Climate change and the energy transition

The world's population is predicted to reach 9.7 billion by 2050[1] and communities across the globe are seeking economic growth and a better quality of life, which is driving underlying demand for energy and materials.

At the same time, the impacts of climate change on ecosystems, economies, societies and businesses are already clear and are predicted to increase.

As an energy company, our role is critical to balancing these two aims. As the world's largest integrated energy and chemicals company, we have the ability to lead and shape the response.

1. UN Department of Economic and Social Affairs (DESA) "World Population Prospects" 2019.

Why it is important

Climate change is one of the most important global issues impacting business and society. It is the interrelationships between environmental and social health and economic wealth, and the trade-offs that will be required to balance these that make it so important to the development of the global energy system.

Our ambition

We have a unique role to play in helping the world navigate the energy transition. We intend to be part of the solution to the global energy challenge, supporting a smooth energy transition and continuing to deliver the economic benefits of oil and gas while reducing emissions on the path to net-zero emissions by 2050.

Our approach

The transition toward a low emissions future will need both new and existing energy sources for some time to come, and will necessitate continued investment to maintain reliable oil and gas supply.

A multi-track approach is needed, reflecting the fact that developing countries and developed countries will not be able to transition at the same speed.

Our plans

The scale and integrated nature of our operations provide us with a cost advantage that positions us better than others in the industry to reduce our operational emissions further, become a net-zero carbon producer by mid-century and be the pre-eminent integrated energy and chemicals company, supporting the Kingdom and our customers to transition to a low-carbon future.

Material topics

Climate Change (including GHG emissions)

Relevant UN SDG

Relevant metric

- Energy intensity (thousand Btu per boe) – pg 36.
- Scope 1 emissions (million metric tons CO_2e) – pg 32.
- Scope 2 emissions (million metric tons CO_2e) – pg 32.
- Upstream carbon intensity (kg of CO_2e/boe) – pg 33.
- Upstream methane emissions (metric tons CO_2e) – pg 89.
- Upstream methane intensity (%) – pg 35.
- Flared gas (mmscf) – pg 34.
- Flaring intensity (scf/boe) – pg 34.

For more details on relevant metrics **see page 88**

The climate challenge

Aramco supports the aims of the Paris Agreement and the Glasgow Climate Pact. These international agreements summarize the challenge for all of us to decouple economic growth from greenhouse gas emissions, recognizing the importance of international cooperation in addressing climate change and its impacts, in the context of sustainable development and efforts to eradicate poverty.

As an energy company, our role is critical to balancing these aims. As the world's largest integrated energy and chemicals company, we have the ability and responsibility to lead and shape the response.

We believe that the dominant public narrative around the energy transition, that focuses heavily on emissions and is characterized as a shift away from hydrocarbons, risks downplaying the importance of ensuring a stable and efficient energy supply and deprioritizes the social and economic needs of billions of consumers.

Events over the last two years including COVID-19 and conflict in Europe have highlighted an under-investment in energy sources that has left a supply shortage and underlined importance of energy security, and have caused a fundamental reappraisal of social needs. But they have also reinforced how critical energy access and security is. These events provide a reminder that the transition of the global economy and energy system towards a lower carbon future is complex, multi-dimensional and will be decadal.

Alternatives to traditional hydrocarbon-based energy sources are progressing, but on their own they are not yet ready to meet the world's energy demands and ensure a smooth energy transition.

Many developing economies depend upon the low cost and reliability of hydrocarbons to avoid energy shortages and cost inflation, with the resulting negative social and economic consequences.

We acknowledge that, as the world's largest commercial oil producer, we have an important role to play along our value chains to support our customers' journey to lower emissions.

Existing oil and gas technologies are reliable and efficient, and we aim to build on this strength with investment in new technologies to reduce and remove hydrocarbon-based emissions. The strategic challenge is to develop and deploy technology solutions at speed and scale, to allow continued delivery of the benefits of oil and gas for future generations while minimizing their emissions impacts.

This is a challenge that plays to Aramco's strengths.

Net-zero ambition

In October 2021, Aramco announced its ambition to achieve net-zero Scope 1 and Scope 2 greenhouse gas emissions across its wholly-owned operated assets by 2050.

This ambition is fundamental to our ability to maintain our position over the decades ahead as the lowest cost and lowest carbon intensity producer amongst our peers. This commitment complements the Kingdom's aim to reach net-zero emissions by 2060, announced as part of the Saudi Green Initiative.

Circular carbon economy

In 2020, the G20 group of leading economies endorsed the concept of a circular carbon economy that was proposed by the Kingdom of Saudi Arabia.

The model extends the principles of circularity — reduce, reuse and recycle — to carbon emissions, and adds an important fourth 'R' — removal of carbon from the atmosphere. These principles provide an effective framework to achieve significant reduction in global emissions, while recognizing the valuable role of carbon products in supporting economic growth. It provides an alternative to the current linear model of the carbon economy which extracts hydrocarbon resources to supply energy and, in the process, emits carbon into the atmosphere.

The circular carbon economy is the basis for Aramco's approach to addressing the challenges and opportunities presented by the energy transition.

Energy transition scenarios

As part of the Company's strategic planning and risk mitigation process, we use scenario planning to stress-test the resilience of our corporate strategy and investment plan against possible futures.

Rapid advancements in technology accompanied by underlying trends in demography and global economy, a heightened awareness by consumers and recognition by policy makers towards a common goal to tackle climate change related issues, and a shift in geopolitical powers pose huge uncertainties on the future of global energy mix.

On the one hand, advancements in lifestyle and economic uplift of a larger portion of global citizens generate increasing demand on energy, while on the other, concerns over climate change and its related impacts are driving demands for a rapid energy transition away from hydrocarbons.

To understand these forces on economic and energy trends, often with conflicting positions and wide-ranging interests, we believe scenarios should consider different assumptions related to the speed of energy transition. They need to be looked through four lenses:

Economic growth — the ability of alternative energy sources to competitively meet future energy (and materials) demand that will drive ongoing demand for hydrocarbons.

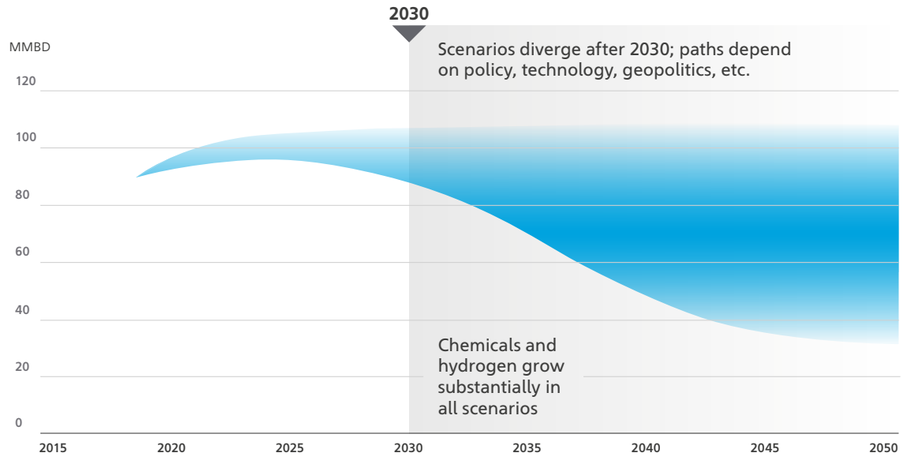
Policy cohesion and execution — the speed at which governments are able to develop and implement climate-related policies in line with both domestic and international pressures.

Societal readiness — the extent to which pressure for GHG action is balanced by the need for a smooth and equitable energy transition.

Technology — the rate at which low-emissions/ low-energy intensity technologies (e.g. CCS and Hydrogen) and associated policy mechanisms can be developed and commercialized.

Accordingly, we developed three scenarios encompassing two alternative pathways to meet Paris Accord goals and a challenging pathway where energy affordability issues and global supply chain bottlenecks lead to a slower transition. In all of these scenarios, global energy related emissions peak imminently. The range of uncertainties portrayed in these scenarios is consistent with those published by the International Energy Agency (IEA) or IHS Markit scenarios. We update our scenarios periodically with available updated information reflecting changes in global economic and energy landscapes.

Long-term oil demand scenarios and key assumptions[1]



1. Source: IEA World Outlook and IHS Markit.

Our climate change and energy transition framework

Our corporate strategy is based upon our ability to produce the lowest cost and lowest carbon oil and our intent to work with customers along the value chain to offer products that support their ambitions for low-carbon fuels.

We have four areas of focus that provide the framework for our climate change initiatives and investments:

Differentiate

Leading in low-carbon intensity operations

Sustain

Supporting the transitions to low-impact energy pathways

Diversify

Developing and growing low-impact value-chains

Enable

Collaborating with partners to develop and deploy technologies and infrastructure at speed and scale

Targets and emissions trajectory

Aramco's ambition is to decarbonize our operations and achieve a net zero footprint by 2050 across our wholly-owned operated assets.

Having undertaken analysis to support this corporate ambition, we know that achieving net zero operational emissions whilst we grow our business to meet global energy demand will be a huge challenge.

It requires internal targets to be set for our businesses and assets, and for these targets to be embedded into our business planning, to ensure capital expenditure and resource requirements are in place. Aramco is currently developing marginal abatement cost curves for each of its assets to define these targets and requirements.

Supporting this planning, we have set ourselves initial, interim targets for 2035.

Upstream carbon intensity

In support of the corporate strategy to maintain an industry-leading position as a lowest carbon intensity major producer of oil and gas, we have set a target to reduce our upstream carbon intensity by at least 15% by 2035, against our 2018 baseline. This will entail reducing our upstream carbon intensity from 10.2 kg CO_2e/boe (2018) to at least 8.7 kg CO_2e/boe by 2035.

This target accounts for anticipated increases in oil production and Maximum Sustainable Capacity, and the expansion of our gas business.

Scope 1 and Scope 2 GHG reductions

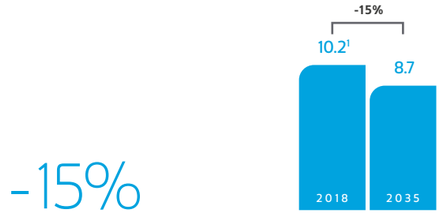
In parallel with our intensity target we are aiming to reduce our net Scope 1 and Scope 2 GHG emissions from both the Upstream and Downstream businesses by 52 $MMtCO_2$e from our business as usual 2035 forecast emissions.

By 2035, consistent with the corporate growth strategy in oil and gas production and development of new businesses, particularly hydrogen and liquids-to-chemicals, we forecast our business as usual Scope 1 and Scope 2 GHG emissions for our wholly-owned operated assets to increase to 119 $MMtCO_2$e. Our goal is to mitigate this growth in emissions and reduce our absolute emissions to 67 $MMtCO_2$e by 2035.

Decarbonization targets

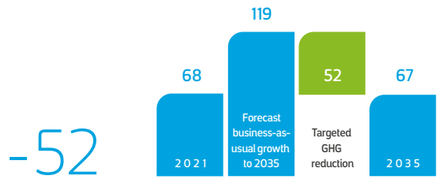
Scope 1 and Scope 2 emissions upstream intensity – 15% reduction by 2035

kg CO_2e/boe



Scope 1 and Scope 2 emissions GHG reduction targeted by 2035

$MMtCO_2$e



1. 2018 was the first year our GHG inventory was independently assured.

GHG reduction initiatives to 2035

Levers to achieve interim targets

To achieve these reductions in GHG emissions we are focusing on five key levers: energy efficiency across our Upstream and Downstream assets; further reductions in methane and flaring; increased use of renewable energy sources; CCUS; and development or purchase of offsets to help address hard-to-abate emissions.

1. Energy efficiency

Implementation status & plans

- Lowest energy intensity among IOCs as measured by Solomon Associates
- In 2021:
  - 308 energy initiatives implemented
  - Supplying 11.85 mboed energy savings
  - Equivalent to 1.26 $MMtCO_2$ reduction
- Initiatives include gas turbine upgrades, boiler and fired heater efficiency improvements

2. Methane & flaring

Implementation status & plans

- Current upstream methane intensity of 0.05%
- Commitment to OGCI near zero upstream methane intensity by 2030
- 2019 commitment to World Bank Zero Routine Flaring by 2030
- LDAR (Leak Detection and Repair) Program
- UAV and satellite methane detection

3. Renewables

Implementation status & plans

- Investment in 12 GW of solar PV and wind projects in support of KSA National Renewable Program
- Affiliate investments in renewables (Motiva, Arlanxeo, SASREF)
- Purchase of Renewable Energy Certificates (REC)
- 2021 30% share in 1.5 GW Sudair solar PV project
- 2022 evaluation of share in 2.3 GW of new projects

4. CCUS

Implementation status & plans

- Key assets and storage capacity identified: Wasit, Fadhili & Khursaniyah
- Joint feasibility studies conducted
- MOUs in place with international partners

5. Offsets

Implementation status & plans

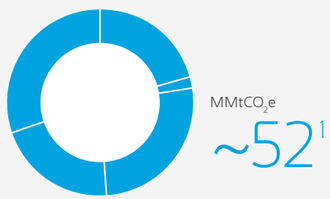
In-Kingdom:

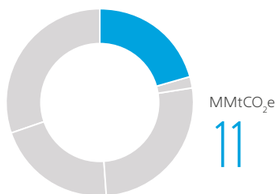
- 13.3 MM mangroves planted to date
- Target: 300 MM mangroves by 2035

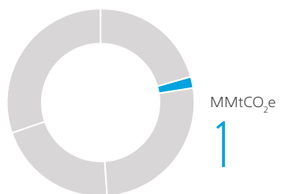
Rest of the world:

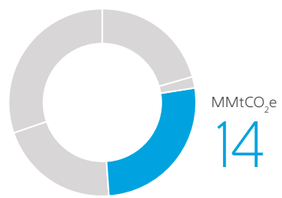
- Target: 350 MM mangroves outside KSA by 2035
- Supported by purchased offsets through voluntary markets

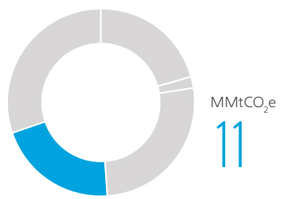
GHG reduction targeted by 2035

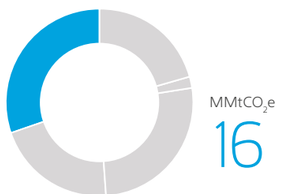












1. This figure may not match up due to rounding.

Leading in low carbon intensity operations

Differentiate

Over the past four decades, Aramco's approach to reservoir management and investments in operational efficiency, flare gas and methane emissions reduction, and greenhouse gas management have helped us to achieve industry-leading low-carbon intensity crude production.

Decades of stewardship

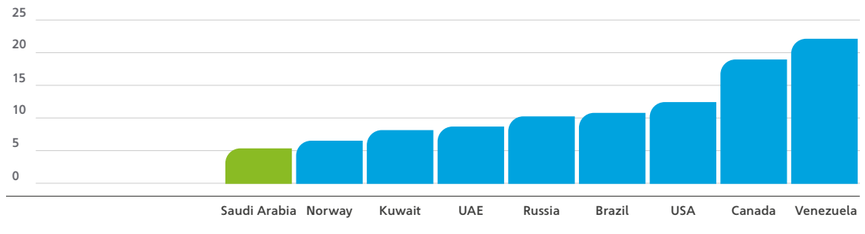
A study of oil producing countries, conducted by Stanford University and published in Science Magazine[1] reported that Saudi Arabia had one of the lowest upstream carbon footprints globally for each barrel of oil produced. In the report, the intensity of Saudi Arabia's volume weighted crude oil upstream GHG emissions was the lowest among major producers, based on an analysis of nearly 9,000 actively producing fields in 90 countries.

Why Saudi Arabia's carbon emissions intensity is so low:

- Decades of investment in emissions management and efficiency.
- Leveraging economies of scale with extremely large and productive reservoirs.
- Advanced reservoir management practices.
- Low water production ("water cut"), resulting in less mass lifted per unit of oil produced and less energy used for fluid separation, handling, treatment and reinjection.
- Low per barrel gas flaring rates.
- Leveraging technologies to reduce energy intensity and emissions from subsurface to surface production.
- Multi-year investments in advanced methane leak detection and repair program.

The Kingdom's average carbon intensity compared to other major hydrocarbon producing countries[2]

Gram CO_2 equivalent/Mega Joule



1. Two of the twenty-four authors received funding from a Company subsidiary and other authors received funding from other sources.
2. As of 31 August 2018 edition of Science Magazine.

GHG emissions management

We recognize the need to reduce our GHG emissions footprint and have a clear ambition to reduce carbon emissions associated with our operations.

Our emissions reduction strategy includes investing in low-emission technologies, including CCUS, energy efficiency programs and energy mix diversification. We are committed to developing and deploying innovative solutions, optimizing operations, and adopting efficient project designs.

For example, we have one of the highest oil recovery rates in the world — reaching up to 70%. This is achieved by using technology and data analytics that play a major part in helping us accurately place wells. These technologies enhance well placement, reducing water production and energy required for processing, treating and disposing, associated water. This enhances energy efficiency and decreases the number of wells needed, thus reducing our carbon footprint.

Our focus is on leading in low-carbon intensity technologies, supporting the development of non-fuel applications for crude oil and targeting the highest impact solutions across the oil and gas value chain.

We are leveraging our R&D and technology leadership to develop, demonstrate and, ultimately, implement, innovative approaches that significantly lower emissions across the oil and gas industry. Some of these will have application in other emission-intensive industries.

What are we doing?

The Master Gas System

Built in the 1970s, to capture associated gas which would have otherwise been flared, the Master Gas System (MGS) has reduced flaring and greenhouse gas emissions while powering in-Kingdom economic growth.

The MGS was one of the biggest energy projects in Aramco's history, enabling one of the world's largest gas markets and transforming the national energy mix toward cleaner fuel.

We have continued to expand the MGS. Hawiyah Gas Plant, completed in 2001, was the first plant to be built exclusively to capture non-associated gas from a gas reservoir rather than produced alongside oil.

Differentiate – continued

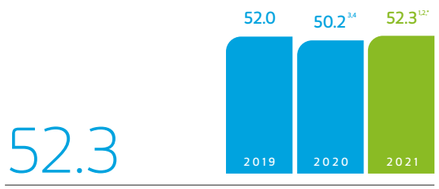
Operational emissions

Our current focus is on GHG intensity from our upstream operations, which reflects the performance of the largest segment of Aramco's emissions (Scope 1 and Scope 2) and is a good indicator of company performance. However, we continue to mature and refine management systems for GHG accounting and reporting, we will continue to evaluate additional GHG performance measures reflecting other business segments that currently have a lesser contribution to the Company's overall emissions profile.

The Company's GHG emissions management program monitors direct (Scope 1) and indirect (Scope 2) emissions from wholly-owned operated assets, consistent with the GHG Protocol. In 2021, Scope 1 emissions increased by 4% following the start up of the Fadhili Gas plant. We saw a decrease of 14% in Scope 2 emissions due to a shift in consumption of electricity from third-party to company-owned power generation.

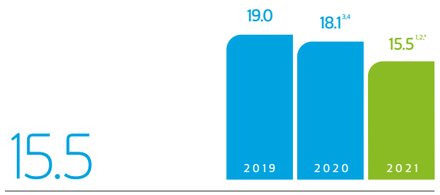
Scope 1 emissions

million tons of CO_2e



Scope 2 emissions

million tons of CO_2e

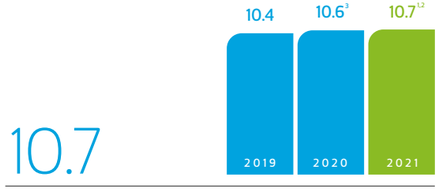


1. This figure has undergone external limited assurance in accordance to the ISAE 3000 (revised) by KPMG. The assurance report can be found online here.
2. Jazan Refinery excluded from 2021 GHG emissions inventory.
3. This figure has undergone external limited assurance in accordance to the ISAE 3000 (revised) by EY. The assurance report can be found online here.
4. Fadhili Gas Plant and Jazan Refinery excluded from 2020 GHG emissions inventory.

* Our 2021 GHG data is different from our 2021 Annual Report as a result of completion of our internal validation and external assurance. As disclosed in our 2021 Annual Report, our 2021 Scope 1 emissions (55.0), 2021 Scope 2 emissions (17.1) and 2021 Upstream carbon intensity (11.2) were estimates and subject to change upon completion of internal and external validation.

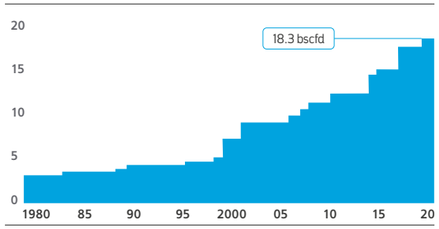
Upstream carbon intensity*

kg of CO_2e/boe



Raw gas processing capacity

bscfd



Upstream carbon intensity

Aramco aims to maintain an industry-leading position in upstream carbon intensity and share best practices to expand the impact of our expertise globally.

Managing our carbon footprint starts at the subsurface. Rather than maximizing short-term production, we manage our reservoirs in a sustainable manner, where the long-term health of reservoirs is a priority. Upstream operations in Saudi Arabia include a number of large and productive oil reservoirs which are managed using technologies and best practices to decrease water production, resulting in less mass lifted per unit of oil produced and less energy used for fluid, handling, treatment and reinjection. This not only yields ultimate recovery and higher return on investment in the long-run, but has many environmental benefits, including reducing our carbon footprint.

The Company's 2021 upstream carbon intensity figure was among the lowest globally of major oil and gas producers at 10.7 kg of CO_2 equivalent per barrel of oil equivalent (boe). This small increase versus 2020 was the result of an increase in the share of gas in our total production, and the higher carbon intensity footprint of gas production relative to oil production.

Flaring and methane

Flaring of waste and fugitive gases has long been recognized as one of the most significant contributors to greenhouse gas emissions in the oil and gas sector. Aramco has been a pioneer in gas flaring reduction since the 1970s, initially driven as much by capturing the economic value of the gas as by reducing the environmental impact.

The success of our program is such that we can proudly point to a large growth in our oil and gas production while achieving industry-leading levels of low methane intensity and gas flaring reduction.

1. This figure has undergone external limited assurance in accordance to the ISAE 3000 (revised) by KPMG. The assurance report can be found online here.
2. Jazan Refinery excluded from 2021 GHG emissions inventory.
3. Fadhili Gas Plant and Jazan Refinery excluded from 2020 GHG emissions inventory.

* Our 2021 GHG data is different from our 2021 Annual Report as a result of completion of our internal validation and external assurance. As disclosed in our 2021 Annual Report, our 2021 Scope 1 emissions (55.0), 2021 Scope 2 emissions (17.1) and 2021 Upstream carbon intensity (11.2) were estimates and subject to change upon completion of internal and external validation.

Differentiate – continued

Minimizing flaring

Aramco is committed to achieving zero routine flaring and sharing best practices with industry partners to accelerate global flaring reduction. We employ a variety of technology solutions to achieve one of the lowest flaring intensities in the industry.

The Kingdom's Master Gas System, developed in the 1970s to capture and reuse gas, has all but eliminated associated gas flaring.

A Flaring Minimization Roadmap has identified priorities across Aramco operations, with every operating facility having a flare minimization plan and targets. Our focus is on continual improvement in performance and investing in technologies, such as: Innovative flare gas recovery systems; high integrity pressure protection systems; and zero discharge technology to reduce intermittent flaring. And we are deploying advanced technologies to monitor Aramco's operations in real-time at our 4th Industrial Revolution Center in Dhahran.

This has enabled us to achieve near zero flaring already. We have maintained a flare volume of < 1% of total raw gas production since 2012.

In 2021, the Company's flaring intensity decreased in relation to the 2020 performance due to our ongoing focus on reducing leaks and emissions. The volume of flared gas decreased from 26,995[1] mmscf in 2020 to 25,825[2] mmscf in 2021. This figure amounts to less than 1% of raw gas production.

We are active and influential in the OGCI, which endorses and supports the World Bank Zero Routine Flaring by 2030 initiative and tracks flaring performance data aggregated from member companies. OGCI flaring performance data has demonstrated considerable progress on flaring across its members. The combined upstream flaring intensity of member companies fell by 21% in 2020, and has declined by 33% since 2017.

What are we doing?

Zero routine flaring

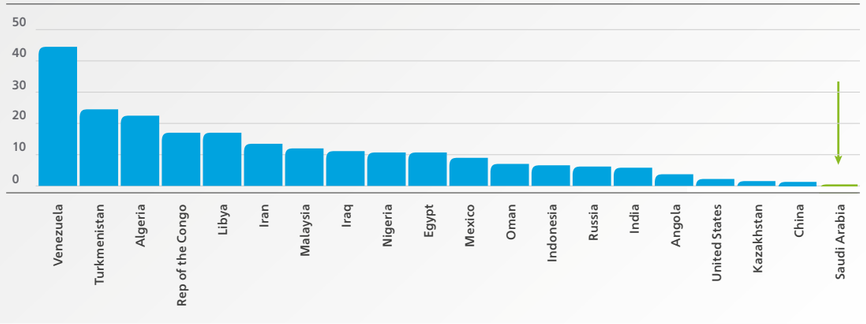
Launched in 2012, our near zero routine flaring program has delivered a leading position in flaring intensity for the Company.

In November 2019, Aramco endorsed the World Bank Zero Routine Flaring by 2030 initiative.

The initiative brings together over 100 governments, oil companies, and development institutions, which have agreed to cooperate to eliminate routine flaring no later than 2030 and to report progress annually.

2020 Flaring Intensity[3]

M^3 per barrel oil produced



1. Fadhli Gas plant and Jazan Refinery are excluded from 2020 GHG emission inventory.
2. Jazan Refinery is excluded from 2021 GHG emissions inventory.
3. Source: World Bank.

Methane

Methane gas is a considerably more potent greenhouse gas than CO_2. Although methane emitted today only lasts about a decade on average in the atmosphere, it absorbs more energy and consequently has a global warming potential 25 times greater than CO_2. That is why addressing methane emissions is one of the fastest, most effective ways to slow the rate of global temperature rise.

Aramco has invested carefully in the design of its plants and well-resourced and maintained operating assets translate into environmental protection and better operational efficiency. We use drones to monitor and measure methane emissions from our operating facilities' equipment. An enhanced leak detection and repair (LDAR) program for the Company's methane emissions in the Kingdom prioritizes actions at operating facilities. Thousands of points are surveyed in each plant annually to minimize potential methane leaks.

In 2018, the OGCI announced a collective average methane intensity ambition, setting a target of achieving an upstream methane intensity of 0.20% by 2025. By 2020, OGCI member companies had achieved this target some five years ahead of schedule.

In response to this, and following the COP 26 call to achieve a worldwide reduction of 30% of methane emissions from all sources by 2030, the members of OGCI have set a new goal aiming to eliminate virtually all methane emissions from the industry. The OGCI companies have committed to aim for near zero methane emissions from operated assets by 2030, supported by transparent, annual measurement, reporting and verification.

Aramco's upstream methane intensity, the ratio of our upstream methane emissions for operated assets to the quantity of marketed natural gas, fell to 0.05%. This compares with an OGCI average of 0.20%, as at 2020, which includes the positive effect of our Company's leading performance.

0.05%

2021 Upstream methane intensity[1]

1. Jazan Refinery is excluded from 2021 GHG emissions inventory.

Differentiate – continued

Energy management

Co-generation

Powering our communities with reliable and efficient energy lies at the center of all we do. Highly efficient co-generation plants enable us to produce electricity as a natural byproduct of our operations and are enabling self-sufficiency in electrical power generation for our own operating plants.

In line with our objective to reduce our climate impact and embrace circular carbon economy principles, we are harnessing what would otherwise be waste energy by maximizing the conversion of energy released from the combustion of fuel into power and steam to achieve improved thermal energy efficiency and reduce overall GHG emissions. As of 2021, we achieved an average thermal efficiency of 70.8% in our interconnected co-generation facilities.

Energy efficiency

The Company's energy efficiency efforts seek to reduce energy consumption at Company facilities, design new facilities to be energy efficient, increase overall energy efficiency, and influence and promote energy efficiency at the national level.

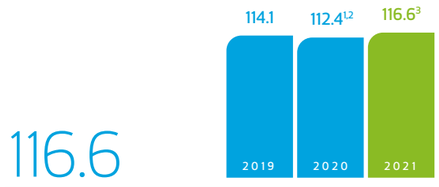
Aramco started its energy management program in 2000. Throughout the years, the Energy Intensity KPI has been improving steadily. The program was driven by implementing energy saving initiatives by operational departments. The Combined Heat and Power (CHP) program, and several other energy optimization initiatives and studies, have steadily reduced energy intensity at Company facilities in Saudi Arabia.

In 2021, the Company implemented more than 300 energy initiatives at its in-Kingdom facilities, resulting in 11.85 mboed of energy savings, equivalent to 1.26 million tons of CO_2 emission reduction.

In 2021, we experienced a year-on-year increase in our Energy Intensity (EI) KPI. This increase, relative to 2020, is because of Aramco's expansion projects in its facilities and inclusion of Fadhili Gas Plant for KPI reporting. Over the last 10 years, we reduced our energy intensity by over 20%.

Energy intensity

Thousand Btu per boe



1. Fadhli Gas plant and Jazan Refinery are excluded from 2020 Energy Intensity KPI boundary.
2. This figure has undergone external limited assurance in accordance to the ISAE 3000 (revised) by EY. The assurance report can be found online here.
3. Jazan Refinery is excluded from 2021 Energy Intensity KPI boundary.

What are we doing?

In-Company renewable energy

In the recent past, our investments in cogeneration facilities have contributed to significant improvements in energy efficiency. Going forward, renewable energy, including power from solar and wind, will be an important source of low-carbon energy for our operations.

Opportunities for in-Company renewable applications include office buildings, pipeline cathodic protection and valve stations, production wells, and bulk plants. These applications are a mixture of off-grid and grid-connected solutions.

Supporting the transition to low-impact energy pathways

Sustain

We recognize the need to reduce absolute emissions and the need to work closely with our suppliers and customers to reduce emissions along the entire value chain of our products.

Low-carbon fuels and transport technologies

Achieving sustainable mobility requires collaboration across the entire value chain to meet consumer demand for affordable, low emitting and efficient transport in the different sectors and regions globally. Electric vehicles are fast growing and they will play an important role in mitigating climate change when integrated with renewable electricity. In the near-term, transport electrification alone is unlikely to be adequate to meet the global CO_2 mitigation goals.

This has to be complemented by advanced combustion engines, fuel-cell vehicles, and low-carbon fuels, including renewable fuels and clean hydrogen.

Aramco is approaching the CO_2 challenge by redesigning internal combustion engines, and the fuels that power them. Through our extensive global network, we are engineering breakthrough solutions to unlock new frontiers in efficiency technologies including advanced combustion systems, novel engine architectures, and innovative after treatment systems. At the same time, our two flagship projects aim to advance the development of low-carbon synthetic fuels, one in Spain and another in Saudi Arabia.

Aramco's low-carbon synthetic fuels aim to combine CO_2 captured from industrial processes or directly from the air with green hydrogen, and targeting a CO_2 reduction potential of at least 80%. This will be pivotal as we work towards a more circular carbon economy based on reducing, reusing, recycling and removing CO_2 emissions.

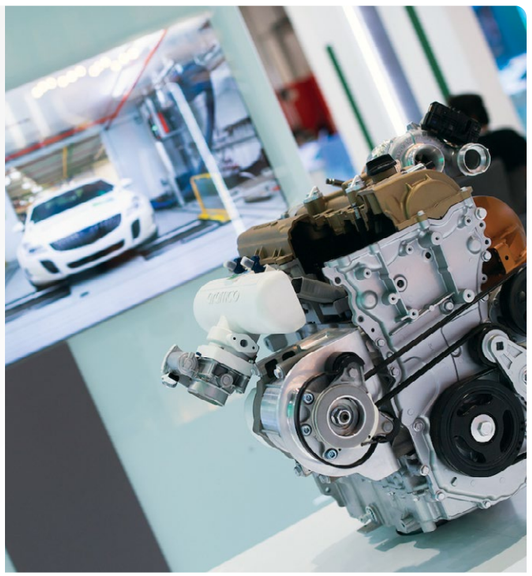
What are we doing?

Engines and fuel

Gasoline Compression Ignition (GCI) engines — the use of a gasoline fuel in an efficient compression ignition engine, can enable lower fuel consumption and vehicle emissions. Our engine prototypes demonstrated that GCI could reduce CO_2 emissions by at least 25% compared to conventional gasoline vehicles on a well-to-wheel basis.

We recently partnered with Repsol to explore the production of 2.6 million liters per year of low-carbon synthetic diesel and jet fuel in Bilbao, Spain, for automobiles and aircrafts. We are also assessing the feasibility of producing 1.8 million liters per year of low-carbon synthetic gasoline in NEOM, Saudi Arabia, jointly with NEOM Energy and Water Company (ENOWA), for light-duty passenger vehicles.

Aramco's mobile carbon capture technology can avoid up to 40 percent of CO_2 emissions from a vehicle by preventing it from being released from the exhaust, demonstrating a promising outlook particularly in the shipping industry. The captured CO_2 can be stored onboard the ocean vessel and then offloaded at port for use in various industrial and commercial applications, including synthetic fuel manufacturing.



What are we doing?

Corporate value chain emissions — Scope 3

Our focus is on measurement, reporting, and management of those emissions within our direct span of control. To date, we have not reported Scope 3 emissions from our supply chain or from customers' use of our products.

We are positioning our Company to support our customers' own journeys to low impact energy pathways, and working with suppliers to integrate ESG performance measures through our iktva program.

Our investment in hydrogen, chemicals and renewable energy sources and our increasing share of gas in our production provide products that will support customers and consumers to access lower carbon energy with reduced carbon emissions from its use. We continue to invest in a number of product stewardship partnerships and technologies to reduce emissions in the value chain, including research and development into low emissions transport solutions.

Sustain – continued

Hydrogen

Hydrogen is a primary element in oil and gas, and has significant potential as a clean, affordable energy that could support significant emissions reductions in hard-to-decarbonize sectors such as heavy-duty transport, heating, and industrial applications. We believe hydrogen has significant potential to provide a material reduction in greenhouse gases, as a global market develops over the next decade.

Hydrocarbons importance to the development of a global hydrogen business

Despite the interest and possibility of producing hydrogen from multiple energy sources, in the short- and medium-term, hydrocarbons will remain the primary feedstock for the production of hydrogen.

Hydrogen has the potential to become a tradable commodity, which opens commercial opportunities for our business over the medium- to long-term.

At the same time, investments in hydrogen can help foster new technological and industrial development in economies around the world, while also creating skilled jobs.

Natural gas and hydrogen

We are seeing interest from potential customers for blue hydrogen. Our Company has a promising role to play, utilizing our own hydrocarbons, infrastructure, and technology.

In much the same way that gas, as a hydrocarbon-based fuel, has helped reduce energy-related emissions, natural gas has the potential to be a viable, cost-effective feedstock for blue hydrogen production. Natural gas-based hydrogen is the most used feedstock for hydrogen production today. It is also a preferred feedstock to produce blue hydrogen where CO_2 emitted during the conversion process is captured. Natural gas-based hydrogen production technology is well established and blue ammonia created from natural gas is expected to be a major form of transportable hydrogen.

What's in a color?

Hydrogen emits only water when burned. However, the carbon intensity of the hydrogen produced will vary depending on the source of the hydrogen molecules and the process of production. The most relevant criteria to measure is the reduction in life cycle emissions from each process rather than the source.

There are many "colors" of hydrogen that differentiate the sources and production methods. The most commonly used terminology is for black/brown, grey, blue and green hydrogen, though other colors have also been used.

- Grey hydrogen is the most common form and is generated from natural gas, or methane, through steam reforming.
- Black or brown hydrogen uses black (bituminous) or brown (lignite) coal in the hydrogen-making process and is the most environmentally damaging as the CO_2 and carbon monoxide generated during the process are not captured.
- Blue hydrogen uses natural gas and involves capturing and storing the carbon generated from the steam reforming through industrial carbon capture and storage.
- Green hydrogen is produced by using energy from renewable energy sources, such as solar or wind power, to split water into two hydrogen atoms and one oxygen atom through a process called electrolysis.

Aramco is a steering member of The Hydrogen Council, a CEO-led organization that promotes collaboration between governments, industry and investors to provide guidance on accelerating the deployment of hydrogen solutions globally.

Hydrogen Council

What are we doing?

World's first blue ammonia shipment

Aramco has committed to develop a hydrogen business. The Company is targeting the production of up to 11 million tons per annum (MMTPA) of blue ammonia by 2030. We are undertaking work to analyze market potential, demand, and future volumes, leveraging the capacity of our hydrogen and ammonia plants in Jubail.

Although additional infrastructure and policy support will be needed to create a more active market for hydrogen, we estimate that Japan and South Korea will be where the first hydrogen trading markets will emerge, over the next decade. It is a natural progression for our business to take on the responsibility for the anticipated demand for hydrogen.

CCUS technologies are fundamental to the acceleration of hydrogen growth. In 2021, this led us to sign a memorandum of understanding with Japan's largest refiner, ENEOS, to consider development of a CO_2-free hydrogen and ammonia supply chain through a year-long feasibility study.

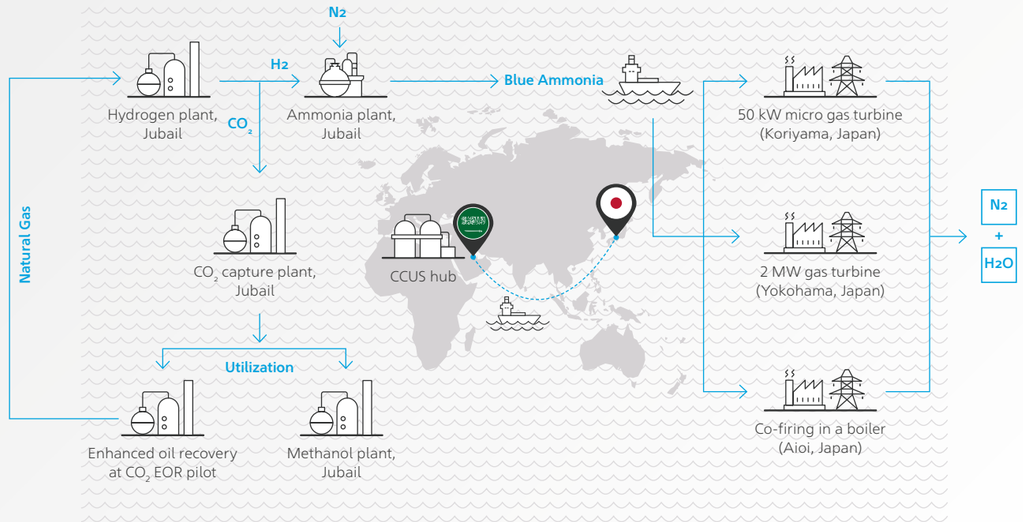
In 2020, Aramco produced and delivered the world's first shipment of blue ammonia, a carrier for blue hydrogen, from Saudi Arabia to Japan. Forty tons of high-grade blue ammonia were dispatched for use in low-carbon power generation.

The project was supported by the Japanese think-tank, Institute of Energy Economics, and the Japanese Ministry of Economy, Trade, and Industry, reflecting a growing focus on hydrogen in the country.

The Saudi-Japan blue ammonia supply network demonstration spanned the full value chain — from the conversion of hydrocarbons to hydrogen and then to ammonia, as well as the capture of associated CO_2 emissions. CO_2 captured during the process was used in methanol production at SABIC's Ibn-Sina facility, and at our Enhanced Oil Recovery demonstration project.

Conceptual flow diagram of "Blue Ammonia" supply chain demonstration

(Duration: August 2020 — October 2020)



Developing and growing low-impact value-chains

Diversify

As we navigate the energy transition, we are vigilant to opportunities to diversify our portfolio into new, lower impact value chains. This includes using oil and gas in non-combustion uses, such as chemicals and nonmetallic materials applications, as well as investment in renewable projects. We see these as providing commercial opportunities and providing resilience for our business to demand shifts caused by the energy transition.

Liquids-to-chemicals

Our 2020 acquisition of a 70% stake in SABIC brought together two global companies committed to growth and value creation in petrochemicals.

Petrochemicals is expected to be the fastest growing sector for oil and gas demand in the years ahead, and will remove significant volumes of hydrocarbons from the combustion cycle.

Our chemicals business spans from production of basic chemicals such as aromatics, olefins, and polyolefins to more complex products such as polyols, isocyanates, and synthetic rubber.

Our crude oil-to-chemicals technologies have the potential to deliver higher chemical yields from our crude oil. By converting crude oil directly to chemicals, we will optimize or eliminate several energy-intensive industrial processes, creating cost and operational efficiencies that result in high value chemical product streams.

Nonmetallics

Nonmetallics describes materials, such as plastics and other such applications that can replace traditional materials and minerals. They can provide improved performance and lower maintenance costs, as well as having the potential to have lower life cycle costs, with greater resistance to corrosion, and a lower carbon footprint than like-for-like alternatives.

In the oil and gas industry, nonmetallics, such as plastics, are already being used for various applications, such as in pipelines where future, carbon-fiber reinforced plastics will be used to manufacture large diameter pipelines with greater strength and operating efficiency than legacy steel-based pipelines.

Nonmetallic products are increasingly being deployed in a variety of industries from the automotive sector to building and construction, packaging, and renewables. The use of polymers and composites is an example of how nonmetallic applications can add value to a project, allowing engineers to create unique, flexible designs that are impossible to make with traditional materials.

We are promoting research and development and maximizing nonmetallic deployment. Our investment in local Saudi companies aims to build manufacturing capacity through our iktva program.

Within the automotive sector, we are working with stakeholders to influence design of new vehicles, developing innovative carbon fiber technology to replace steel and aluminum, and aiming for increased efficiency across the design and assembly processes.

Renewable energy investments

Renewable energy, including power from solar and wind, is an energy source under any energy transition. With more than 320 sunny days per year and ample wind, Saudi Arabia's geography and climate hold great potential for harnessing these renewable energy sources. Deployment of renewable resources within the Kingdom could reduce GHG emissions and support long-term prosperity.

The Saudi Arabian Government has established a National Renewable Program with an aim of increasing the generation capacity of renewable energy sources to over 58 gigawatts (GW) by 2030. 40 GW is planned to be from solar, 16 GW from wind energy and the balance coming from other renewable energy sources.

Aramco is supporting the Kingdom on this journey and has committed to investing in 12 GW of renewable energy by 2030. We will use the allocation of renewable energy credits from these investments towards decarbonizing the power supplied to our operations.

In 2021, Aramco, via its subsidiary, Saudi Aramco Power Company, joined a consortium led by ACWA Power to develop the 1.5 GW Sudair solar plant, a key project in Saudi Arabia's renewable energy push. Aramco's investment in Sudair marks its first participation in the Kingdom's renewable energy program. The first phase of the project is expected to begin producing electricity during the second half of 2022. The site, which is anticipated to be the world's largest single-contracted solar photovoltaic plant, will be located in Sudair Industrial City, North of the Saudi capital, Riyadh.

What are we doing?

Innovation Centre

We partnered with TWI ltd and Abu Dhabi National Oil Company to establish the Non-metallic Innovation Centre in Cambridge, UK. The Non-metallic Innovation Centre brings together academics, technology organizations, material suppliers, pipe manufacturers and leading Oil and Gas companies to expand the operational envelope of non-metallic materials and ensure cost effective operation and maintenance.

Collaboration with partners to develop and deploy technologies and infrastructure at speed and at scale

Enable

Aramco recognizes that the reduction of emissions from production and the removal of CO_2 from the atmosphere are the biggest contributors to emissions reduction across our industry.

Scaling up solutions to do this is not unique to Aramco, or even distinct for the oil and gas sector. Working with other companies, whether direct contractors, peers or companies in our product value chains, and with academia and research institutes offers an opportunity to share risk and magnify the impact of investment.

In 2021, sustainability-related R&D was USD315MM[1] which equated to 52% of total 2021 R&D spend of USD607MM[2]

R&D Focus Areas – Sustainability	2021 Spend ($MM)
CCUS	**$24.7**
Renewable Energy	**$9.3**
Energy Efficiency	**$55.9**
Waste Management and Recycling	**$31.1**
Water Management	**$29.7**
Gas Treatment	**$21.4**
Low-carbon Hydrogen	**$25.6**
Sustainable Mobility	**$94.0**
Liquids to Chemicals	**$7.8**
Nonmetallic Applications	**$15.5**
Total	**$315.1**

Leveraging technology

We have a track record of innovation and technology development and we recognize that a successful energy transition will require collaboration with a wide range of business and technology partners to be able to develop the solutions needed.

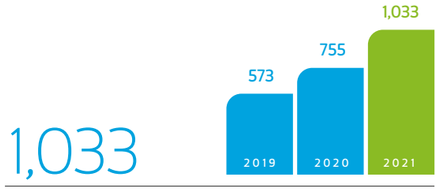
We believe that the span, concentration and integration of our operations position us well to develop, test and deploy new technologies such as carbon capture, utilization, and storage, at speed and scale.

We are a large investor in technology and one of the leading authors of patents in the oil and gas industry. Application of such technology can provide sustainable competitive advantage in core and new businesses and add commercial value by creating or extending future markets for oil, such as crude oil-to-chemicals, crude oil to hydrogen and nonmetallic materials. Technology will also be essential to delivering emissions reductions at the scale needed. Our goal is to deploy technologies at scale and with a high degree of integration across our value chain. Due to the size of our business, even small advances can have globally significant impacts.

With 864 granted US patents in 2021, Aramco now ranks in the top 50 of all companies and universities receiving US patents in 2021.

Group R&D expenses[3]

USD millions



1. Includes direct R&D program costs plus estimated overheads.
2. Does not include SABIC R&D expenses.
3. 2021 Total Group R&D including SABIC.

What are we doing?

OGCI commitments

We are a founding and active member of the Oil and Gas Climate Initiative (OGCI), a collaboration between 12 major national and international oil and gas companies whose shared mission, since its formation in 2014, is to act collectively in combating the climate challenge and to accelerate the global response to the risk of climate change.

Representing almost 30% of global oil and gas production, OGCI member companies work to reduce GHG emissions from their operations and leverage their collective strength to support the transition to a low-carbon future. OGCI supports the temperature goals of the Paris Agreement, including limiting global warming to well below 2°C, pursuing efforts to limit it to 1.5°C.

An imperative for all OGCI members is identifying and implementing the best business cases, portfolios and approaches to support the need for the world to move to a net-zero carbon emission future.

As a founding member of OGCI, we reiterate our continued efforts and pledge to:

- Accelerate our emissions reduction efforts to reach net-zero Scope 1 and Scope 2 GHG emissions from wholly-owned operated assets by 2050 and aiming to reach near zero methane emissions by 2030.
- Take action to sustain investments and technology development in low-carbon solutions so that we can continue to meet OGCI's collective climate commitments.
- Continue to support the development, implementation, and scale up of innovative low-carbon solutions in oil and gas, other industries, and commercial transportation through OGCI Climate Investments, a $1 billion-plus climate investments fund.
- Advance opportunities to scale up commercially viable, environmentally responsible, and safe carbon capture, utilization, and storage, to decarbonize multiple industrial sectors, and through OGCI Climate Investments.
- Continue to support governments as they design efficient policies that can accelerate energy transitions while stimulating economic growth, working in particular with our partners such as the International Energy Agency, the Clean Energy Ministry, and the Global Methane Alliance.

Enable – continued

Carbon capture, utilization, and storage

We believe capturing and storing or reusing CO_2 has the potential to significantly reduce global emissions. It is a central element to support the decarbonization of our own business and operations. It is also an essential element of an integrated blue ammonia and hydrogen program, and there is potential to partner with others to develop commercial solutions for CCUS in the Kingdom.

Aramco is working on developing long-term sequestration goals and a roadmap to achieve these goals. In addition to supporting emissions reduction goals, CCUS has the potential to contribute to the Saudi Green Initiative's greenhouse gas emissions reduction goals, support economic diversification, job creation, and sustainable development of the country's economy.

Aramco has set a goal of developing CCUS capacity to capture up to 11 MMtCO_2e by 2035. The ability to grow our CCUS capacity is critical to our efforts to decarbonize, and is dependent on financial support from the Government.

In parallel we are developing opportunities to use captured CO_2 for conversion into other materials or products with higher economic value and where either combustion is avoided or lower levels of CO_2 are emitted, for example, plastics, concrete and biofuels.

CO_2 has been shown to be a useful feedstock for a variety of industrial products. From fuels to concrete, CO_2 is a primary building block, a valuable commodity, which can be used both directly and as a feedstock. Current advanced CO_2 utilization takes place in chemicals production, mineralization processes, and plastics and polymer production. We are also exploring direct air capture, an immature technology, with technology partners.

What are we doing?

Aramco's enhanced oil recovery demonstration project

Aramco CO_2 EOR Demonstration Project has a capture capacity of 800,000 tons of CO_2 per year; the CO_2 is captured at one of our NGL plants. The captured CO_2 is piped 85 kilometers and pumped into a mature area of an oil field to enhance oil recovery (EOR) and sequester CO_2.

Capability to capture

CO_2 per year

800,000 tons

CCUS & concrete

After water, concrete is the most widely used material on earth. Concrete manufacturing is responsible for around 7% of annual global CO_2 emissions. If the global precast concrete industry implemented CO_2 curing technology, we estimate it could recycle at least 63 million tons of CO_2 every year — the equivalent of taking around 14 million cars off the road.

In partnership with the Korea Advanced Institute of Science and Technology, Aramco is developing a CO_2 curing technology for precast concrete materials that can store up to 20% of the CO_2 in the concrete, while delivering superior mechanical strength and reducing curing time by a third. By using CO_2 instead of air to cure the concrete, the carbon footprint is one-third of the footprint of conventional concrete. We are field-testing this technology in collaboration with a local cement company.

Offsets and carbon credits

Carbon offsets are units of greenhouse gas credits that Aramco seeks to earn by undertaking greenhouse gas reduction projects. The use of offsets is an important part of Aramco's net-zero planning as they enable the mitigation of hard to abate emissions, by offsetting actions we have taken elsewhere, or credits we might have purchased in a carbon market. They also allow us to accelerate emissions reduction action, particularly where alternatives, such as CCUS, are nascent.

Natural climate solutions

Natural climate solutions are conservation, restoration and improved land management actions that increase carbon storage or avoid greenhouse gas emissions in landscapes and wetlands across the globe. Combined with innovations in clean energy and other efforts to decarbonize the world's economies, natural climate solutions offer some of our best options in the response to climate change.

Aramco is exploring the use of natural climate solutions to generate offsets and credits. Aramco has planted 13.3 million mangrove trees, along the Arabian Gulf and Red Sea coastlines and over one million terrestrial native trees and we aim to plant millions more. As well as restoring habitats that encourage biodiversity and act as a natural barrier to coastal erosion, mangroves also form a natural sink for CO_2.

To develop useable, and potentially tradable, offsets Aramco plans to develop baselines, confirm methodologies and establish third-party measurement and verification of carbon stored in mangroves and other trees being planted in Saudi Arabia and internationally with partners.

Carbon markets

Putting a price on carbon would be a key enabler for motivating investment in emerging technologies that are currently not cost-effective, such as CCUS. Aramco favors and supports efficient and cost-effective ways to set a carbon price. We believe market mechanisms that address climate change and sustainable development, and take the economic circumstances of developing countries into account, offer a good balance between driving emissions reductions and supporting economic growth.

To be effective, any framework or market-based mechanism should cover all emitting sectors and all types of GHG emissions, recognize carbon intensity differentiation, equity, and revenue neutrality, as well as transferability of potential credits.

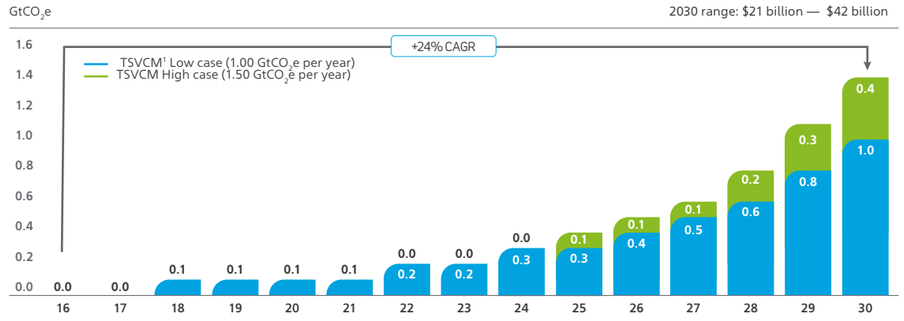
Voluntary markets enable private investors, governments, non-governmental organizations, and businesses to purchase carbon offsets to offset their emissions.

The Riyadh Voluntary Exchange Platform

Ahead of COP 26, Saudi Arabia committed to develop a trading platform for carbon offsets and credits produced in the Middle East and North Africa. The Riyadh Voluntary Exchange Platform is aimed at helping countries and companies within the region support Paris Agreement climate goals.

Aramco is actively engaged in supporting the Platform's development and has signed an MoU with Saudi Arabia's PIF to become an inaugural member of the first carbon market in the Middle East.

Carbon offsets voluntary market demand — global



1. TSVCM — Taskforce on Scaling Voluntary Carbon Markets.