definition of fugitive emissions across the oil and gas value chain. In the latest annual emissions inventory report dated May 2020, fugitive emissions made up five per cent of Australia's total emissions inventory.

Fugitive emissions comprise less than one per cent of Santos' operated emissions. Santos is committed to continuous improvement to minimise their occurrence in our operations, with rigorous leak detection and repair practices across our assets.

Action on fugitive emissions

Establishing natural gas emissions baselines

Santos establishes a baseline in new onshore operational areas by doing a background survey before we commence operations. This is re-measured periodically to determine any changes in levels or impacts from our operations.

Reporting

Santos emissions are transparently reported through the NGER framework and independently assured.

Performance

Emission intensity of operations reduced 20% over the last five years.

Finding and fixing

Santos has rigorous leak detection and repair programs and monitor gas field infrastructure, including wellheads, pipe joints and flanges, using technology such as gas leak detectors and infrared cameras.

Our well integrity process is designed to ensure that hydrocarbons do not leak from wells. We conduct frequent well integrity assessments and well emissions are measured or estimated in accordance with regulatory requirements, which are among some of the most stringent in the world.

Measurement

Santos' emissions are measured and audited, including studies with CSIRO and the Commonwealth Government to determine background natural gas levels and fugitives from onshore wells. We sponsor research to independently measure fugitive emissions.

Comparison to the United States

Natural gas production in the US has many differences compared to Australia due to the history of gas development, size of the industry and differences in environmental regulatory controls.

One of the key differences is that routine flaring (burning of excess methane) and venting (releasing excess methane) is commonplace in the US to maximise production and is also included in the definition of 'fugitive' emissions, making US fugitive emissions (as defined there) generally significantly higher than in Australia. In Australia flaring and venting is more generally used to ensure safety in production and are each separately reported along with carbon dioxide removal and fugitive (minor loss) emissions sources under the NGER framework. Santos' emissions related to each of these sources are shown individually on page 40 of this report.

A CSIRO study measuring fugitive emissions rates in Santos' operations in Queensland found emissions to be very low, and much lower than those that have been reported for US unconventional gas production.[41]

41. CSIRO, Field Measurements of Fugitive Emissions from Equipment and Well Casings in Australian Coal Seam Gas Production Facilities, Report to the Department of the Environment 2014.

Fugitive emissions are included when calculating the emissions intensity of natural gas, which is already on average 50 per cent lower than coal when used to generate electricity. Improvements in emission management including reductions of flaring, venting and fugitive emissions can therefore further realise the climate benefits of natural gas.

Quantifying natural and activity-related fugitive emissions[42]

Australia's principal scientific research body, the CSIRO, has since 2013 conducted a range of research programs in Queensland, New South Wales, Western Australia and the Northern Territory. Some of their recent findings include:

+ Fugitive emissions from upstream gas production infrastructure in the Surat Basin in Queensland is less than 0.5 per cent of natural gas production.
+ The largest contribution to total fugitive emissions in this region was cattle grazing (54 per cent), followed by feedlots (24 per cent) and coal seam gas processing (eight per cent).
+ The median fugitive emissions from measurements of natural gas wells in Queensland and New South Wales is less than 1kg/day.
+ To put this into context, methane emissions measured from an urban sewerage treatment plant were 45 kg/day, a medium sized waste land fill were 400 kg/day and from a cattle feed lot were 2,600 kg/day.

Santos is working with CSIRO, the Federal Department of Industry, Science, Energy and Resources, and other gas producers in Queensland on further studies to quantify fugitive emissions from coal seam gas activities.

These programs build on previous work by CSIRO in New South Wales and Queensland in 2013 and 2014, which measured fugitive emissions from 43 coal seam gas wells and found it was very low.

As a next phase to the research the CSIRO undertook assessments into fugitive emissions at gas compression facilities within the Surat and Bowen basins. More field studies are planned for 2021 with the results from the research expected to become available in late 2021.

42. CSIRO Australia, Fugitive emissions from unconventional gas, July 2019. Available at https://gisera.csiro.au/wp-content/uploads/2019/07/19-00168_GISERA_FACTSHEET_MethaneFutureEmissions_190722v3.pdf

Case study

Studying background natural gas (methane) levels

While fugitive emissions comprise less than one per cent of Santos' operated emissions, Santos is committed to continuous improvement to further reduce their occurrence. This will be achieved through a combination of asset integrity plans and leak detection and repair practices.

In Queensland, New South Wales and the Northern Territory we survey gas field infrastructure and facilities, including well heads, pipe joints and flanges, using specialist equipment such as gas detectors and infrared cameras. Santos has well integrity processes to ensure that we manage and minimise the risk of leaks. Each asset is required to develop a specific well integrity plan, which outlines the defined regulatory framework and accountability as required by legislation, as well as the frequency of well integrity assessments and actions to repair if a leak is detected.

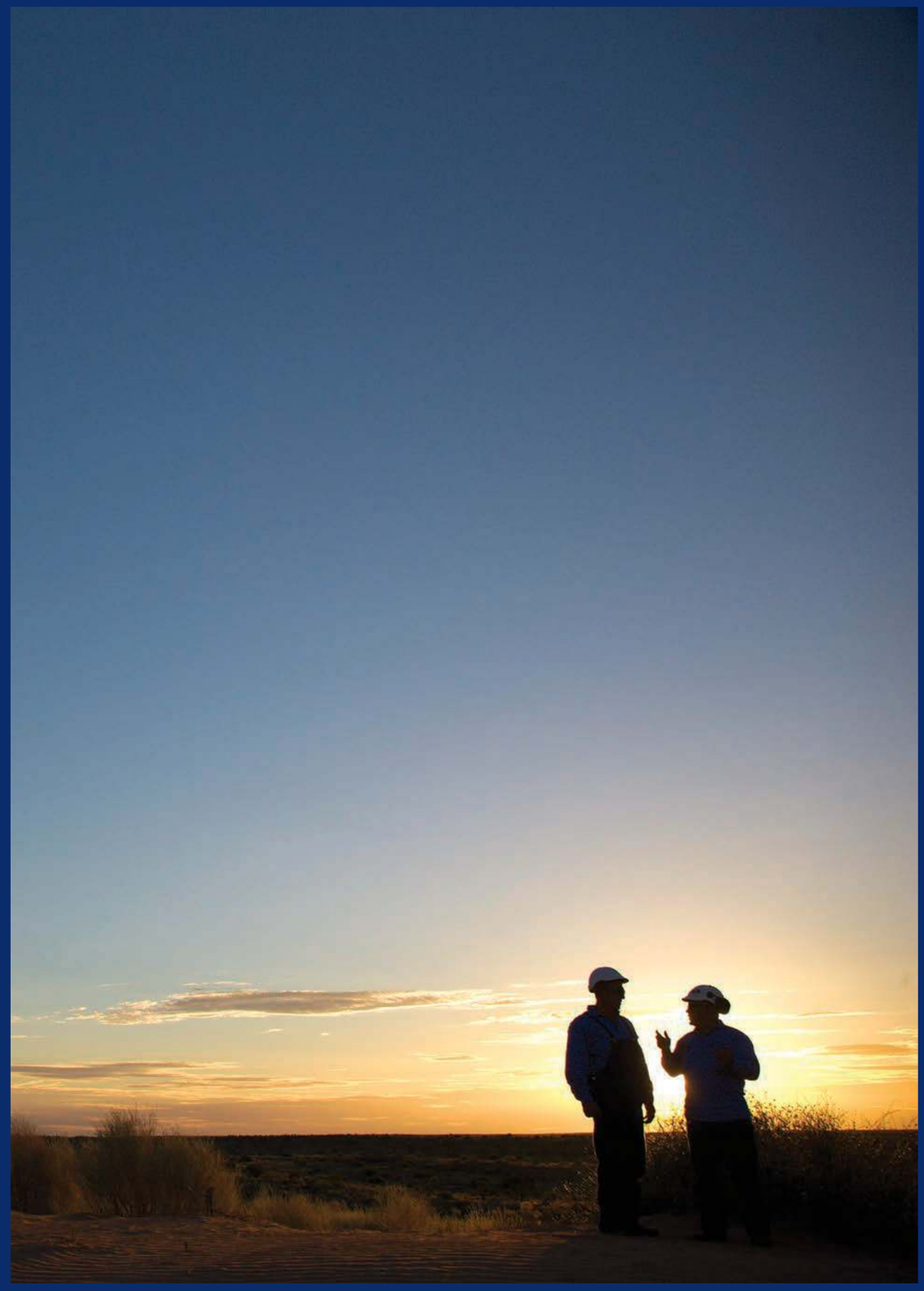
To measure fugitive emissions from oil and gas operations, natural biological and geological sources (for example from soils, wetlands, rivers and agriculture) must be identified and understood. This is known as background methane. CSIRO are undertaking initial field monitoring across our operated onshore assets, including measuring background levels of methane, investigating fluxes (which is the rate of flow of methane) and identifying sources of elevated methane levels.

In 2018 and 2019, background and baseline studies were conducted in the McArthur and Amadeus Basins in the Northern Territory and our Arcadia acreage in Queensland, which involved taking continuous measurements over thousands of kilometres on trafficable roads and tracks. Each of the studies shows that average atmospheric methane concentrations across the survey area is consistent with normal background concentrations of methane expected in these rural areas. We will continue with these studies in 2021.

In 2020, research focused on areas of planned future development within Fairview and Roma and an exploration tenure near Scotia.

These studies built on knowledge acquired in previous work undertaken by the CSIRO in 2018 and 2019, as well as studies in the McArthur and Amadeus basin in the Northern Territory, the Gunnedah basin in New South Wales and the Bowen and Surat basins in Queensland.

> The results show that background concentrations of methane were in the range of 1.78 to 1.82 parts per million consistent with normal background concentrations of methane expected in rural or natural areas.



4

Governance and risk management

Santos has had a Climate Change Policy since 2008, guiding our management of emissions and climate change risks.

A dedicated Environment, Health, Safety and Sustainability Committee of the Santos Board is responsible for monitoring and reviewing the company's approach to climate change and management of climate change risks.

Climate change is incorporated into Santos' Enterprise Material Risk Management Profile and our risk management processes and practices.

Key indicators are included in the Short-Term Incentive Scorecard which link climate-related performance to remuneration outcomes for the Executive Committee.

Santos' Executive Committee includes a role dedicated to leadership of the company's environmental, social and corporate governance (ESG), including sustainability and climate change.

Company policy and Board oversight

Santos' Climate Change Policy guides the company's activities to reduce greenhouse gas emissions as it produces the reliable, affordable and cleaner fuels required to meet domestic and global demand. Through the commitments made in our Policy, Santos is striving to contribute to the global aspiration to limit temperature rise to less than 2 degrees Celsius.

The Environment, Health, Safety and Sustainability (EHSS) Committee of the Santos Board regularly monitors and reviews the company's Policy and approach to climate change including management of climate change risk. The EHSS Committee provides advice to the Santos Board on climate-related issues and the company's performance in managing climate change risks.

The EHSS Committee receives regular updates on climate change developments from subject matter experts. These include information about risks, risk mitigation measures, opportunities and the financial impacts for the company arising from climate-related issues. Delivery of our climate change objectives is supported by teams who continually monitor and assess trends and changes in Australian and international energy markets, assess and model a range of energy mix scenarios based on varying policy and technology drivers, and conduct portfolio and asset reviews of our business and strategy.

The Santos Climate Change Policy, EHSS Committee Charter and 2018, 2019 and 2020 Climate Change Reports are available at santos.com.

Executive remuneration

In 2020, we re-assessed our previous long-term aspiration to achieve net-zero emissions from our operations by 2050, in line with global aspirations to limit temperature rise to well below 2 degrees Celsius. As a result, we announced the revised targets in pursuit of more aggressive emissions reduction over a shorter time frame, as detailed on Page 9.

Key indicators continue to be included in the company's Short-Term Incentive scorecard which link climate-related performance to remuneration outcomes for the company's senior management. These key indicators include a reduction of absolute emissions from operated assets, and an additional measure which links short term incentives to the delivery of a set of low-carbon fuels initiatives which are critical to the company's significant ambitions to drive sustainable shareholder returns in a lower carbon future. Below a threshold level of performance, no amount will be payable under the Short-Term Incentive for climate-related measures.

In addition, company executives participate in the company's Long-Term Incentive Plan which delivers Santos shares at the end of a four-year performance period, subject to the achievement of performance hurdles including total shareholder return relative to ASX100 companies and the constituent members of the Standard and Poor's 1200 Global Energy Index. The Long-Term Incentive Plan promotes a focus on achievement on key milestones in the management of climate-related risks and delivery of our climate change strategy and targets.

Managing climate change risks

An integrated and active risk management approach

The Santos Risk Management Framework is consistent with the International Standard (AS/NZS ISO 31000) Risk Management Guidelines and the ASX Corporate Governance Principles and Recommendations. The Framework incorporates a Risk Management Policy, Risk Management Standard and risk processes to facilitate the identification, assessment and treatment of risk.

The Framework is reviewed annually by the Audit and Risk Committee of the Santos Board, and the Santos Board of Directors, to confirm that it adequately and comprehensively addresses known and emerging risks, including those risks related to sustainability and climate change. Climate change risk is a focus for the Audit and Risk and EHSS Committees and the Board, with the Enterprise Material Risk Profile reviewed at least twice annually by the full Santos Board.

Santos has dedicated staff who manage the company's compliance with all carbon reporting requirements.

Our teams collaborate across the business and the Executive Committee to ensure that external and internal climate change developments and risks are identified and integrated into the company's strategy and activities.

Material climate risks

The company's material risks relating to climate change consider physical, policy and legal, technological, market and reputational risks in the context of the internal and external environments relevant to Santos' business activities. These risks have potential to impact on our corporate objectives, including material financial implications such as increased cost, lost profitability, product demand and revenue disruptions. These risks are summarised in the following table.

Risk category	Climate-related risks and potential impacts
Physical risks (acute and chronic)	Increased frequency or severity of extreme weather events could impact facilities onshore and offshore. These risks may potentially result in injuries, damage to facilities and infrastructure, and disruption of operations.
Policy risks	Carbon pricing policies, including a carbon tax, emissions trading scheme, or any other regulatory carbon pricing mechanism may increase operating costs or impact the international competitiveness of Santos projects. Project approvals may not be granted due to associated greenhouse gas emissions, or the conditions of approval (or operation) may be too onerous to proceed, potentially impacting operating and development costs.
Legal risks	Litigation against governments and companies for compensation for climate change impacts may adversely affect Santos' reputation, development or operating costs.
Technology and market risks	Innovation in oil and gas could occur at a slower pace than coal, while technology breakthroughs could allow coal to significantly decrease emissions or renewables to manage intermittency issues. Natural gas could be displaced by more rapid advances in hydrogen or other technologies. These factors could all reduce demand for gas and its position in the energy mix.
Reputational risks	Increased public and consumer activism on climate change and alternate views about the role of natural gas in supporting a lower-carbon future present a risk to Santos' reputation, with the potential to impact project approvals and licence to operate.

Case study

Charo solar and battery microgrid

Santos is an industry leader in reducing operational emissions through renewable energy integration, beginning with our innovative program to convert beam pumps to run on solar power.

The conversions reduce combustion emissions from fuel gas in our operations and have been running successfully since August 2018, an Australian first proving that a solar photovoltaic and battery system can maintain reliability and availability in the harsh environment of the Cooper Basin.

The program has now been rolled out to 33 wells across the Cooper Basin and further installations are planned throughout 2021. As a part of this ongoing focus to include renewables into remote power generation, an opportunity was identified to develop a solar and battery powered microgrid in the remote Charo field, near the South Australian and Queensland border.

With all Charo's wells and processing sites set within a two kilometre radius, it was determined that a centralised power generation solution would be better suited than individual solar and battery arrangements. The project involves the installation of solar, battery and firming generators to support the fluctuating load across this field and is expected to be complete in Q1 2021.

The Charo microgrid is an important evolution of Santos' ongoing strategy to integrating renewable energy into our operations, delivering both environmental and commercial benefits by reducing diesel consumption, long distance fuel haulage and emissions associated with combustion for power generation.

Solar beam pumps, Charo field, Queensland

Risk mitigation

Santos' key controls for those identified climate change risks include the following:

Control category	Key controls to prevent and mitigate identified risks
Strategic and commercial	Modelling of carbon price scenarios, with integrated costs of carbon included in business planning and decision making at portfolio, asset and project levels. Potential impacts and opportunities resulting from current and future climate change policies is considered in commercial and strategic decision-making.
Access to domestic and export markets	Santos continues to monitor carbon and energy policies in Australia and export markets, including Japan, South Korea and China – markets which are highly supportive of natural gas, due to both lower greenhouse gas emissions and air quality benefits.
Operational and project risk management	Robust risk management practices are embedded across Santos' operations.
Advocacy	Through direct engagement with policy makers and industry associations, Santos advocates for environmentally effective and economically efficient carbon policy. Santos is proactive in supporting awareness of the availability, responsible extraction, demand for, and advantages of natural gas to achieve a lower-carbon future in Australia and our region. Santos seeks to work with governments and stakeholders in sharing information to support the design of climate change regulation and policy.
Technology	Investment in carbon capture and storage, energy efficiency and increased use of renewables in our operations.
Low cost base	Santos has been able to significantly reduce costs of development and production of natural gas over the past five years. This low cost base puts Santos in a stronger position to bear commodity price fluctuations and carbon pricing or abatement costs. It also increases Santos' competitiveness in the market and helps put downward pressure on consumer prices.
Access to infrastructure and storage	Santos has access to significant storage facilities due to its acreage and infrastructure position, enabling the company to minimise disruption to customers in the event of physical events which may impact operations for a period of time. Santos includes climate-related risks, such as flooding and other extreme weather events in crisis and incident planning and training.

Santos has a long history of safe and sustainable operations, having planned for and successfully managed extreme weather events and changes in Australian carbon policy over past decades. The company's approach to climate-related risk management from physical operations through to financial and strategic impacts positions the company well to remain resilient and continue to supply affordable, reliable and cleaner fuels to Australia and Asia in a lower-carbon world.

Santos' experience with flooding across some of its key onshore asset areas and extreme temperatures in remote locations has led the company to innovate and enhance the effectiveness of its operations. This has been demonstrated though the development of remote operations capabilities and facilities, access and transportation improvements and evolving work practices that enable personnel to conduct activities both more efficiently and during the least intense periods of weather. Two examples of the improvements and opportunities that have resulted from these experiences in relation to heat and flooding were included in the company's 2018 Climate Change Report on page 16, which can also be found on the Santos website santos.com along with this report.

With changes to policy and social dynamics in relation to climate change, also come opportunities in innovation, technological advances and the demand for natural gas in the energy mix. More information in relation to the role of cleaner fuels in a less than 2 degrees Celsius future can be found on page 25, the role of CCS and clean hydrogen on page 27 and case studies in relation to opportunities Santos is actively pursuing in emissions reduction and operational efficiencies can be found on pages 20, 31, 44 and 50.

5

Resilience and opportunity in a lower-carbon future

Santos is committed to twin objectives of managing climate change risk and delivering a sustainable business model supplying cleaner, low-cost energy to the Asia-Pacific region.

Climate change risks are managed with Executive Committee and Board oversight. Central to our business strategy, climate change is embedded through our ambitious targets, reporting transparency and portfolio innovation driven by the Energy Solutions group. Across our operations, Santos is implementing projects to reduce emissions by integrating renewables, reducing fuel use and investing in nature-based carbon offset initiatives while progressing the step-change technologies of CCS and clean hydrogen.

Santos' leadership in emissions strategy is evident in our performance. In 2021 we are not just beating our targets, but able to set new ones that place us at the forefront of our sector: to reduce our emissions by 26-30 per cent by 2030 and reach net-zero emissions by 2040.

Our core portfolio of high quality, low-cost oil and gas assets play an integral role in decarbonising the Asia-Pacific energy sector and remain resilient under all International Energy Agency World Energy Outlook 2018 Scenarios.

In parallel, our leading position in CCS has Santos poised to capture the upside of deeper decarbonisation, providing permanent abatement for our own operations and other industry while potentially enabling low-cost production of a key fuel of the future: clean hydrogen.

This portfolio of options is combined with a disciplined, low-cost operating model and exposure to the global growth engine room of Asian markets. Unique amongst our peers, Santos is strongly placed to not just manage the risks of a low-carbon future, but to benefit from the great opportunities.

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STO

Santos Website

To view Annual Reports, shareholder and Company information, news announcements and presentations, quarterly activities reports and historical information, please visit our website at santos.com

Annual Reports

You can view our Annual Report online at santos.com or request a printed copy from the Share Registrar either by email at santos@boardroomlimited.com.au or by telephone on 1300 096 259 (within Australia) or +61 2 8016 2832.

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