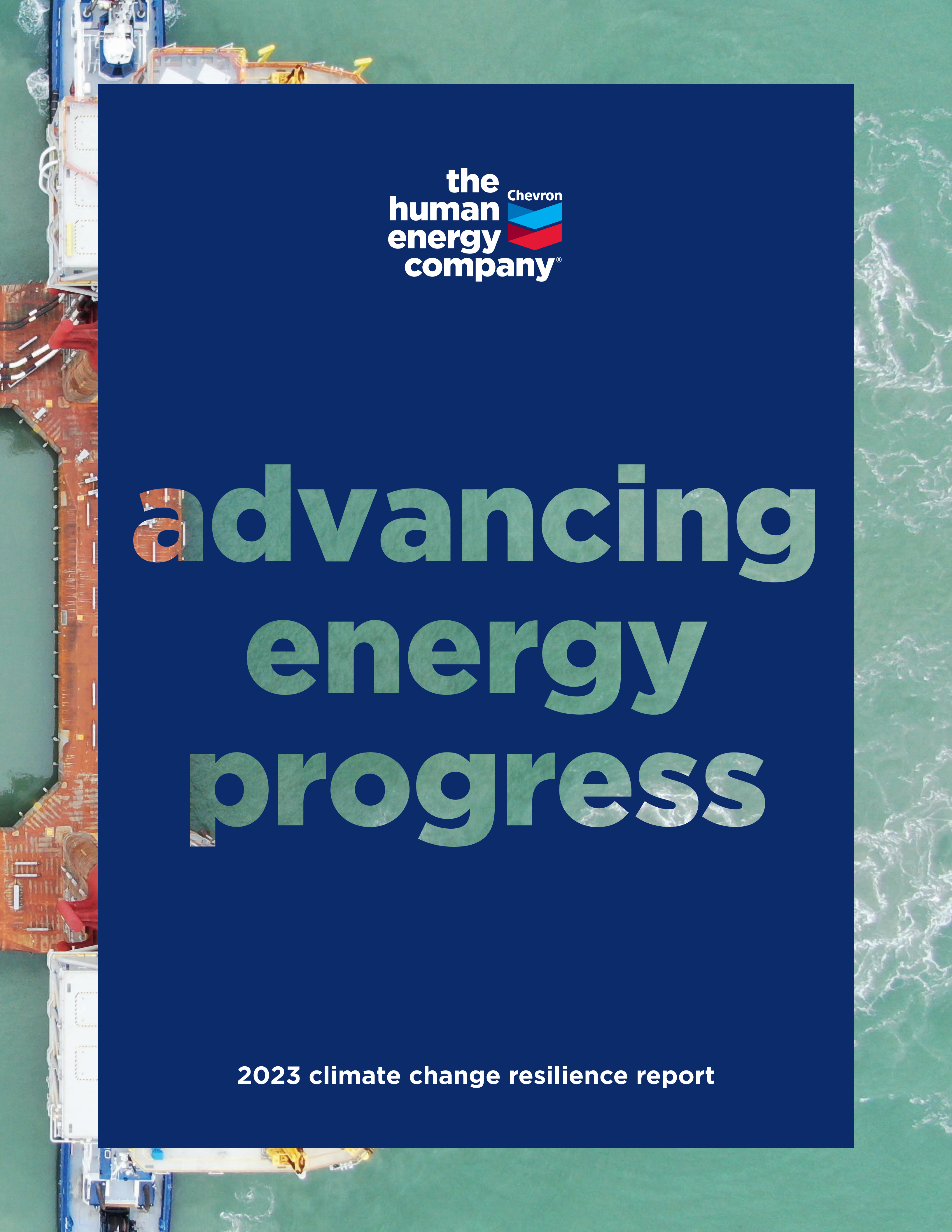


the
human
energy
company®
Chevron

advancing energy progress

2023 climate change resilience report

in this report

Photo: Anchor major capital project hull arriving to Kiewit in Ingleside, Texas. Our U.S. Gulf of Mexico facilities are some of the lowest carbon intensity-producing assets in the world.

advancing energy progress

at chevron, we believe that the future of energy is lower carbon and that human ingenuity and the power of innovation can solve any challenge

chairman's letter

"the strengths we have today are important to innovating and scaling the solutions of tomorrow"

We all have a stake in a reliable and affordable energy system and a lower carbon future. This belief drives Chevron's lower carbon ambitions and the actions we take to advance them, which are detailed in this report.

Our strategy is clear: Leverage our strengths to safely deliver lower carbon energy to a growing world. Our greatest strengths are our assets, the capabilities of our people and technology, and our customers. We're building on these strengths to create value for our stockholders and our stakeholders in three ways.

First, we aim to lead in lower carbon intensity oil, products and natural gas, which are expected to be part of the global energy mix for the foreseeable future. While there are many potential pathways to achieving the goals of the Paris Agreement, all include the continued use of oil and gas, even in rapid decarbonization scenarios.

It's within this context that we strive to be among the most efficient and responsible producers of lower carbon energy.

To drive down the carbon intensity of our operations, we are high-grading our portfolio, improving operations and using marginal abatement cost analysis to drive the most reduction from each dollar spent. Examples of progress include our deepwater U.S. Gulf of Mexico operations, which produce some of the world's lowest carbon intensity oil and gas, and our methane intensity performance in the Permian Basin, which was in the top quartile of oil and gas producers in 2021.

Second, we're helping to reduce the carbon emissions of major industries and hard-to-abate sectors by advancing new products and solutions, including renewable fuels, carbon capture and offsets, hydrogen, and other emerging technologies, such as geothermal.

Renewable fuels provide a promising path to reducing the carbon intensity of heavy transportation, including trucking, aviation and shipping, by allowing customers to use existing equipment. With the planned completion of the expansion of the Geismar biorefinery in 2024, our overall renewable fuels capacity is expected to increase by 30%.

We also continue to advance carbon capture, utilization and storage, another technology critical to advancing a lower carbon future. Through a joint venture with Talos Energy and Equinor, our Texas Bayou Bend project is positioned to be one of the largest carbon storage projects in the United States. In early 2023, the project was expanded to cover nearly 140,000 acres of geological formation.

Finally, we believe measurable outcomes are important to transparency and use metrics to track our progress. Our portfolio carbon intensity metric measures the full value chain carbon intensity of our entire business.

Many solutions will be needed to build the lower carbon energy system of the future. The strengths we have today – experience, expertise, reach and partnerships – are important to innovating and scaling the solutions of tomorrow.

We look ahead with optimism and remain confident in the power of human ingenuity to deliver progress.

Thank you,

Mike

Michael K. Wirth
Chairman of the Board and Chief Executive Officer

view from the lead director

dr. wanda austin

> “innovative solutions are needed to ensure energy is lower carbon, affordable and reliable”

how does the Board of Directors oversee climate-related risks?

Directors provide oversight and advice for navigating the evolving landscape and furthering Chevron’s strategy to leverage its strengths to safely deliver lower carbon energy to a growing world. The Board has deep expertise and broad experience across many disciplines. The Board’s four standing committees help our Board fulfill its oversight responsibilities related to climate issues. For example, the Public Policy and Sustainability Committee assists the Board in identifying, monitoring and evaluating potential implications of climate-related policies and trends that affect Chevron’s businesses and performance.

how does the Board bring in new ideas?

The Board receives regular briefings from internal and independent external subject matter experts and considers broad perspectives on climate change-related matters. In four of the past five years, the Board participated in offsite strategy sessions that included presentations by third-party experts on issues related to climate change and the energy transition, such as policies, regulations, technology and marketplace evolution. Fostering long-term and broad-based perspectives are also important Chevron objectives. The Board engages extensively with external stakeholders, including stockholders, as an essential part of advancing the company’s environmental goals. Our Directors’ regular participation in these dialogues enhances the Board’s effectiveness.

how is the role of technology evolving?

Technology will play a major role in shaping the energy mix in both the near- and long-term future. Innovative solutions are needed to ensure energy is lower carbon, affordable and reliable. These solutions should consider lifecycle emissions and be cost-effective and scalable. Although there is great focus on electrification, the world must look to many different solutions because reducing emissions in essential industries like air travel, shipping and heavy industry cannot be achieved through electrification alone. Chevron has a strategy that aims to advance lower carbon technologies that can be developed and deployed on the scale needed for meaningful carbon reduction in hard-to-abate sectors, including its own.

what are your views on the path and pace of the energy transition?

Achieving a successful energy system of the future requires three things: First, it must deliver solutions that meet customer needs, balancing affordability, reliability and lower carbon; second, given the scale of the energy system, these solutions must be scalable to be meaningful; third, once a solution works and is scalable, the pace of transition can accelerate.

Chevron’s assets, the capabilities of its people and technology, and customers are distinct advantages in helping to meet the world’s energy and climate goals. I’m optimistic about the progress Chevron is making, and I believe Chevron will play a major role in shaping the energy system of the future.

advancing energy progress

chevron’s strategy is to leverage our strengths to safely deliver lower carbon energy to a growing world

Our objective is to safely deliver higher returns, lower carbon and superior stockholder value in any business environment. Adopting intensity metrics provides Chevron the flexibility to grow our upstream and downstream businesses while aiming to become an increasingly carbon-efficient operator. We are investing to grow our traditional oil and gas business, lower the carbon intensity of our operations and grow new lower carbon businesses in renewable fuels, carbon capture and offsets, hydrogen, and other emerging technologies.

lowering the carbon intensity of our operations
2028 targets

(pages 66–70)

71 g CO_2e/MJ

portfolio carbon intensity
(Scope 1, 2 and 3) by 2028

24 kg CO_2e/boe

gas carbon intensity
(Scope 1 and 2) by 2028

24 kg CO_2e/boe

oil carbon intensity
(Scope 1 and 2) by 2028

36 kg CO_2e/boe

refining carbon intensity
(Scope 1 and 2) by 2028

2030 targets

(pages 45–48)

100 mbd

renewable fuels
production capacity

25 mmtpa

offsets business
and CCUS

150 mtpa

hydrogen equity
production capacity

planned capital allocation

(pages 39, 45–49)

$8.0

billion

in lower carbon
investments by 2028

$2.0

billion

in carbon reduction
projects by 2028

executive summary

At Chevron, we believe the future of energy is lower carbon, and we support the global ambitions of the Paris Agreement. This report builds on our previous five editions and has updates throughout as we outline our governance, risk management, strategy, portfolio, performance and policy, and metrics.

board and management oversight

Given the nature of climate change and its relevance to our business, the entire Board of Directors addresses climate change-related issues, with the Board's committees assisting the Board by focusing on climate issues related to their respective functions. The Board has four standing committees: Public Policy and Sustainability; Audit; Board Nominating and Governance; and Management Compensation. At the executive level, we manage potential climate change-related risks and energy transition opportunities through the Enterprise Leadership Team and the Global Issues Committee, each of which meets regularly throughout the year.

risk assessment and management

We face a broad array of climate-related risks, including physical, legal, policy, technology, market and reputational risks. We operationalize an enterprisewide process to assess major risks to the company and seek to apply appropriate mitigations and safeguards. As part of this process, we conduct an annual risk review with executive leadership and the Board of Directors and assess our risks, safeguards and mitigations. As Chevron aims to safely deliver higher returns and lower carbon in a transitioning world, we continue to place a high priority on the safety and health of our workforce and on the protection of communities, the environment and our assets.

higher returns, lower carbon

Our objective is to safely deliver higher returns, lower carbon and superior stockholder value in any business environment. Chevron's strategic and business planning processes bring together the company's views on long-term energy market fundamentals to guide decision making by executives and to facilitate oversight by the Board of Directors. The world's energy demands are greater now than at any time in human history. Chevron has a long history of producing oil, gas and other products that enable human progress, which we proudly continue today as we pursue the energy future. Many published outlooks conclude that fossil fuels will remain an important part of the energy system for years to come and that the energy mix will increasingly include lower carbon sources. As part of our strategic planning process, we use models and analysis to forecast demand, energy mix, supply, commodity pricing and carbon prices. This includes assumptions about future policy, such as those that may be implemented in support of the Paris Agreement's goal of "holding the increase in the global average temperature to well below 2° C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5° C above pre-industrial levels."

We believe that our asset mix and actions in new energies enable us to be flexible in response to potential changes in supply and demand.

performance and policy

In 2022, more than 50% of our equity (i.e., participating share of emissions both from facilities that Chevron operates and from our nonoperated joint ventures) direct emissions were in regions with existing or developing carbon-pricing policies. In this environment, and into a future likely to include additional lower carbon policies, we seek to find solutions that are good for society and good for investors.

To achieve society's goals most effectively, markets should be empowered to incentivize the most carbon-efficient producers and enabled through transparent performance reporting. We continue to help develop standardized methodologies for carbon data that are calculated in a consistent, reliable, transparent way and are comparable across sectors and firms of all sizes to enable progress toward a lower carbon future.

success in a lower carbon future

We aim to grow our traditional oil and gas business, lower the carbon intensity of our operations and grow new lower carbon businesses in renewable fuels, carbon capture and offsets, hydrogen, and other emerging technologies.

section 1

governance framework

Photo: In 2022, Lead Director Dr. Wanda Austin met with stakeholders and employees at Chevron operations in the Eastern Mediterranean and visited the Leviathan offshore platform. The Board of Directors' approach to governance and oversight is informed by feedback and engagements from our stakeholders.

section 1: governance framework

board and management oversight

Our climate-related governance is designed to manage potential climate change-related risks and energy transition opportunities. Board oversight, executive management and organizational capability are foundational elements to our disciplined approach.

1.1 board oversight

Chevron's Board of Directors oversees the company's strategy and risk management, both of which include climate change issues. Our governance structure gives the Board multiple avenues to oversee risks and opportunities, including those related to climate change.

The full Board annually reviews the company's strategy, including long-term energy outlooks and signposts on key trends. The Board has access to education and training on climate-related materials and to Chevron's internal subject matter experts. The Board also regularly receives briefings on climate-related issues, including policies, regulations, technology and adaptation. The Board annually reviews Chevron's Enterprise Risk Management (ERM) process, which assists the Board and executive leadership in overseeing key strategic risks for the company. Climate change is addressed in a comprehensive manner in the ERM process (see **page 13**).

The full Board periodically meets with external experts to hear their perspectives on climate change and the energy transition. Accessing external experts who have varying viewpoints on the speed and scale of the energy transition may enable the Board to consider a range of risks and opportunities arising from climate change.

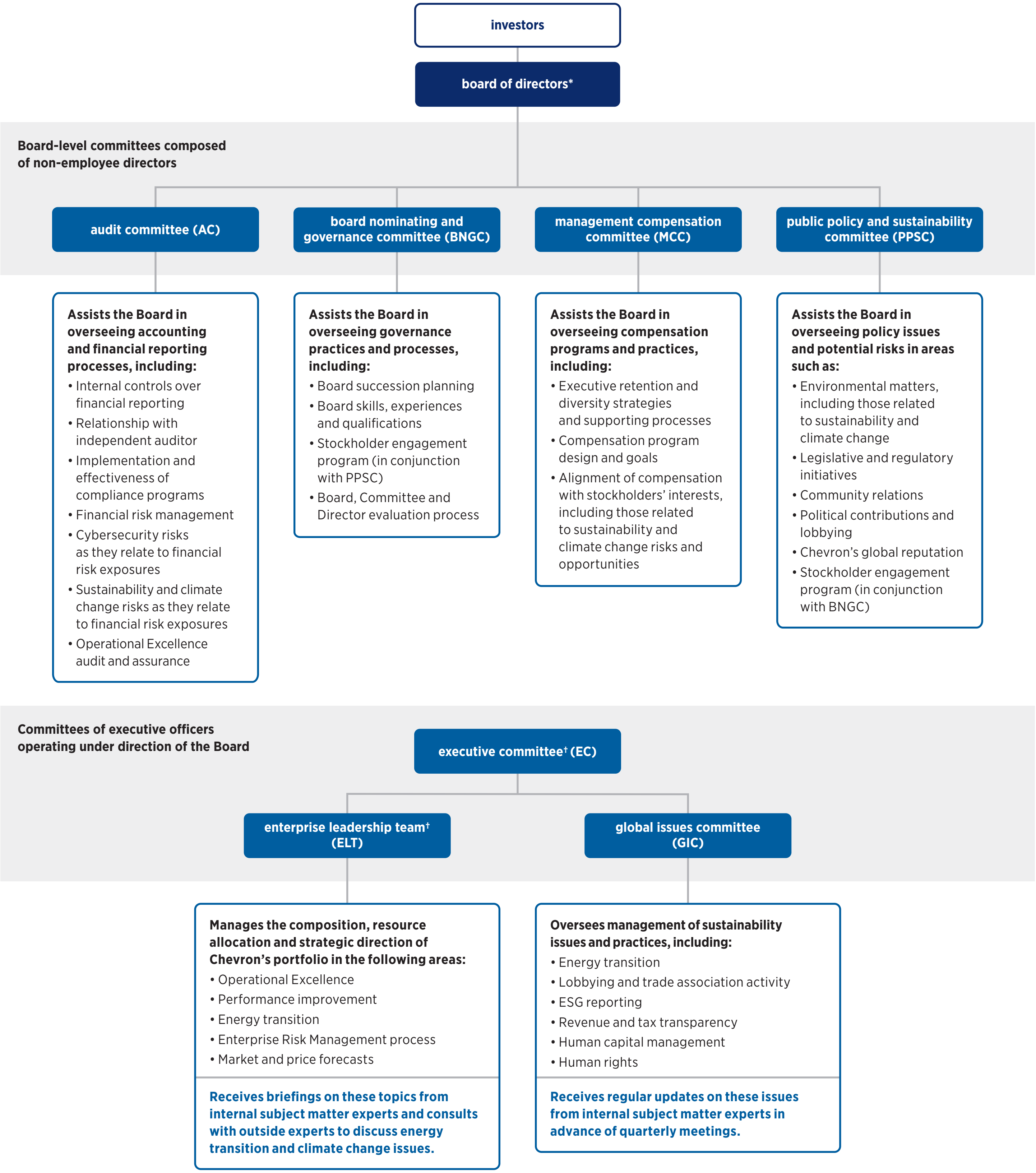
Given the nature of climate change and its relevance to our business, the entire Board addresses climate change-related issues, with the Board's committees assisting the Board by focusing on climate issues related to their respective functions. The Board has four standing committees: Public Policy and Sustainability; Audit; Board Nominating and Governance; and Management Compensation (Exhibit 1). Each Board committee includes only independent Directors, and each is chaired by an independent Director. Each committee has access to management, company information and independent advisors. In 2020 and 2021, the Board reviewed its governance of climate change-related risks and energy transition opportunities with the aim of leveraging the purview of the four standing committees and more clearly defining how each committee assists the Board with its oversight responsibilities. As a result, the Board amended the charter of each of the four standing committees to clearly articulate each committee's responsibility in assisting the Board in its oversight related to climate issues. Specifically, the Public Policy and Sustainability Committee's charter was enhanced to underscore its role in assisting the Board's oversight of potential climate change-related risks and energy transition opportunities.

board engagement

The Board's approach to governance and oversight is informed by feedback from stakeholders. Members of the Board periodically engage stakeholders to discuss issues like climate change and to convey Chevron's approach to the energy transition. The viewpoints they hear on energy markets, geopolitics and technology trends enable the Board to effectively deploy our capital and human talent to achieve our higher returns, lower carbon objective.

Chevron's actions are directly informed by engaging with our stockholders. In 2022, Chevron had over 90 one-on-one environmental-, social- and governance-focused meetings with stockholders representing approximately 50% of outstanding common stock. Of these engagements, members of the Board participated in environmental-, social- and governance-focused meetings with stockholders representing approximately 28% of outstanding common stock.

Exhibit 1. Chevron's governance structure relevant to potential climate change-related risk and energy transition opportunity oversight



investors

board of directors*

Board-level committees composed of non-employee directors

audit committee (AC)

Assists the Board in overseeing accounting and financial reporting processes, including:
- Internal controls over financial reporting
- Relationship with independent auditor
- Implementation and effectiveness of compliance programs
- Financial risk management
- Cybersecurity risks as they relate to financial risk exposures
- Sustainability and climate change risks as they relate to financial risk exposures
- Operational Excellence audit and assurance

board nominating and governance committee (BNGC)

Assists the Board in overseeing governance practices and processes, including:
- Board succession planning
- Board skills, experiences and qualifications
- Stockholder engagement program (in conjunction with PPSC)
- Board, Committee and Director evaluation process

management compensation committee (MCC)

Assists the Board in overseeing compensation programs and practices, including:
- Executive retention and diversity strategies and supporting processes
- Compensation program design and goals
- Alignment of compensation with stockholders' interests, including those related to sustainability and climate change risks and opportunities

public policy and sustainability committee (PPSC)

Assists the Board in overseeing policy issues and potential risks in areas such as:
- Environmental matters, including those related to sustainability and climate change
- Legislative and regulatory initiatives
- Community relations
- Political contributions and lobbying
- Chevron's global reputation
- Stockholder engagement program (in conjunction with BNGC)

Committees of executive officers operating under direction of the Board

executive committee† (EC)

enterprise leadership team† (ELT)

Manages the composition, resource allocation and strategic direction of Chevron's portfolio in the following areas:
- Operational Excellence
- Performance improvement
- Energy transition
- Enterprise Risk Management process
- Market and price forecasts

Receives briefings on these topics from internal subject matter experts and consults with outside experts to discuss energy transition and climate change issues.

global issues committee (GIC)

Oversees management of sustainability issues and practices, including:
- Energy transition
- Lobbying and trade association activity
- ESG reporting
- Revenue and tax transparency
- Human capital management
- Human rights

Receives regular updates on these issues from internal subject matter experts in advance of quarterly meetings.

---

*Chaired by Chairman of the Board
†Chaired by Chief Executive Officer

Additionally, events may be handled via ad hoc, cross-functional Crisis Management and Issue Management teams, which report regularly to members of the ELT, and if appropriate, provide updates to the Board.

1.1.1 Public Policy and Sustainability Committee (PPSC)
The PPSC assists the Board in identifying, monitoring and evaluating potential climate risks, policies and trends that affect Chevron's activities and performance. The PPSC discusses Chevron's progress in addressing sustainability and climate change matters such as the energy transition, establishment of climate-related goals and voluntary reporting of environmental matters. The PPSC is briefed on emerging or ongoing issues related to capital markets, government policies and societal trends that could significantly impact Chevron's enterprise objectives. The PPSC reviews Chevron's political activities, including how direct and indirect lobbying on climate issues supports Chevron's climate strategy and reflects on the company's reputation. In conjunction with the Board Nominating and Governance Committee, the PPSC reviews climate-related proxy proposals and makes recommendations to the Board on responses to such proposals.

PPSC oversight on climate lobbying

Lobbying is an important way for Chevron to participate in the political process. Chevron engages in direct and indirect lobbying. Direct lobbying is conducted by our employees and contract lobbyists. Related activities that support our employees and contractors are referred to as "indirect" lobbying activities and include research and analysis related to issues and pending legislation. Indirect activities are performed by our employees as well as the trade associations of which we are a member.

Both lobbying and corporate political contributions are managed internally with oversight by Chevron's corporate compliance and internal audit teams and the Board of Directors.

The PPSC assists the Board in overseeing political activities and providing effective responses to stockholder concerns regarding such activities. The PPSC annually reviews the policies, procedures and expenditures related to the company's political contributions and lobbying to assess the value of these activities and ensure alignment with Chevron's positions, interests and trade-offs. The PPSC provides guidance on Chevron's political activities to the vice president of Corporate Affairs.

For more information on our lobbying practices, see our lobbying and trade association webpage **chevron.co/lobbyingandtrade**.

1.1.2 Audit Committee (AC)
The AC reviews the company's policies with respect to risk assessment and risk management and Chevron's major financial risk exposures, including sustainability and climate change risks. These risks are discussed in the "Risk Factors" section of the company's Annual Report on Form 10-K.[1] The AC selects and engages the company's independent auditor and assists the Board in overseeing the audit of the company's financial statements.

1.1.3 Management Compensation Committee (MCC)
The MCC considers the relative alignment of the company's compensation policies and practices with investors' interests, including those related to sustainability, climate change risks and energy transition opportunities. The MCC assesses and approves the incorporation of greenhouse gas-related performance measures into the scorecard that affects the compensation of management and most other employees.

1.1.4 Board Nominating and Governance Committee (BNGC)
The BNGC identifies and recommends prospective Directors with the goal of maintaining a Board composition appropriate to overseeing the wide-ranging risks that affect the company. The BNGC regularly reviews the appropriate skills and qualifications of Directors in the context of the current composition of the Board, the strategy of the company and the long-term interests of investors. The BNGC also regularly reviews the list of skills and qualifications desired for Board composition under the Corporate Governance Guidelines and, in 2021, added "experience leading business transformation" in light of the energy transition. Among the other collective skills and qualifications desired for an appropriate Board composition are experience and knowledge of environmental (including climate issues), governmental, regulatory, legal, public policy, financial, global business, international affairs and technology issues.

Chevron's Directors have a diverse set of skills, experience and expertise to enable the Board to effectively oversee potential climate change-related risks and energy transition opportunities for the company. Several independent Directors bring specific environmental and policy skills and qualifications to the Board.

Our Directors' experience comes from academic, government and business sectors. These diverse perspectives enable the Board to challenge itself and company management on climate change-related risks and energy transition opportunities.

The Board periodically reassesses Chevron's governance structure and the skills, experience and expertise of the Board. Such assessment helps Chevron maintain an effective framework for managing the company's performance and the risks to our business.

board of directors

highly engaged, diverse board with relevant skills and qualifications

Michael K. Wirth, Chairman and CEO

Former Vice Chairman of the Board
and Executive Vice President of
Midstream & Development, Chevron
○○○○○○○

Wanda M. Austin, Lead Director

Retired President and CEO,
The Aerospace Corporation (2, 3)
○○○○○ ○

John B. Frank
Vice Chairman,
Oaktree Capital Group, LLC (1)
○ ○○○ ○

Alice P. Gast
Retired President and Professor
Emeritus of Chemical Engineering,
Imperial College London (2, 4)
○○○○○

Enrique Hernandez, Jr.
Executive Chairman,
Inter-Con Security Systems, Inc. (3, 4)
○ ○○○ ○

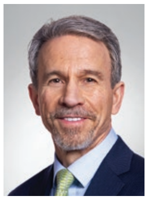
Marillyn A. Hewson
Retired Chairman, CEO and President,
Lockheed Martin Corporation (1)
○○○○○○○

Jon M. Huntsman Jr.
Former Governor of Utah;
U.S. Ambassador to Russia, China
and Singapore (3, 4)
○ ○○○○

Charles W. Moorman
Senior Advisor to Amtrak,
Retired Chairman and CEO,
Norfolk Southern Corporation (2, 3)
○○○○ ○○

Dambisa F. Moyo
Co-Principal,
Versaca Investments (1)
○○○○○

Debra Reed-Klages
Retired Chairman, CEO and President,
Sempra Energy (1)
○○○○○○○



D. James Umpleby III
Chairman and CEO,
Caterpillar Inc. (2, 4)
○○ ○○○○

Cynthia J. Warner
Former President and CEO,
Renewable Energy Group, Inc. (4)
○○ ○○○○

Skills, Experiences and Expertise: ○ CEO/Senior Executive/Leader of Significant Operations ○ Science/Technology/Engineering/Research/Academia ○ Government/Regulatory/Legal/Public Policy ○ Finance/Financial Disclosure/Financial Accounting ○ Global Business/International Affairs ○ Environmental ○ Leading Business Transformation

Committees of the Board: (1) Audit: Debra Reed-Klages, Chair (2) Board Nominating and Governance: Wanda M. Austin, Chair (3) Management Compensation: Charles W. Moorman, Chair (4) Public Policy and Sustainability: Enrique Hernandez, Jr., Chair

1.2 executive management of climate risks

Under the direction of the Board, Chevron's Executive Committee (EC) is composed of executive officers of Chevron and carries out Board policy in managing the business affairs of the company. The Enterprise Leadership Team and Global Issues Committee, described below, are subcommittees of the Executive Committee.

1.2.1 Enterprise Leadership Team (ELT)

The ELT is responsible for managing the composition, resource allocation and strategic direction of Chevron's portfolio to achieve Chevron's objectives. The ELT focuses on performance improvement by understanding current performance and business drivers and assessing the progress and status of key corporate initiatives, like the development of our New Energies business lines (see **pages 46–49**) to evolve our portfolio in light of energy transition opportunities. The ELT also oversees the ERM process (see **page 13**), which includes and addresses climate change-related risks. The ELT receives briefings from Chevron's subject matter experts on topics such as climate change; geopolitical risk; market conditions; energy transition strategies; peer activities; performance on and updates to metrics; technology and innovation; policy; and future energy opportunities. The ELT reviews market fundamentals for oil, gas, products, carbon and new energy solutions (see **page 24**).

1.2.2 Global Issues Committee (GIC)

The GIC, chaired by the Vice Chairman of the Board, oversees the development of Chevron's policies and positions related to global issues that may have a significant impact on Chevron's business interests and reputation.

> **the vice president of chevron strategy and sustainability also serves as secretary to the PPSC, helping to connect the GIC's work to the PPSC**

The GIC receives updates from subject matter experts on an array of climate change-related issues, such as carbon policy development around the world; company positions on carbon policy; political developments; lobbying and trade association activity; and environmental, social and governance (ESG) reporting practices. The GIC reviews the public climate change-related actions of other companies to understand how our peers are responding to climate change-related risks and energy transition opportunities. It also oversees our stockholder engagement plan and reviews feedback from our stockholder engagements. The GIC is focused on ensuring that our strategy and position are clearly communicated and that stakeholder feedback and concerns are carefully considered.

1.3 organizational capability on energy transition

Our people strategy is focused on engaging the full potential of our people to deliver the future of energy. We will achieve this by building great leaders, advancing our culture, and strengthening core and emerging skills.

We strive to continually improve execution across all aspects of our business as the energy system evolves. Our Oil, Products & Gas (OPG) organization combines upstream, midstream and downstream – the full value chain – which allows for a more integrated approach to capital allocation, asset class excellence and value chain optimization. For example, the OPG Lower Carbon organization provides coordination to accelerate execution of high-impact opportunities and development of future lower carbon pathways.

Chevron Technology Ventures (CTV) identifies, invests in and integrates externally developed technologies and business solutions. CTV targets innovation and transformational technology in areas like carbon capture, utilization and storage (CCUS); hydrogen; and emerging power technologies, among others. The Chevron Technical Center develops and deploys technology enterprisewide, including integrating lower carbon technology into our operations.

Chevron New Energies is focused on developing new lower carbon businesses that have the potential to scale. Its focus includes commercialization opportunities in renewable fuels, CCUS and offsets, hydrogen, and emerging technologies.

Chevron Strategy and Sustainability (CSS) stewards the company's long-term strategy by integrating climate change, energy transition and other sustainability themes into macroeconomic forecasting, supply-and-demand forecasting, price forecasting, portfolio modeling and competitor intelligence. In 2022, CSS formed a methane reduction team to guide and implement our enterprise methane strategy.

section 2

risk management

Photo: Workers inspecting pipe at CO_2 injection well. Chevron Australia's Gorgon liquefied natural gas facility incorporates one of the world's largest integrated carbon capture and storage projects.

section 2: risk management

enterprise risk management

Chevron employs risk management processes for identifying, assessing and managing the risks to our business, including potential climate change-related risks.

Our ERM process provides corporate oversight for assessing major risks to the company and the safeguards and mitigations that are put in place. As part of the annual ERM process, the ELT reviews risk categories that pertain to external stakeholders, geopolitical and legislative issues, organizational capability, and skilled personnel, among others, and their potential consequences, financial and otherwise. An executive from the ELT owns each risk category, directs a team to identify, safeguard and mitigate enterprise risks, and reports the findings to the ELT. Following endorsement by the ELT, the annual ERM assessment is reviewed by the Board of Directors. Potential climate change-related risks are integrated into multiple ERM categories.

Our management of risk is further aided by other systems and processes such as our Operational Excellence Management System (OEMS).

For more information on OEMS and focus area examples, see our **2022 Corporate Sustainability Report**.

Climate disclosure frameworks generally identify two main areas of corporate climate risk: physical risks and transition risks.* Physical risks include potential physical impacts driven by both acute events and long-term shifts in climate patterns. Transition risks include the potential risks to a company arising from the transition to a lower carbon energy system, such as litigation, technology advancements and changes in policy, supply and demand, and stakeholder perceptions.

2.1 physical risks

According to the UN Intergovernmental Panel on Climate Change (IPCC) *Sixth Assessment Report*, the physical risks of climate change are varied and widespread. As disclosed on page 21 of the company's 2022 Annual Report on Form 10-K, the company's operations are subject to disruption from natural or human causes beyond its control, including physical risks from hurricanes, severe storms, floods, heat waves, other forms of severe weather, wildfires, ambient temperature increases, sea level rise, fires and earthquakes, some of which may be impacted by climate change and any of which could result in suspension of operations or harm to people or the natural environment.

Our operations have practices in place to help manage risks associated with the impacts of ambient conditions and extreme weather events, regardless of any connection to anthropogenic climate change. These long-standing practices are also applied to address possible effects of climate change and to maintain the resilience of our infrastructure. For example, Chevron's Metocean Design and Operating Conditions guideline provides guidance for the physical parameters to be used in the design, construction and operation of offshore and coastal facilities, including those on land that may be threatened by coastal inundation due to storm surges. Chevron and a third party developed screening tools to identify potential physical risks at our assets globally as part of the Physical Risk from Climate Change procedure, formerly Climate Assess. The procedure is captured within the corporate OEMS, as part of the Environment Risk Management Process, and is for use in identifying, assessing, managing and mitigating the potential physical impacts of climate change to Chevron activities, including existing operations, operational changes, projects and new opportunities.

With worldwide operations subject to diverse microclimates and weather phenomena, we stay prepared for the possibility of natural disasters. Based on risk evaluations and business impact analysis, business units develop and implement a business continuity plan to provide continuous availability – or prompt recovery – of critical business processes, resources and facility operations. Our business units work with local communities and emergency response teams to develop site-specific plans in the event of any disruption. The plans and processes are regularly reviewed and tested to promote business continuity.

---

*Two such frameworks are CalPERS/Wellington Management, *Physical Risks of Climate Change (P-ROCC)*, which can be accessed at wellington.com/en/wellington-news/physical-risks-of-climate-change-p-rocc, and the Task Force on Climate-related Financial Disclosures (TCFD), *Recommendations of the Task Force on Climate-related Financial Disclosures*, which can be accessed at assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf.

2.2 transition risks

Our ERM process encompasses risks typically identified as climate-related transition risks, including policy, technology, market, legal and reputational risks. Risks that could materially impact our operations and financial condition are discussed in the "Risk Factors" section of our Annual Report on Form 10-K.

2.2.1 Policy risks

Policies addressing climate-related issues are evolving (see **pages 54–64**). The direct effects, as well as second- and third-order effects, of potential policy changes will depend on the type and timing of such changes. As disclosed on pages 22–24 of the company's 2022 Annual Report on Form 10-K, significant changes in the regulatory environment, including those driven by climate-related issues, could affect our operations.

For example, legislation, regulation and other government actions related to global greenhouse gas (GHG) emissions and climate change could continue to increase Chevron's operational costs and reduce demand for Chevron's hydrocarbon and other products.

Climate-related issues are integrated into the company's strategy and planning, capital investment reviews, and risk management tools and processes, where applicable (see **page 24**). They are also factored into the company's long-range supply, demand and energy price forecasts (see **page 36**).

2.2.2 Technology risks

Development and deployment of innovations and emerging technologies in pursuit of a lower carbon economy may disrupt or displace portions of the current economic system. As disclosed on page 20 of the company's 2022 Annual Report on Form 10-K, technology advancements could affect the price of crude oil.

The Chevron Technology Center (CTC) supports Chevron's businesses through research, technology and capability development. The CTC also helps bridge the gap between business unit needs and emerging technology solutions developed externally to the company (see **pages 26–28**, **49**). Chevron established the Chevron Future Energy Fund in 2018 with a commitment of $100 million and a follow-up Future Energy Fund II in 2021 with a commitment of $300 million to invest in breakthrough technologies that could help advance the energy transition.

2.2.3 Market risks

The potential impacts of climate change on markets are complex and uncertain. As disclosed on page 20 of the company's 2022 Annual Report on Form 10-K, Chevron is primarily in a commodities business that has a history of price volatility. Potential consumer use of substitutes to Chevron's products that may be developed in the future may impact our business.

We are focused on maintaining a strong balance sheet and preserving prudent liquidity levels. Our policies and controls provide centralized governance over key enterprise processes, including banking, liquidity management, foreign exchange, credit risk, financing, and climate change-related risks and energy transition opportunities (see **page 24**).

we continue to place a high priority on the safety and health of our workforce and on the protection of communities, the environment and our assets

Guided by The Chevron Way, we have embedded and long-standing processes that are designed to grow our workforce capabilities and engage with stakeholders to manage potential impacts in the communities where we operate. We aim to:

- Employ risk management processes to evaluate facility-, activity- and product-related risks across the lifecycle of the business, from planning and construction through operation and decommissioning.
- Empower our people through programs that promote their health, well-being and development, including training and development for employees to help them achieve their full potential and to meet the needs of the evolving business.
- Cultivate innovative collaboration in the communities where we operate to support robust social investment programs, including investing in STEM education and programs that support small and diverse businesses and supporting workforce development programs.
- Involve communities and other stakeholders in meaningful discussions and planning where there may be asset retirement or divestiture.

For more information on activities regarding employees and communities, see our **2022 Corporate Sustainability Report**.

2.2.4 Legal risks

In recent years, a variety of plaintiffs have brought legal claims against various defendants alleging climate-related losses and damages. As disclosed on page 24 of the company's 2022 Annual Report on Form 10-K, increasing attention to climate change may result in additional government investigations and private litigation against Chevron.

We have highly capable legal staff and associated safeguards through all levels of the enterprise to identify, evaluate and actively address legal risks. Our legal experts review and report on emerging issues and trends that could impact the company. They aim to provide systematic reviews of climate-related matters and timely analysis and advice for the management of identified risks.

2.2.5 Reputational risks

As disclosed on pages 24–25 of the company's 2022 Annual Report on Form 10-K, increasing attention to ESG matters, including those related to climate change, may impact our business. Organizations that provide information to investors on corporate governance and related matters have developed ratings processes for evaluating companies on their approach to ESG matters. Such ratings are used by some investors to inform their investment and voting decisions. Also, some stakeholders, including but not limited to sovereign wealth, pension and endowment funds, have been promoting divestment of fossil fuel equities and urging lenders to limit funding to companies engaged in the extraction of fossil fuel reserves. Unfavorable ESG ratings and investment community divestment initiatives may lead to increased negative investor sentiment toward Chevron and our industry and to the diversion of investment to other industries.

Our GIC actively stewards our reputation by working toward alignment of key corporate policies, practices and public positions related to climate change. Refer to Section 1, "Governance Framework" (see **pages 7–11**).

The Stakeholder Engagement and Issues Management process in our OEMS facilitates engagement with local communities and stakeholders to identify and assess the unique risks for each business unit's operations. Potential social, political and reputational risks are identified, leading to risk management strategies. We regularly engage with investors and other stakeholders to receive feedback on climate-related issues.

climate-related litigation

Chevron, along with other investor-owned energy companies comprising a small subset of the industry, has been named as a defendant in 25 lawsuits brought by four U.S. states, the District of Columbia, various county and city governments, and a fishing trade group. The lawsuits seek to hold the targeted companies financially responsible for the alleged effects of climate change, seeking billions of dollars in alleged damages, remediation costs and contingency-fee payments to private lawyers representing most of the plaintiffs. The lawsuits' proponents seek to radically transform modern society.

In the only case that to date has been finally resolved on the merits, the U.S. Court of Appeals for the Second Circuit affirmed the dismissal of all claims: "To permit this suit to proceed under state law would … risk upsetting the careful balance that has been struck between the prevention of global warming … and energy production, economic growth, foreign policy and national security." See *City of New York v. Chevron Corp.*, 993 F.3d 81 (2d Cir. 2021). The court characterized climate change as a "uniquely international problem of national concern" that is not apt for adjudication under state law.

In Chevron's view, the suggestion that a few, investor-owned energy companies should be held retroactively liable for the cumulative effects of the phenomena contributing to climate change is legally and factually baseless. These companies' collective production meets only a small fraction of global oil and gas demand and contributes an even smaller portion of overall GHG emissions. The production of oil and gas has brought immense economic and security benefits to billions of people around the world, including the citizens of the state and local governments filing these lawsuits, which is why it has long been permitted, promoted and even mandated by governments around the world. Seeking to impose retroactive liability against a small group of energy companies disregards the history of how our complex energy system has developed, as well as national security and geopolitical imperatives. Granting the putative relief requested in these lawsuits would neither reduce global demand for oil and gas nor effectively address climate change. Targeting investor-owned energy companies while ignoring the much larger production of state-owned companies and GHG emissions from other sectors of the economy is arbitrary and opportunistic and would punish companies that are often the most transparent, innovative and responsible producers of the energy that is essential to modern life.

Claims that Chevron has improperly concealed superior knowledge of climate change from the public are false. The potential climate effects of GHG emissions – including those produced by certain end users of fossil fuels – have been the subject of extensive study funded and published by the United States government, among other national and international bodies, for more than half a century. This massive body of research has been the subject of widespread public discussion by prominent scientists, activists and government officials. Within this broad public debate, policymakers at every level of government – including government entities that are plaintiffs in these lawsuits – have made policy decisions to continue the production and use of oil and gas after weighing the costs, benefits and competing priorities.

Chevron believes that climate change is a global issue that requires global solutions. We welcome meaningful efforts to address climate change and look forward to continuing to engage with governments and stakeholders to develop constructive solutions to help deliver a lower carbon future. Attempting to use the court system to usurp the proper role of policymakers, stifle disfavored speech on issues of public importance, and retroactively punish investor-owned energy companies for lawful and beneficial activity is not an appropriate or effective means of accomplishing that objective.

2.2.6 scenario test

stress-testing our portfolio under the IEA NZE scenario

We consider a range of long-term energy-demand scenarios* and commodity prices when evaluating our portfolio. For longer-term scenarios, we routinely use external views to both inform and challenge our internal views. This includes scenarios that assume a wide range of energy transition outcomes, which may include scenarios for which the possibility of occurrence is remote. We analyze these alternative scenarios representing diverse potential futures to stress-test our portfolio and integrate lessons learned into our decision making to assess investments and evaluate business risk.

IEA NZE Scenario in context

The International Energy Agency (IEA) Net Zero Emissions by 2050 (NZE) Scenario is one potential path to a 1.5° C scenario. Described by the IEA as "a pathway to reach net zero emissions by 2050, not *the* [emphasis added] pathway," the scenario was originally published in 2021, with an update issued in October 2022.

We used the assumptions in the NZE Scenario (2022) to test the resiliency of our portfolio. The statements that follow in this section represent projections and assumptions associated with that scenario test. They are not representative of Chevron's own predictions or actual conditions at the present time.

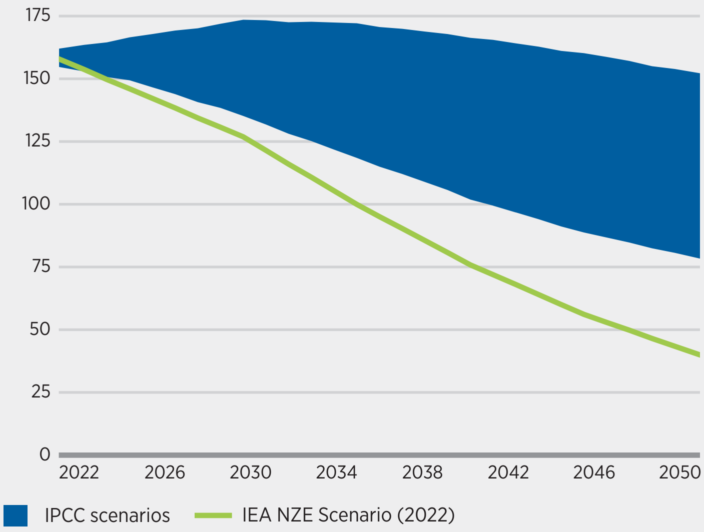
The hypothetical NZE Scenario sets out a pathway to achieve net zero emissions from the global energy system in 2050. It assumes a transition based on three fundamental shifts in the global energy system: massive electrification, unprecedented levels of energy intensity improvement† and widespread global policy cooperation. In the scenario, the global economy moves away from one largely powered by fossil fuels to one powered predominantly by renewable energy and decreases in oil and gas demand put downward pressure on prices.

The NZE Scenario has lower oil and gas demand than other externally developed Paris-aligned scenarios such as the average C1 pathway, described as warming limited to 1.5° C with no or limited overshoot, through C4 pathway, described as warming limited to 2° C (Exhibit 2), of the Intergovernmental Panel on Climate Change (IPCC).

The NZE Scenario also reflects lower oil and gas prices than other 1.5° C scenarios such as the Network for Greening the Financial System Net Zero by 2050 Scenario (NGFS Net Zero by 2050 Scenario).[2] The IEA's NZE Scenario projects the price of oil drops to approximately $35 per barrel by 2030 and to less than $25 per barrel by 2050 in real terms. This compares with projections for oil prices greater than $85 per barrel in 2030 and approximately $110 per barrel in 2050, in real terms, in the NGFS Net Zero by 2050 Scenario.

Exhibit 2. IEA NZE Scenario in context: oil and gas demand in various 2° C or lower external scenarios

(mmboe/d)



Sources: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022; IPCC, *AR6 Scenario Explorer and Database Hosted by IIASA*, data.ene.iiasa.ac.at/ar6/#/downloads.

The 2022 update to the NZE Scenario reflects higher near-term emissions following the world's rebound from the COVID-19 pandemic, initial increased use of coal and a faster transition from gas to renewables in Europe following the Russia-Ukraine military conflict, and revisions to behavior-based assumptions. Compared with NZE Scenario forecasted assumptions in 2021, the 2022

---

*A scenario is a hypothetical construct that uses assumptions and estimates to highlight central elements of a possible future but is not a forecast, prediction or sensitivity analysis.

†The IEA defines energy intensity improvement as the percentage decrease in the ratio of global total energy supply per unit of gross domestic product.

updates result in very little change in overall energy demand or price. Natural gas demand is the notable exception. Based on the IEA's projection of how present-day energy security concerns over international gas supply could cause a shift away from gas demand in the coming decade, gas demand is down markedly in favor of coal and biomass, followed by nuclear and renewable power. The IEA also specifically calls out the need for policymakers to "do much more to provide signals on the demand side" to develop clean energy supply chains and emphasizes that the NZE Scenario pathway "cannot be achieved without the rapid and large-scale adoption of measures that limit growth in energy demand."

The scenario's assumptions are limited to the energy sector and do not address natural climate solutions, such as offsets, or impacts to land-use change that occur in non-energy sectors. The framework also assumes less use of negative emissions technologies, like CCUS, than IPCC scenarios.

The IEA describes the pathway as "narrow but still achievable," in that it "entails very ambitious policies and measures to improve energy efficiency and reduce energy demand, including through behavioral change," and acknowledges that "[t]here are … many areas where progress is well short of what is envisaged in the NZE Scenario." We agree – the scenario and its assumptions are challenging. The NZE Scenario requires globally coordinated policy design, strong international cooperation, vast capital redeployment, nearly quadrupling of renewables and nuclear capacity additions, accelerated technology deployment, and an improvement in energy intensity that is two-and-a-half times higher than the observed trend of the past decade. We see the NZE Scenario as remote and highly unlikely due to the immediate and unprecedented action required to transform the global energy system.

> **"there is still a large gap between today's ambitions and a 1.5° C stabilization"[3]**

Modeling of long-term scenarios is inherently speculative, given the wide range of unpredictable variables and externalities that could affect outcomes through 2050. We do not rely on the NZE Scenario for our business planning. Nonetheless, we have conducted a scenario test of the NZE Scenario demand projections, as well as its oil and gas projections, to stress-test our portfolio.

The IEA does not directly provide all the necessary market details required to run an NZE Scenario analysis (e.g., regional pricing or product consumption). Where necessary, we developed additional assumptions consistent with the NZE Scenario narrative to estimate the performance of our portfolio.

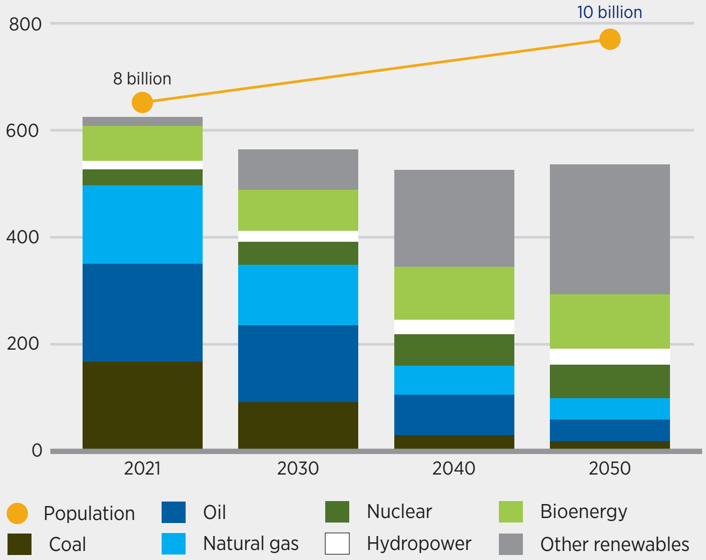
Our Corporate Audit department, which performs the internal audit function at Chevron, conducted a nonrated assurance review of the NZE Scenario analysis. The Corporate Audit department found that the analysis was conducted in accordance with established internal process and emerging external guidance.

IEA NZE Scenario assumptions

The NZE Scenario results in approximately 15% lower global primary energy demand in 2050 than in 2021 (Exhibit 3) while supporting 2 billion more people and a doubling of the global economy. A selection of the scenario's assumptions are as follows:

- Global energy investment doubles, increasing from an average of 2% of annual GDP from 2017 to 2021 to nearly 4% by 2030.
- Universal energy access is achieved globally by 2030.
- Electricity use increases from approximately 20% of final energy consumption today to over 50% by 2050.
- Renewables and bioenergy account for over 80% of the global energy mix by 2050.
- The oil and gas sector's share of total primary energy demand declines from over 50% today to approximately 15% by 2050.
- The power generation sector reaches net zero emissions across all advanced economies by 2035 and net zero emissions globally by 2040.

Exhibit 3. Total primary energy demand in IEA NZE Scenario
(Exajoules)



Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

- Battery storage increases 30-fold between 2021 and 2030, with storage surpassing natural gas as the principal source of system flexibility by 2035.
- No new cars with internal combustion engines are sold after 2035, and nearly all trucks sold in 2040 and beyond use electricity or hydrogen.
- By 2050, crude oil prices drop to less than $25 per barrel, in real terms, and international gas prices drop to $2–$5 per mmbtu, in real terms.
- By 2050, carbon prices rise to $250 per tonne CO_2e in advanced economies, $200 in China, India, Indonesia, Brazil and South Africa, and $180 in other emerging-market and developing economies (Exhibit 4).
- By 2050, CCUS accounts for 6.2 gigatonnes (Gt) of CO_2 removals.
- Energy efficiency and changes in consumer behavior drive much of the emissions reduction (Exhibit 5):
    - Approximately 50% of emissions reductions for industry and buildings result from energy efficiency measures
    - Fuel switching (approximately 65%) and behavior changes (approximately 20%) drive demand reductions in the transportation sector
    - Approximately 75% of the projected emissions reductions related to behavior change stem from measures directly mandated or influenced by government policies such as congestion charges, speed limits and high-speed rail build-out
    - Behavior changes include less space heating and air conditioning, levies on frequent fliers, and policies that encourage travel by rail and discourage car use in cities and SUV ownership

oil

- **Oil demand:** In the NZE Scenario, oil demand drops to approximately 23 mmbd by 2050, a decrease of approximately 75% from today's levels. The majority of oil demand in 2050 is from uses for which oil is not combusted, such as chemical feedstocks, lubricants, paraffin waxes and asphalt. Oil consumption for transportation drops by approximately 90% from 2021. Sectors such as aviation and shipping decline to a lesser extent and account for approximately 2 mmbd of demand in 2050.
- **Oil supply:** Lower demand implies that less supply is required. However, because of the natural decline inherent in oil production, even under the NZE Scenario, ongoing investment in existing fields is still needed. Upstream oil investment averages approximately $300 billion per year through 2030 and $125 billion per year thereafter, in real terms, following rapid deployment in clean energy technology. The IEA states that "reducing oil investment to this level would lead to a very different outcome if done in advance of – or instead of – the huge scaling up in clean energy spending and consequent reduction in oil demand that features in this scenario."

Exhibit 4: IEA NZE Scenario (2022) assumed carbon price

	2030	2050
advanced economies with net zero pledges*	$140/tonne	$250/tonne
emerging-market and developing economies with net zero pledges†	$90/tonne	$200/tonne
other emerging-market and developing economies	$25/tonne	$180/tonne

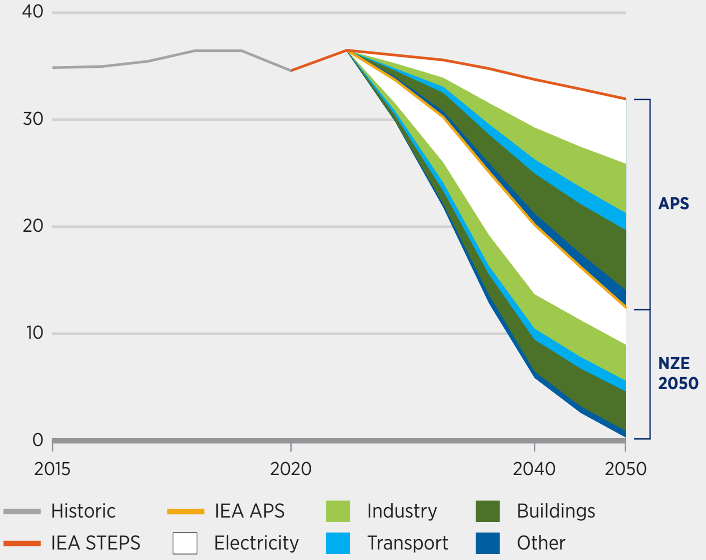
*Includes all Organization for Economic Co-operation and Development (OECD) countries except Mexico.

†Includes China, India, Indonesia, Brazil and South Africa. Note that as of the 2022 IEA NZE Scenario update, this no longer includes Russia.

Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

Exhibit 5. Global CO_2 emissions from energy reductions in IEA APS and IEA NZE Scenario

(Gigatonnes)



APS = Announced Pledges Scenario

STEPS = Stated Policies Scenario

Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

- **Oil price:** The NZE Scenario projects that the price of oil drops to approximately $35 per barrel by 2030 and to less than $25 per barrel by 2050 in real terms. We have assumed this global oil price represents Brent.

> **"there is continued investment in existing fields ... to ensure that supply does not fall faster than the decline in demand"[4]**

natural gas

- **Natural gas demand:** The NZE Scenario approximates that gas demand peaks in the near term and drops 30% through 2030 to 3,300 bcm and 1,200 bcm in 2050, 70% lower than in 2021. By 2050, approximately 40% of global natural gas demand goes to CCUS-paired hydrogen production.

- **Natural gas supply:** As with oil, continued natural gas investment is needed to maintain supply at existing fields in the NZE Scenario. Natural gas investment averages approximately $200 billion per year through 2030 and $85 billion per year thereafter. Under the NZE Scenario, traded volumes of liquefied natural gas (LNG) fall by two-thirds and traded volumes of pipeline gas fall by 85% between 2021 and 2050.

- **Natural gas price:** The NZE Scenario includes projections for country- and region-level gas prices in the United States, European Union, China and Japan. The United States benchmark decreases to $1.9 per mmbtu in 2030 and $1.8 per mmbtu in 2050. The European Union benchmark decreases to $4.6 per mmbtu in 2030 and $3.8 per mmbtu in 2050. The China and Japan benchmarks decrease to approximately $6 per mmbtu in 2030 and $5.1 per mmbtu in 2050. The lack of granular market descriptors and/or regional information in the dataset necessitates additional judgments; we have made additional assumptions to convert these prices to regional benchmarks.

refined products

In the NZE Scenario, rapid electrification of the vehicle fleet leads to a sharp decline in demand for refined products, such as gasoline and diesel, which implies decreased refinery throughput. At the same time, demand for noncombusted refined products, such as petrochemicals, remains more resilient. Refineries able to shift production to chemicals and biofuels may gain competitive advantage, as both of these products see increased demand through 2030. Nevertheless, the scale of changes in the NZE Scenario would inevitably lead to rationalization. Refineries able to shift to other areas, such as chemical recycling, renewable fuels or hydrogen production, may be able to reconfigure to avoid full closure.

CCUS, hydrogen and renewable fuels

- **CCUS:** The NZE Scenario assumes implementation of policies to support a range of measures that establish markets for CCUS investment. By 2050, approximately 6.2 Gt of carbon are captured. While efforts are pursued to increase the efficiency of industrial processes such as cement manufacturing in the NZE Scenario, CCUS plays an important role in limiting these emissions from harder-to-abate energy-consuming sectors. In addition, many developing nations have recently built or are building large numbers of coal power plants. Given the service life of these facilities, retrofitting them with CCUS will be central to reducing emissions in these economies.

- **Hydrogen:** Lower carbon intensity hydrogen production increases from very low current levels to approximately 450 million tonnes in 2050 in the NZE Scenario projections. Approximately 60% is used in end-use sectors, such as for steel and chemical production, with the remainder converted to power or other fuels. By 2050, over 70% of hydrogen production is from electrolysis, with the remainder largely from natural gas in combination with CCUS.

- **Renewable fuels:** Renewable fuels supplies accelerate in the NZE Scenario, with liquid biofuels expanding by a factor of approximately three and biogases by a factor of approximately 12 by 2050. Liquid demand is driven by conventional ethanol and biodiesel for passenger cars and trucks through 2030, shifting to advanced biodiesel and sustainable aviation fuel for shipping and aviation through 2050. Advanced liquid biofuels increase their share of the global aviation fuel market to 40% in 2050. In addition, biogas and biomethane are used for clean cooking fuels and transport via compressed natural gas (CNG) in the NZE Scenario.

portfolio analysis

We tested our portfolio against projected global demand and prices under the NZE Scenario. The NZE Scenario is hypothetical and relies on assumptions that would entail unprecedented policy and other actions by a large number of stakeholders and governments worldwide to achieve net zero global emissions by 2050. While the NZE Scenario paints a fundamentally different and generally unlikely picture of the energy future, based on the assumptions underlying the scenario, we believe Chevron could transition to help meet the world's evolving energy needs projected in the NZE Scenario by taking a number of actions, including: further focusing our upstream portfolio on assets that are the most competitive from a returns, cost of supply and carbon intensity perspective in the short term and midterm; aligning our downstream and chemicals business around scaled, efficient, flexible, integrated and high-margin value chains and renewable fuels; and concentrating our New Energies investments in high-demand growth areas where we have competitive advantage, such as CCUS and hydrogen. Our business model can evolve to deliver the growth of our New Energies business if policies, such as significant economywide carbon prices envisioned in the NZE Scenario, enable lower carbon solutions to scale. Under this hypothetical scenario, we would expect to experience reductions in projected free cash flow* as we evolve from a company focused primarily on hydrocarbon extraction and refining to one primarily focused on low-carbon fuels, low-carbon gases and CCUS. In the long term, New Energies would likely generate the majority of Chevron's free cash flow. As such, New Energies would shift from being a small segment in the portfolio to becoming the most significant contributor to free cash flow.

- **Short-term and midterm impacts (0–10 years), upstream:** In the NZE Scenario, Chevron's upstream investments would likely decrease, adapting to changing industry economics. Our existing portfolio is diverse and flexible, which would allow us to mitigate risk and enable the prioritization of capital to existing assets and resource bases with the highest returns, lowest cost of supply and lowest carbon intensity within our portfolio. In addition, our GHG reduction investments would enable us to further reduce the carbon intensity of our assets and supply the market with lower carbon intensity crude oil and natural gas, which is still needed in the NZE Scenario. Upstream capital and exploratory spending, production and free cash flow would decline over the first decade in the NZE Scenario; however, free cash flow is projected to remain positive.

    - Today, much of our upstream investment is focused in short-cycle, lower carbon intensity assets or development of major existing fields. Our short-cycle assets, like those in the Permian and the Denver-Julesburg basins in the United States, give us the flexibility to respond to commodity price volatility. Our assets in Kazakhstan, the U.S. Gulf of Mexico, Nigeria, Angola and the Eastern Mediterranean would continue to generate positive free cash flow in the short term at lower commodity prices, given limited point-forward investment requirements. These assets provide opportunities for investment in infill drilling and backfill projects that are typically higher return and lower risk, given that they leverage existing assets and infrastructure. Our LNG assets in Australia would generate positive free cash flow in an environment that lacks substantial price growth with our existing asset base and select backfill investments. We believe that our advantaged asset base would continue to attract capital and generate competitive returns even in a hypothetical low-price environment like the NZE Scenario.
    - In a declining-demand and low-price environment like the NZE Scenario, operating costs would likely decline across the portfolio, driven by efficiency initiatives and portfolio rationalization, and a general reduction in industry cost structure would occur due to reduced demand for goods and services.

- **Short-term and midterm impacts (0–10 years), downstream:** Although the NZE Scenario shows a sharp decline in demand for conventional transport fuels, we believe that the downstream portion of our portfolio would remain resilient through 2030 due to continued demand for certain products, including chemicals and lubricants, combined with the actions we have taken to enhance refinery competitiveness. In addition, our investments in the renewable fuels value chain, like our acquisition of Renewable Energy Group, Inc. in 2022 and our joint venture with Bunge North America, Inc., would provide opportunities for more rapid growth as demand for these commodities would increase in the NZE Scenario. Petrochemical demand also increases slightly through 2030 in the NZE Scenario, which could help grow free cash flow from the chemical business.

- **Short-term and midterm impacts (0–10 years), New Energies:** Our focus on scaling lower carbon intensity hydrogen and CCUS solutions aligns with the significant demand growth that occurs in this decade in the NZE Scenario. As is typical of a business in its growth stage, we expect that New Energies' free cash flow will be negative during the next decade as we invest in projects. We believe it could become positive and continue to grow post-2030 if businesses scale and achieve positive rates of return and policy remains supportive in the NZE Scenario.

---

*Free cash flow is a non-generally accepted accounting principles metric and is defined as net cash provided by operating activities less capital expenditures. It generally represents the cash available to creditors and investors after investing in the business.

- **Long-term impacts (10-plus years), upstream:** In this scenario, post-2030, upstream investment would be limited to only our assets that provide the highest returns and have the lowest cost of supply and lowest carbon intensity, signposted by the pace of global demand decline in the NZE Scenario. Positive free cash flow would likely decrease substantially as production would decline. In the NZE Scenario, between 2040 and 2050, positive free cash flows end. The NZE Scenario will ultimately advantage producers at the lowest end of the cost of supply stack. An increase in hydrogen demand could create opportunities to supply gas for CCUS-paired hydrogen from our Permian Basin, Denver-Julesburg Basin and legacy gas assets, such as Gorgon and Wheatstone in Australia and those in the Eastern Mediterranean.

- **Long-term impacts (10-plus years), downstream:** The continued decline in demand for gasoline and diesel would result in reduced need for those products globally. Lighter crudes and lower runs would lead to less feed for conversion units in more complex refineries, which in the absence of flexibility, efficiency and reconfiguration could disadvantage high-conversion refineries (e.g., coking) relative to simpler refineries. Our investments in renewable fuels could allow for full refinery conversion to meet the continued demand for these fuels in the NZE Scenario. In addition, tightly integrated value chains, in areas such as the U.S. West Coast, the U.S. Gulf Coast and Asia, could enable us to pivot these operations to lower carbon intensity hydrogen. Finally, the continued demand for chemicals could enable continued select investments in petrochemical facilities.

- **Long-term impacts (10-plus years), New Energies:** New Energies would generate a significantly larger share of Chevron free cash flow in 2050 as the demand for lower carbon intensity hydrogen and CCUS continues to increase in the NZE Scenario. We expect that New Energies' free cash flow will turn positive between 2030 and 2040, given the assumptions previously mentioned. The rise in carbon prices and enabling policies assumed in the NZE Scenario create significant demand growth for lower carbon intensity hydrogen and CCUS. Our investments in these areas would continue to grow, potentially enabling us to meaningfully pivot and scale into them.

summary of scenario test

Although our asset mix would need to evolve to adapt to various scenarios, we believe our signpost framework (see **page 29**) and portfolio management approach (see **pages 23–24**) would enable Chevron to pivot and scale into areas of opportunity under the modeled assumptions.

We believe our processes for tracking leading indicators and adapting our business enable us to be flexible in response to potential changes in policy, supply, demand and physical risk.

stranded assets

High-profile publications have stated that the portfolios of many oil and gas companies are not competitive in a "well below 2° C world," implying that companies and their investors have significant exposure to "stranded" assets because a company's value is tied to undeveloped assets. Chevron has several robust processes and controls in place to assess our reserves and the economic productivity of our assets.

As part of the internal control process related to reserves estimation, the company maintains a Reserves Advisory Committee, an organization that is separate from the business units that estimate reserves, chaired by the Manager of Global Reserves. Annually, the company assesses whether any changes have occurred in facts or circumstances, such as changes to development plans, regulations or government policies, that would warrant a revision to reserve estimates. A common way to evaluate the depth of a company's reserves is to divide the quantity of proved reserves (R) by the annual production (P), creating a ratio (R/P) that indicates the number of years remaining before all proved reserves will be produced. At the end of 2022, Chevron's R/P ratio was 10.2 years.

Impairment reviews are triggered when events test market assumptions upon which our business plans and long-term investment decisions are made and are based on management's best estimate of future expected cash flows.

Reserve changes and the results of our impairment review processes are detailed in the company's 2022 Annual Report on Form 10-K.

section 3

strategy

Photo: A worker at a tankless facility in Greeley, Colorado.
Tankless production facilities reduce GHG emissions and surface footprint.

section 3: strategy

our strategy is to leverage our strengths to safely deliver lower carbon energy to a growing world

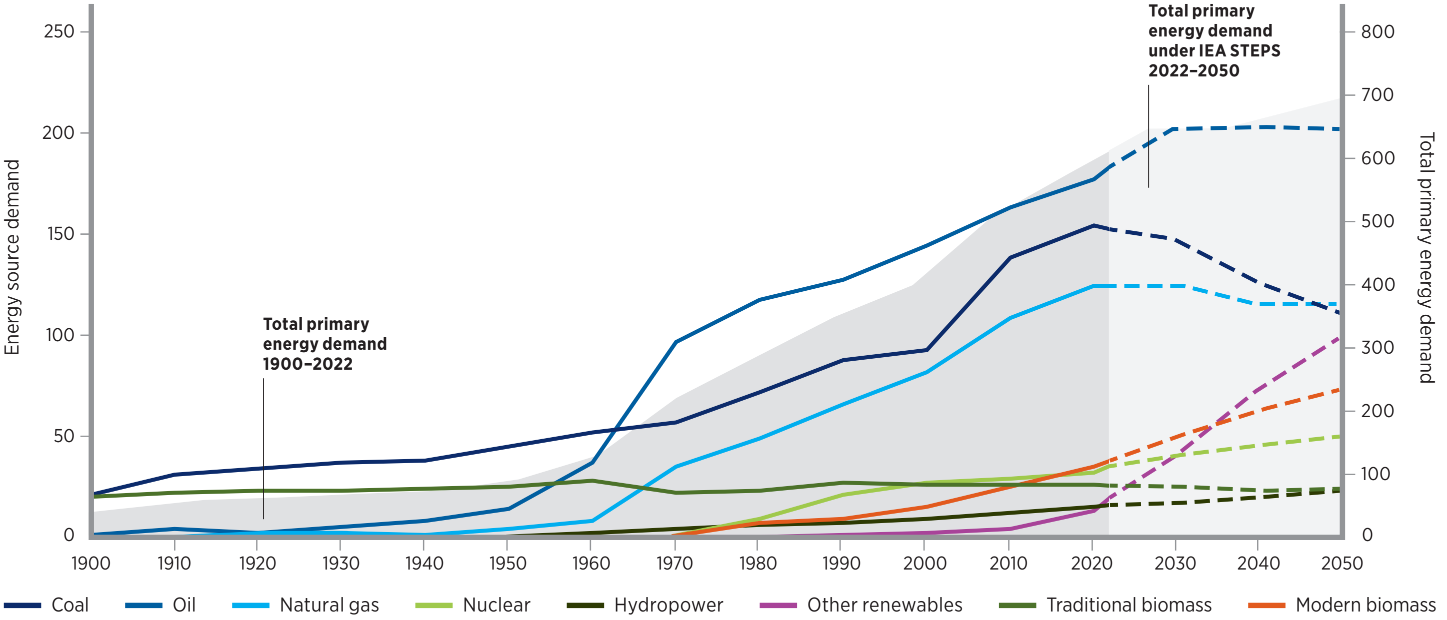
higher returns, lower carbon

Our purpose is to develop the affordable, reliable, ever-cleaner energy that enables human progress. We operate in many jurisdictions that have enacted lower carbon policies. Policy-enabled markets are advancing around the world with emerging support for mandatory reporting, renewables, electric vehicles, hydrogen fuel and CCUS technologies, among others. Under current and potential future market conditions, we seek to understand the impacts of climate-related policies to help guide our actions.

The world's energy demand in recent years is greater than at any time in human history (Exhibit 6). Most published outlooks conclude that fossil fuels will remain a significant part of an energy system that increasingly incorporates lower carbon sources of supply. Within this context, we align our strategy with areas in which we have a competitive advantage and in which we see the potential to generate increased value for our investors.

Oil and gas reservoirs and resources decline naturally over time – investment is needed to maintain them in order to meet projected demand, even in lower carbon scenarios. Given this, we will continue to develop resources to help fulfill the world's demand for energy. At the same time, we will maintain flexibility in our portfolio and examine ways to adapt investment patterns in response to changing policy, demand and energy transition opportunities. We discuss our approach to each energy transition opportunity in Section 4, "Portfolio" (see **pages 38–49**).

Exhibit 6. Global energy transformation since 1900
(Quadrillion BTU)



Sources, as modified by Chevron Corporation: 1900–1970, Hannah Ritchie, Max Roser and Pablo Rosado (2022), "Energy," OurWorldInData.org, ourworldindata.org/energy; *Energy Institute Statistical Review of World Energy* (2023); Vaclav Smil (2017); 1971–2020, IEA (2022), *World Energy Balances* (database), iea.org/data-and-statistics/data-product/world-energy-balances-highlights; 2021–2050, IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

We believe that lower carbon intensity oil and gas assets will remain economically competitive under a wide range of future scenarios. We also believe that our asset mix enables us to be flexible in response to potential changes in supply and demand, even in hypothetical lower carbon scenarios like the NZE Scenario (see **pages 16–21** of Section 2). Our growing new energy businesses provide us with the opportunity to deploy capital and generate returns in accelerated energy transition pathways.

The scale of investment and time involved in finding, extracting and processing oil and gas requires long-term planning and decision making to effectively manage the uncertainties inherent in these markets. Our strategic and business planning processes guide our actions as we aim to safely deliver higher returns and lower carbon.

Key strategic processes that support our ability to operate in a lower carbon future include:

- **Decision analysis (DA):** Our DA process is structured for developing, evaluating and comparing alternatives, including future options, in the face of risk and uncertainty. Our DA function incorporates deterministic and probabilistic analyses and economic and financial analysis tools, along with debiasing techniques, to improve decision quality in many of the following processes.
- **Capital-project approvals:** Investments are developed, approved and implemented in the context of the strategic plan, segment-specific business plans and commodity price forecasts. Investment proposals are evaluated by management and, as appropriate, reported to the Executive Committee and the Board of Directors. Final decisions are guided by a strategic assessment of the business landscape. GHG-related factors are considered in project-appropriation assessments.
- **Business-development screening:** Our screening processes to assess opportunities include a range of considerations, such as portfolio fit and impact on portfolio carbon intensity.
- **Marginal abatement cost curve (MACC):** Our MACC process is a disciplined and value-driven approach to cost-effectively reduce the carbon intensity of our operations and assets by optimizing carbon reduction opportunities and integrating GHG mitigation technologies across the enterprise (see **page 39**). We source emissions reduction opportunities from operated and nonoperated assets. We apply both deterministic and probabilistic analysis to assess opportunities, consistent with our DA practices. We use portfolio theory and efficient frontier analysis to identify a portfolio of opportunities across the technology spectrum, segments, business units and geographies.

3.1 long-term fundamentals

Fundamentals that drive strategic focus and action

Chevron's strategic and business planning processes bring together our views on long-term energy market fundamentals to help guide decisions on strategy, portfolio management, business planning and capital allocation by executives and to facilitate oversight by the Board of Directors (Exhibit 7). We use models and internal analysis to forecast demand, energy mix, supply, commodity prices and carbon prices, all of which include assumptions about future policy and technology developments. A cross-functional team tracks and forecasts long-term fundamentals to inform us of potential changes in market dynamics that could indicate the need for changes to strategy.

Exhibit 7. A disciplined approach to strategy development

3.1.1 Macroeconomic and demographic drivers

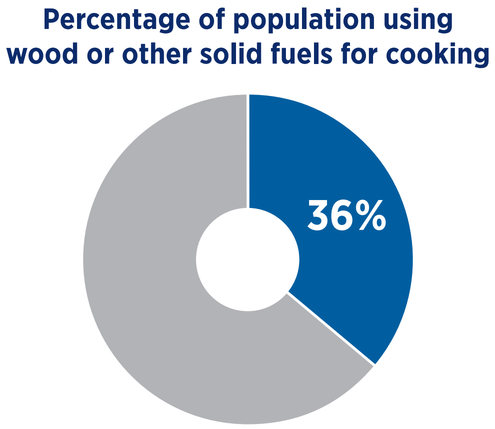
Affordable, reliable energy enables economic development by facilitating modern production techniques across all segments of the economy, which ultimately leads to increased life spans and a higher quality of life.[5]

Individuals and society benefit from access to affordable, reliable and ever-cleaner energy (Exhibit 8). As populations increase and urbanize and as incomes grow and billions of people in less-developed countries seek a higher standard of living, many experts forecast global energy demand to increase (Exhibit 9), even as the energy intensity of the world's economic output declines.[6] Developing economies currently consume 59.1 gigajoules of energy per person as compared with 160 gigajoules per person in advanced economies. Energy use per person across developing economies is approximately 37% of the levels across advanced economies, up from 29% a decade ago.

As advanced economies shift to the service sector, they outsource their manufacturing to developing economies. Rising income levels, population growth and manufacturing expansion contribute to increased energy consumption across developing economies, helping to close the gap with advanced economies. As incomes improve, more economic growth comes from the service sector, which is often more energy- and carbon-efficient than manufacturing. Technological advancements and improvements in energy efficiency will likely further reduce energy intensity.

Changes in consumer behavior can also influence energy demand. Behaviors like remote working and videoconferencing can lead to a decrease in energy demand. Others, like more home deliveries, can lead to an increase in energy demand. The impact of behavior changes may be modulated by other demand drivers, such as government policies or the long life of existing infrastructure. In 2022, the residential sector accounted for approximately 15% of natural gas consumption in the United States, and natural gas was the source of approximately 42% of residential sector end-use energy consumption.[7] Approximately 60% of homes in the United States use natural gas for space and water heating, cooking, and drying clothes.[8] Demand for natural gas is primarily driven by existing homes and buildings, which typically have very long service lives. The IEA estimates that half of the buildings expected to be in use by 2050 are already built.[9]

Exhibit 8. Billions of people would benefit from affordable, reliable and ever-cleaner energy

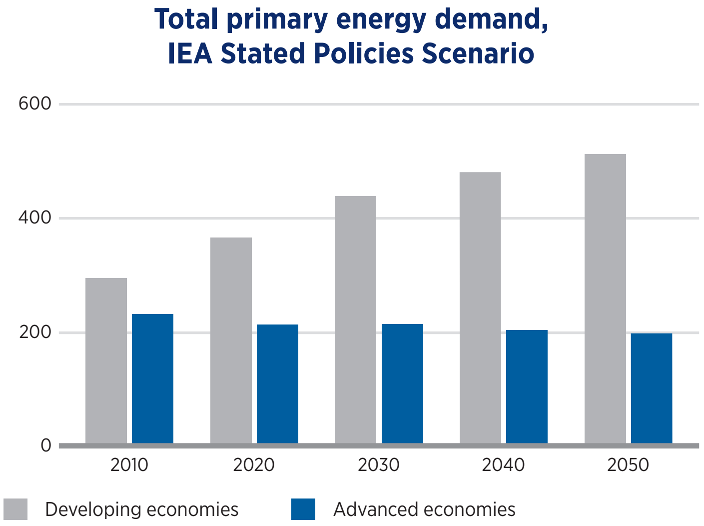


Percentage of population using wood or other solid fuels for cooking

Source: World Health Organization, *Proportion of Population with Primary Reliance on Clean Fuels and Technologies*, who.int/data/gho/data/themes/air-pollution/household-air-pollution. Wood or other solid fuels for cooking are defined by WHO as biomass, charcoal, coal and kerosene.

Exhibit 9. A growing middle class drives demand for access to energy

(Exajoules)



Total primary energy demand, IEA Stated Policies Scenario

Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

3.1.2 Policy trends

Policies, like those that support the Paris Agreement, can change the amount of energy consumed, the rate of energy-demand growth, the mix of energy sources and the relative economics of one fuel versus another. Tracking and anticipating policy trends helps us identify potential changes in energy mix and supply-and-demand scenarios and adjust our outlooks accordingly. We discuss our policy framework and impact analysis in Section 5, "Performance and Policy" (see **pages 54–64**).

The Paris Agreement specifies a goal of "holding the increase in the global average temperature to well below 2° C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5° C above pre-industrial levels."[10] Under the agreement, each country may pursue its own strategies for achieving its Nationally Determined Contributions (NDCs). According to the IEA, the current NDCs do not appear likely to achieve the goals of the agreement,[11] although new, updated or reconfirmed NDCs are intended to be submitted.

According to the IPCC, achieving the Paris Agreement's goals will require peaking emissions as soon as possible and global net zero emissions by around 2070 (2065–2080). The IPCC finds that achieving a 1.5° C scenario with high confidence and without any temporary overshoot would require net zero by around 2050 (2045–2055). Other IPCC scenarios reach net zero later this century, but they achieve 1.5° C outcomes through greater adoption of CO_2 removal opportunities. Achieving a 1.5° C goal will require countries to reduce emissions across all sectors of the economy. It will also require increasing removals by sinks, such as nature-based solutions (e.g., forestry), which absorb more carbon than they release, and through technology solutions (e.g., CCUS).[12]

The IPCC notes numerous potential pathways to achieving the goals of the Paris Agreement. All pathways include the continued use of oil and gas, even in rapid decarbonization scenarios. To achieve net zero emissions by 2050, direct air carbon dioxide capture and storage and carbon capture and storage (CCS) must be scaled up and globally deployed. Without this technology, the IPCC climate models cannot achieve theoretical solutions to reach net zero in the desired time frame.[13]

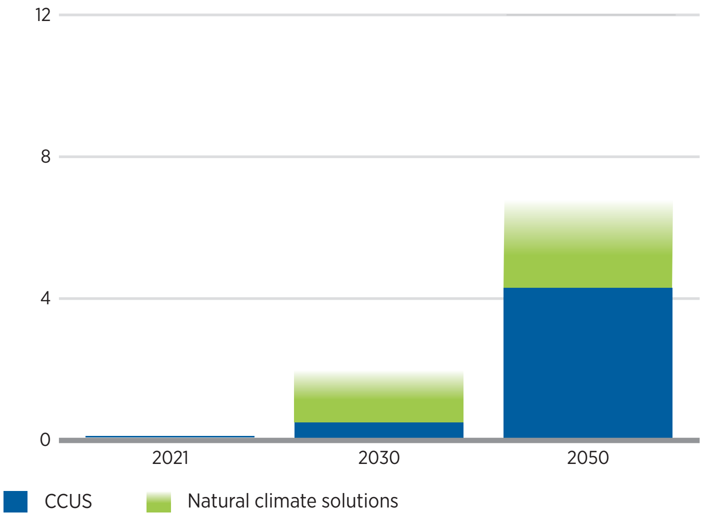
3.1.3 Technology trends

Improvements in technology can reduce energy costs, lower emissions and influence the energy mix by changing the relative competitiveness of different energy types. Four prominent areas of investment include CO_2 removals, hydrogen, renewable fuels and battery storage. Removals, hydrogen and renewable fuels in particular are important technologies to assist in carbon intensity reduction of hard-to-abate sectors. A lifecycle approach to carbon accounting can help assess the relative carbon efficiencies of different technologies. We discuss assessing performance on a lifecycle basis in Section 5, "Performance and Policy" (see **pages 51–52**).

Removals: The IPCC 1.5° C report points out that many pathways to achieving the <2° C goal will require "negative emissions" approaches. Negative emissions, or CO_2 removals, are often classified as natural climate solutions and technology removals, like carbon capture. Both can be essential tools in mitigating GHG emissions and meeting the goals of the Paris Agreement (Exhibit 10).[14] In its *Sixth Assessment Report*, the IPCC continues to recognize the importance of "deploying carbon dioxide removal (CDR) methods to counterbalance residual GHG emissions."[15] CCUS can play a dual role in climate change mitigation: It can be used for technology to remove carbon from the atmosphere with direct air capture (DAC) and reduce emissions from point sources in energy-intensive industries and power generation.[16] According to the IEA Announced Pledges Scenario (APS), CCUS may grow over 100-fold by 2050. To unlock the full potential of natural climate solutions and CCUS, advancement of supportive policy as well as legal and carbon accounting frameworks are needed. For example, if CO_2 is shipped internationally or natural climate solutions are used to create an environmental attribute that is sold to a party in another country, corporate and national GHG inventory accounting could be impacted.[17]

Exhibit 10. CCUS and natural climate solutions could make a long-term contribution toward reducing GHG emissions

(Gigatonnes CO_2e per year)

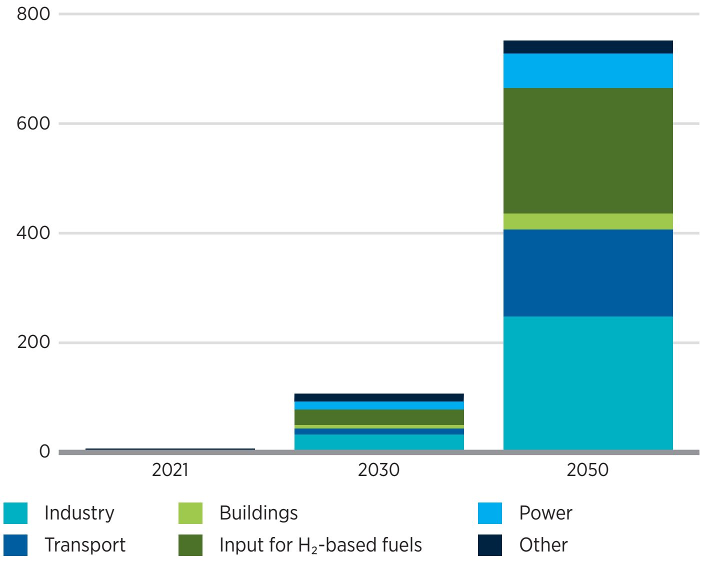


Sources: Griscom, Bronson et al., "Natural Climate Solutions," Proceeding of the National Academy of Sciences of the United States of America, October 2017, pnas.org/content/114/44/11645; University College London, *Future Demand, Supply and Prices for Voluntary Carbon Credits—Keeping the Balance*, June 2021, trove-research.com/report/carbon-credit-demand-supply-and-prices; IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

Hydrogen: Hydrogen is a versatile energy carrier, with potential as a lower carbon fuel, particularly in sectors where carbon intensity is harder to abate, including heavy-duty transportation, marine transportation and heat-intensive manufacturing. Hydrogen may also play a role in the power generation sector as a fuel source and as a storage medium to balance intermittency of renewables. Lower carbon intensity hydrogen demand could significantly increase if infrastructure is built and hydrogen costs come down (Exhibit 11).[18] The emergence of hydrogen value chains connecting producers with consumers is also critical to enabling scale. Government policies can help reduce costs and lower the risk of investment for early entrants. Transparent and standard quantification of carbon intensity of hydrogen and hydrogen-derived fuels is needed to inform decision making and accelerate effective reductions. More than 15 different standards exist or are under development to calculate hydrogen carbon intensity. Each varies on key approaches, such as temporal and geographical location of renewable energy used for hydrogen production[19] and chain of custody requirements. The same activity or product having a different emissions performance assessment can lead to methodology arbitrage, market fragmentation and suboptimal investment.

Exhibit 11. Under the IEA APS, hydrogen demand could significantly increase by midcentury

(bcm/y)



Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

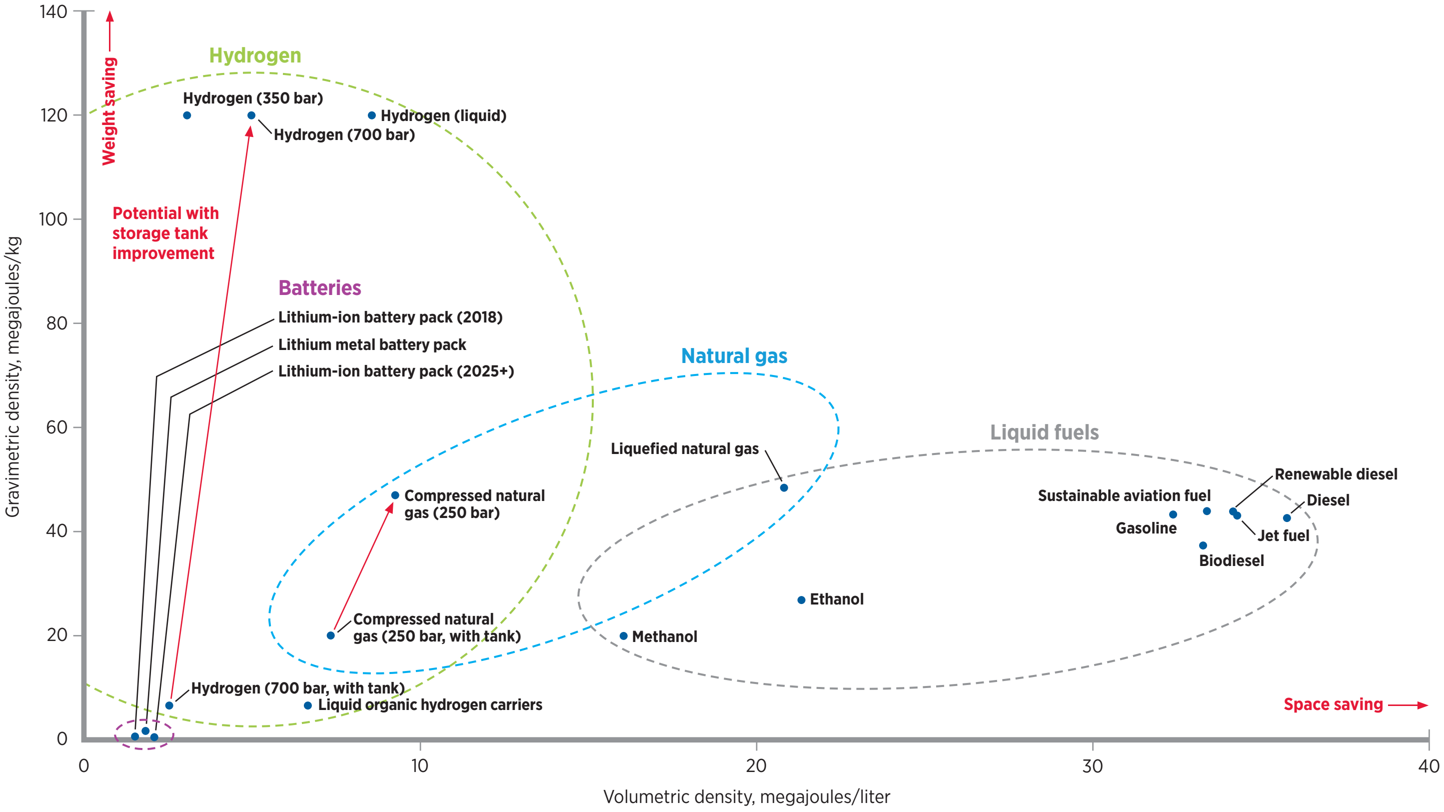
Renewable fuels: Renewable fuels can be produced from bio-based feedstocks through conventional refining process technologies and include biodiesel, renewable diesel, sustainable aviation fuel (SAF) and advanced gasoline. The IEA notes that renewable fuels will be central to reducing emissions from long-distance transportation, aviation and high-temperature heat industries. Renewable fuels are particularly important in lowering the carbon intensity of transportation, serving as low-carbon solutions for existing technologies, such as light-duty vehicles in the near term and heavy-duty trucks, ships and aircraft with few alternative solutions in the long term. Many renewable fuels are compatible with existing infrastructure and can be used with existing technologies, making them an attractive lower-emissions substitute for conventional fuels. Use of renewable fuels can result in lower emissions than conventional fuels on a lifecycle basis, depending on feedstocks, production pathways, and carbon accounting treatment of emissions associated with cropland cultivation and avoided emissions. Differences in accounting treatment can result in the same biofuel appearing to have different carbon performance.

Battery storage: Over the past decade, there has been notable cost reduction and performance improvement in lithium-ion (Li-ion) batteries and other storage technologies. However, in recent years, cost declines have slowed, and in 2022, costs actually increased due to higher raw material prices and supply chain constraints.[20] Renewable energy production and technology advancements such as smart-grid and demand-management, coupled with battery storage, have the potential to increase electrification and reduce carbon emissions. These advances facilitate increased use of renewable energy in electricity generation and help mitigate the problem of intermittency.

Assessing the carbon efficiency of technologies enabled by batteries can be enhanced using a lifecycle approach to carbon accounting. For example, batteries can account for up to 60% of GHG emissions in electric vehicle (EV) production.[21] Including emissions associated with battery production in a lifecycle assessment of carbon accounting can provide a more complete assessment of relative GHG performance.

Even with improvements in energy storage, many leading energy experts agree that additional technology breakthroughs are needed to enable wider scaling of renewables and decarbonization in other hard-to-abate sectors. We believe CCUS and hydrogen are among the most promising of these other technologies.

Exhibit 12. Energy density of different fuel sources can drive the attractiveness of fuel types



Sources: Argonne National Laboratory, *GREET Model Fuel Specifications*, 2022, greet.anl.gov; *Advanced Automotive Battery Conference (AABC) for Li-ion Battery Performance*, 2018, with Chevron internal compilations.

Energy density of different fuels: The energy density and portability of a fuel are among the most important characteristics when considering viability for use in transportation (Exhibit 12). Two important aspects are as follows:

- **Gravimetric density**, the energy contained in a unit mass of fuel, determines how far a vehicle can travel with a given amount of fuel. Higher gravimetric density means less weight is required to be carried as fuel, meaning more weight capacity is available for carrying people and freight.
- **Volumetric density**, the energy stored in a unit volume of fuel, determines how much space the fuel takes up. Higher volumetric energy density means less vehicle space is required to store the fuel, and thus more space is available for carrying people and freight.

Fundamental differences in energy densities are a major obstacle to using alternative fuels for some modes of transport, such as long-distance shipping and air travel. To date, few alternative fuels or energy storage systems can surpass the energy densities of liquid fuels.

Gaseous fuels, like CNG and hydrogen, currently require large and heavy tanks for onboard vehicle storage. Further research and development are needed to reduce the weight and size of such storage tanks. Li-ion battery systems have achieved considerable progress in light-duty vehicle applications in the past decade, but some trade-offs in range, which is dictated by energy density, still exist.[22]

3.2 future energy mix

We have a cross-functional team that forecasts the energy system decades into the future. By tracking and analyzing energy demand and energy mix drivers, we work to understand which sources of energy supply, including oil and gas, are likely to meet expected demand. We believe the energy mix will continue to be primarily determined by the economics of each energy supply source, which are influenced by the intersection of cost of production as well as by macroeconomic and consumer, policy and technology trends. The relative importance of these factors can vary by region and over time.

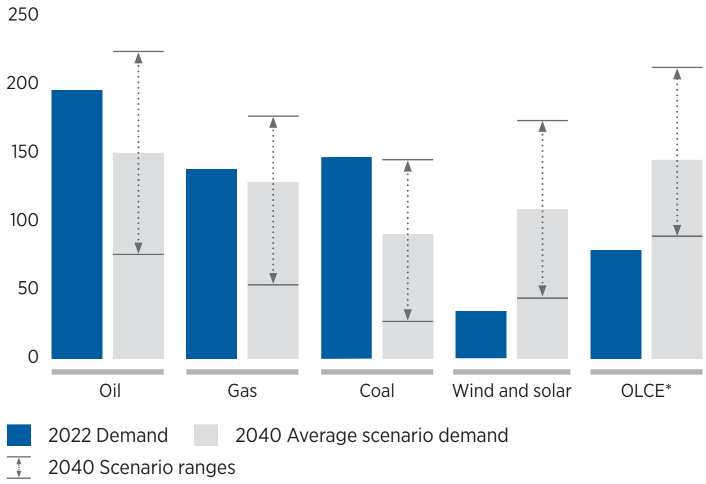
Though oil and gas may one day fall below today's share of the energy supply, many energy experts agree that these commodities will be required to satisfy global energy demand under almost any future market scenario – even one in which policies increasingly aim to limit fossil fuel use and reduce GHG emissions (Exhibit 13).[23]

Oil and gas currently account for a majority of global energy supply, at approximately 330 exajoules per year, and have a diverse set of end uses (Exhibit 15). In some uses, like aviation, marine, freight and petrochemicals, there are few, if any, cost-effective and scalable alternatives to oil. Reduction in oil demand is limited by the slow turnover of transportation stock (Exhibit 16).[24]

As the future is uncertain, we leverage signposts that help us track market conditions and the evolution of the energy system (Exhibit 14). Our signpost framework includes indicators for energy investment, consumer behavior, raw material inputs, electrification, government policy and the deployment of low-carbon technologies. Our signposts also track progress in emerging energy technologies, including battery storage, modular nuclear and fusion, that could radically transform the energy system should breakthroughs occur.

Exhibit 13. Most scenarios, which vary in likelihood, show a range of energy sources will make up the future energy mix

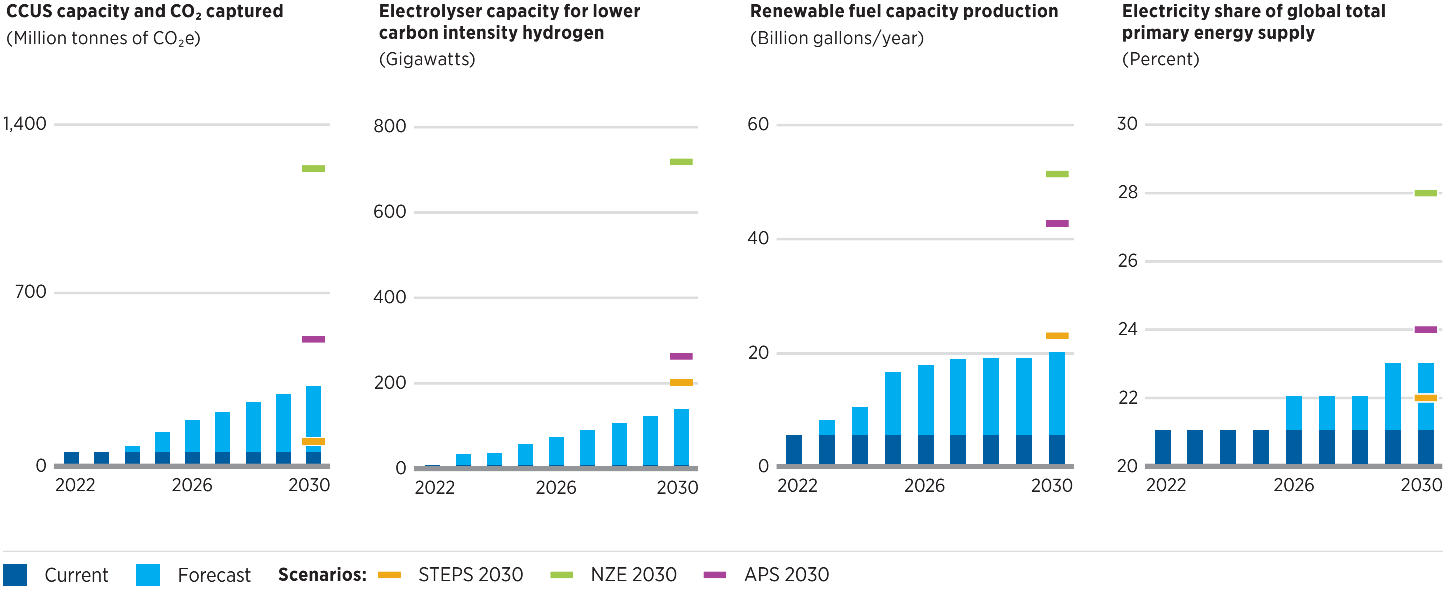
(Exajoules)



Sources: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A); BNEF Scenarios: Energy Transition Scenario 2022, Net Zero Scenario 2022; Wood Mackenzie Scenarios (2022): Energy Transition Outlook, Accelerated Energy Transition 2° C; S&P Global Commodity Insights Scenarios (2022): Inflections (IHSM), Green Rules (IHSM), Discord (IHSM), Accelerated CCS (IHSM), Multitechnology Mitigation (IHSM), December Most Likely Case (Platts), 2° C Case (Platts).

*OLCE: Other low-carbon energy (nuclear, hydrogen and biomass)

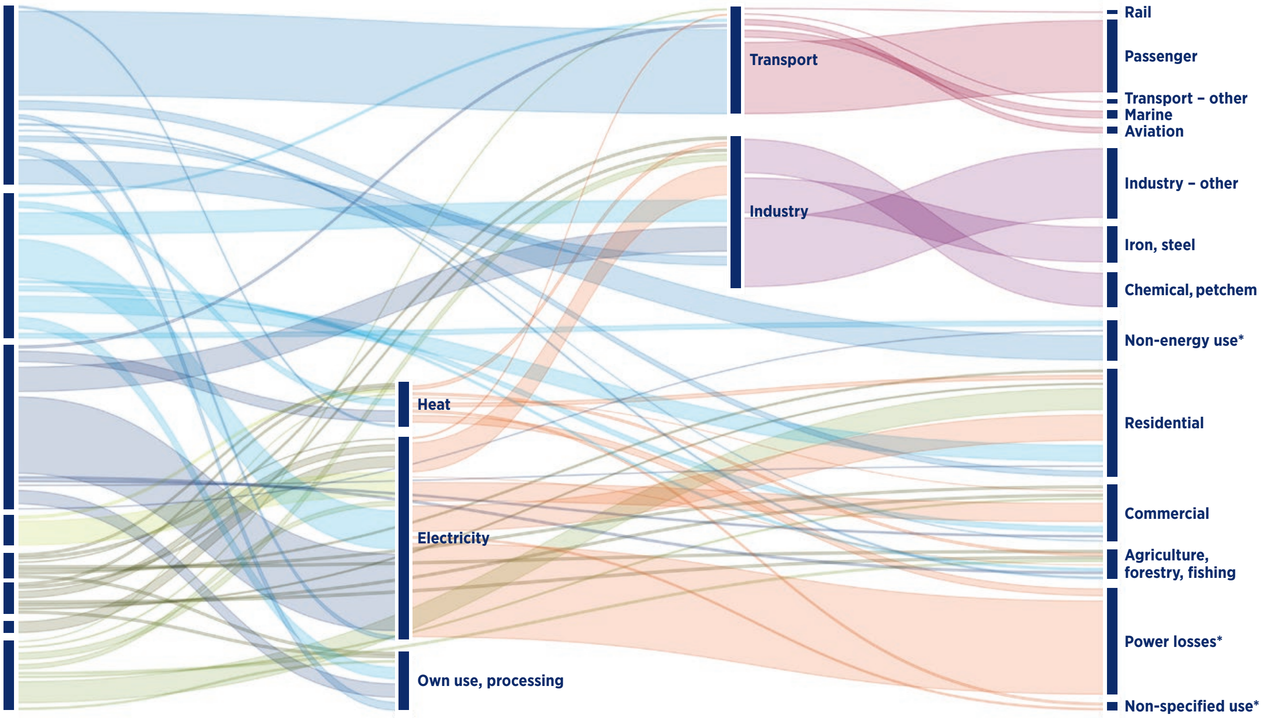
Exhibit 14. Select signposts we monitor to track the energy transition



Forecast: Renewable fuels includes new projects that have been announced that are under construction or have reached final investment decision (FID); CCUS includes under-construction and planned CO_2 capture facilities with an announced capacity of more than 100,000 tonnes per year (or 1,000 tonnes per year for DAC) and an announced timeline; lower carbon intensity hydrogen production from electrolysers includes projected capacity on the basis of announced projects; electricity forecast from S&P Global Commodity Insights, Inflections base-case scenario.

Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A); IEA, *CCUS Projects Database*, iea.org/data-and-statistics/data-product/ccus-projects-database, License: CC BY 4.0; BloombergNEF, *Global Renewable Fuel Projects Tracker* (1.2.2), bnef.com/insights/26611; S&P Global Commodity Insights Scenarios (2023): Inflections (IHSM).

Exhibit 15. Oil and gas have many important and diverse uses, as shown in world energy flows



***Power loss** = Thermal loss from the generation of electricity and loss in gas distribution, electricity transmission and coal transport. **Non-energy use** = Those fuels that are used as raw materials in the different sectors and are not consumed as a fuel or transformed into another fuel. Non-energy use is shown separately in final consumption under the heading "non-energy use." **Non-specified use** = All fuel use not elsewhere specified, as well as consumption in the above-designated categories for which separate figures have not been provided. Military fuel use for all mobile and stationary use is included here (e.g., ships, aircraft, roads and energy used in living quarters), regardless of whether the fuel delivered is for the military of that country or for the military of another country.

Based on data from: IEA, *2021 World Balances*, excluding "Other Energy Sector" balances, iea.org/sankey/, modified by Chevron Corporation.

Exhibit 16. Turnover of energy infrastructure will influence the pace of change

12 **years**	pickups
13 **years**	passenger cars
17 **years**	other trucks
27 **years**	aircraft
30 **years**	gas power plants
50+ **years**	gas pipelines
75 **years**	buildings

Sources: Bureau of Transportation Statistics (BTS), *Average Age of Automobiles and Trucks in Operation in the United States*, bts.gov/content/average-age-automobiles-and-trucks-operation-united-states; BTS, *Average Age of Aircraft 2019*, bts.gov/2019-average-age-aircraft; Energy Information Administration (EIA), *Natural Gas Explained: Natural Gas Pipelines*, eia.gov/energyexplained/natural-gas/natural-gas-pipelines.php; EIA, *Assumptions to the Annual Energy Outlook 2023: Commercial Demand Module*, eia.gov/outlooks/aeo/assumptions/pdf/CDM_Assumptions.pdf; Portland Cement Association, *Durability*, cement.org/learn/concrete-technology/durability.

3.3 demand and supply

How we approach demand: Our views on short- and long-term demand are based on analysis of macroeconomic and demographic trends, technological pathways, consumers' behavioral patterns, and policy impacts, among other factors. Growing populations, rising incomes and urbanization are the principal forces behind energy-demand growth, as they typically lead to greater use of transportation, heating, cooling, lighting and refrigeration. Policies will continue to play a large role in aggregate energy demand and fuel mix. Given the range of uncertainty across key demand drivers, we analyze multiple demand scenarios as part of our annual planning cycle.

How we approach supply: Every year, we develop a range of long-term supply scenarios for oil, gas and refined products to inform our views on prices, test our strategies and assess business risks. The process involves our proprietary view of the principal drivers of supply growth, including resource supply curves, production constraints, capacities at secondary processing facilities, fiscal and financial requirements, and geopolitical trends and shifts. Given the complex set of variables and uncertainties associated with forecasting long-term supply, we routinely examine multiple scenarios and assess our forecasts against third-party perspectives.

3.3.1 View on oil demand

In 2022, global liquid fuel demand rose to approximately 100 mmbd and nearly recovered to pre-COVID-19 levels.[25] The IEA projects global oil demand to grow to approximately 102 mmbd in 2023, supported by the world's growing demand for mobility.[26] The 102 mmbd level would represent a new record high for annual oil consumption. Although global oil demand has grown at a rate of approximately 1 mmbd, or 1% per year, over the past several decades, the IEA Stated Policies Scenario (STEPS) projects that global oil demand will plateau at approximately 102 mmbd through 2050. Future projected growth in China, India and Southeast Asia is offset by projected demand declines in advanced economies. Other third-party scenarios project global oil demand between a low of approximately 70 mmbd and a high of 112 mmbd in the 2040–2050 horizon, highlighting the range of future uncertainty on oil's forward trajectory.

3.3.2 View on oil supply

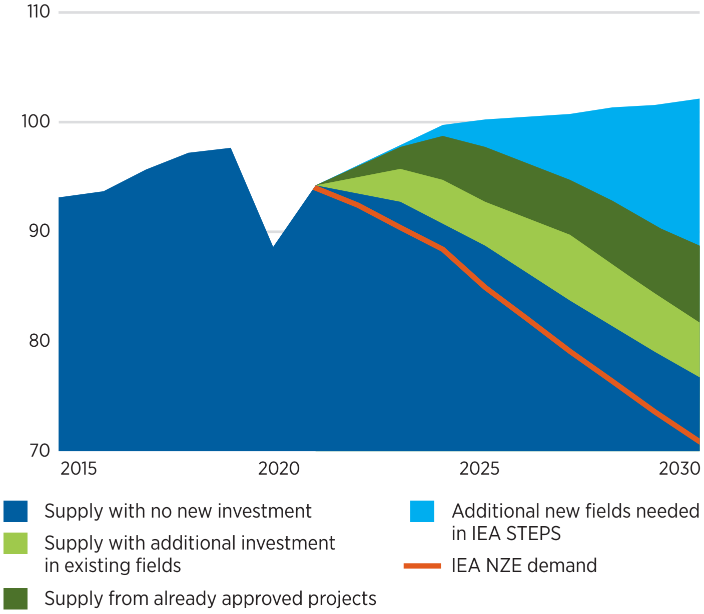
At a macro level, oil supply is significantly impacted by producers' strategies to manage near- and long-term uncertainties. For example, producers respond to demand expectations by adjusting investment levels. The IEA estimates that upstream oil and gas investments have risen by 18% since 2020, when they bottomed out due to COVID-related demand shocks.[27] Further, geopolitical factors can drive production levels, evidenced by fluctuations in OPEC+ (OPEC plus 11 non-OPEC members) production since 2021.

Capital spending on oil and gas is also impacted by the continued need for maintenance and investment in existing assets to manage decline rates (Exhibit 17). The production profile for a well, a field or a geography depends on geological circumstances, engineering practices and government policies, among other factors.

Although non-OPEC decline rates have been estimated to be approximately 3%[28] over the past decade, the increasing share of shale and tight oil has led to higher decline rates. Price declines stemming from COVID-19 demand shocks and OPEC+ tensions, uncertainty about the nature of demand recovery from the pandemic, limited price recovery, and a more constrained capital market could lead to inadequate investment, future supply shortages and price volatility.

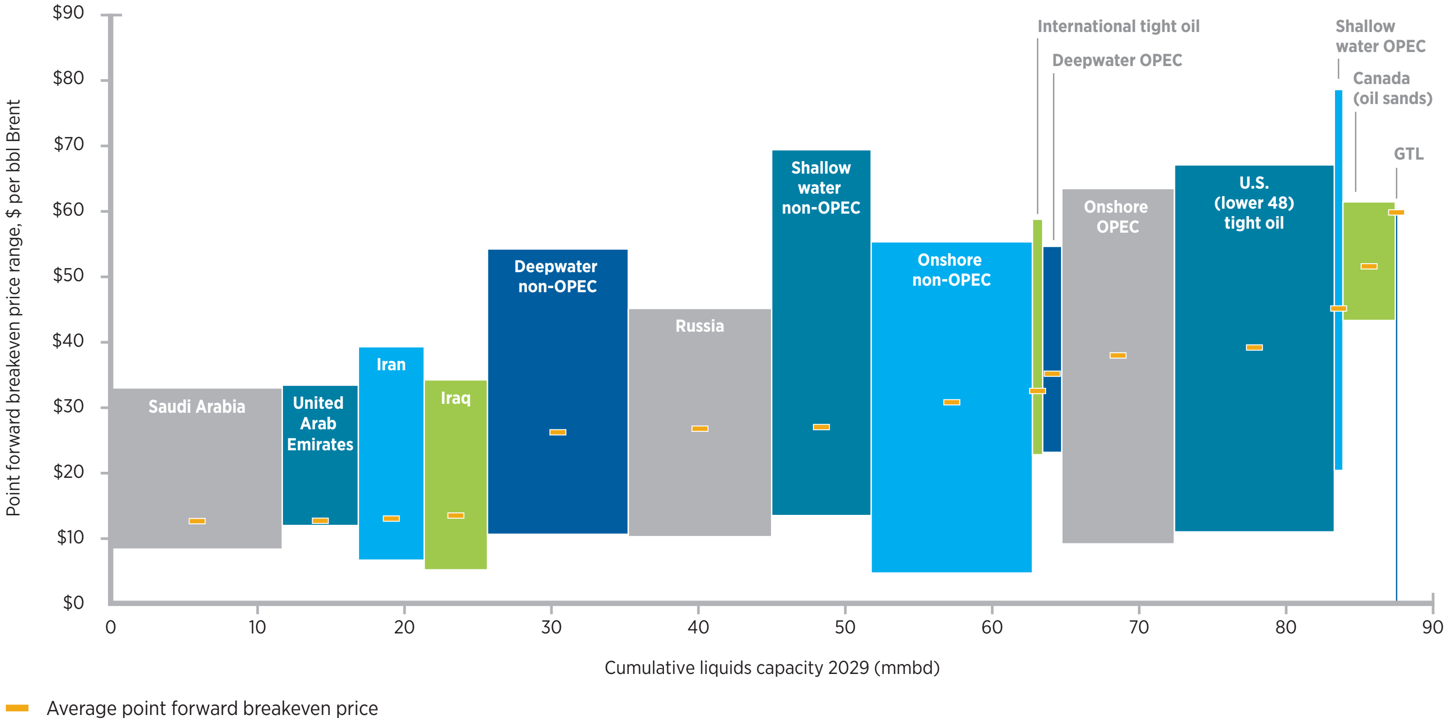
Although oil markets are well supplied in the short term, in the medium term more investment would be required to meet increased demand – often referred to as the "supply gap." We analyze this gap in order to forecast which types of resources will be needed in the future. Typically, the most economical barrels are produced from reinvesting in existing production to minimize natural decline.

Exhibit 17. Realized decline rates determine the size of the supply gap and opportunities for new investment
(mmboe/d)



Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

Exhibit 18. Global liquids long-term supply curve and average point forward breakeven prices in 2029 show the supply curve is relatively flat, implying increased competition among producers



Liquids supply shown includes crude oil, natural gas liquids, coal-to-liquids (CTLs) and gas-to-liquids (GTLs).

Point forward breakeven is the amount of capital needed to produce the resource from today forward. This differs from full-cycle breakeven, which includes all costs for developing a new field. For a further discussion of breakeven calculations, see *Energy Economics*, *Tight Oil Market Dynamics: Benchmarks, Breakeven Points, and Inelasticities*, February 2018, sciencedirect.com/science/article/pii/S0140988317304103.

Source, as modified by Chevron Corporation: Wood Mackenzie, *Oil Supply Tool*, May 2023.

A common way to visualize oil supply is via a supply curve by resource type, in which the width of the bar represents the amount of total production for a given year and the height of the bar indicates a representative price range over which that resource is economical to produce (Exhibit 18). Similar types of resources, or resources from certain regions, are grouped together and thus show a range of prices instead of a single price. In a more detailed and expanded version, every field would be its own line on the supply stack. Assets can move relative to one another when their breakeven values change due to technology, geopolitical or policy changes, fiscal terms, or other reasons. The supply stack is a useful way to gauge trends in the overall cost of supply and whether there have been shifts through time. However, care should be taken when drawing detailed conclusions from a supply stack, as the exact annual values depend on forecasts, such as project timing and performance.

3.3.3 View on natural gas demand

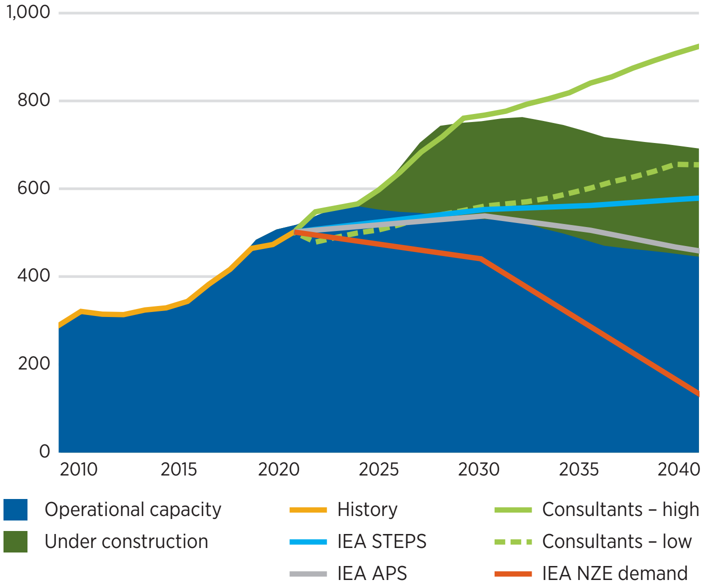
The IEA estimates that global natural gas demand fell by 1.5% in 2022 to 4,046 bcm as key markets, notably Europe, faced an energy crisis and record high prices in the wake of supply disruptions stemming from the Russia-Ukraine military conflict. In 2022, LNG accounted for approximately 40% of natural gas exchanges.[29] The IEA projects global gas demand to remain near 2022 levels in 2023 as growth in Asian gas markets is offset by further declines in Europe. The STEPS projects that global gas demand will increase to just over 4,300 bcm in the 2030s and will plateau around that level through 2050. Growth in natural gas demand is driven by natural gas's status as a relatively cost-competitive resource, a desire among industrial consumers to diversify fuel sources, and efforts in some jurisdictions to reduce local air pollution and carbon emissions. Gas markets continue to price regionally, with Asia-Pacific remaining the largest growth market for gas to 2050.[30] However, Asia will continue to compete with Europe for incremental LNG supply as the latter seeks to replace lost Russian supply. Due to concerns around cost and energy security following the Russia-Ukraine military conflict, scenario ranges in future demand of natural gas are very wide for the next decade or so. A recent analysis of third-party future energy scenarios shows that forecasted natural gas demand in 2040 ranges from roughly 1,000 bcm to 7,000 bcm, a range wider than total gas demand in 2022 (4,000 bcm).

3.3.4 View on natural gas supply

As with oil, we analyze future gas supply needs against demand growth in the context of a supply curve to forecast future economically competitive sources of supply. LNG accounted for approximately 500 bcm, or approximately 12%, of global natural gas supply in 2022. LNG is projected to increase to roughly 650 bcm by 2050 per the STEPS, making up approximately 15% of the global natural gas markets. Many third parties project that there will be enough capacity from producing assets and projects under construction to satisfy global demand through 2025 (Exhibit 19). In the medium to long term, a supply gap could open up as soon as the mid-2020s or beyond 2030, depending on resilience of demand in Europe, the adoption of gas in emerging economies, the speed of recently announced LNG liquefaction and regasification facility construction, and the pace of wind, solar and energy storage construction. Europe is expected to continue importing LNG and additional piped gas from North Africa to displace Russian supply. Asia is expected to experience the greatest demand growth, and with limited pipeline capacity, the region is forecasted to import more LNG in the coming decades. This is one reason LNG is predicted to be the fastest-growing source of supply within the gas sector.

Exhibit 19. LNG supply and demand scenarios

(bcm)



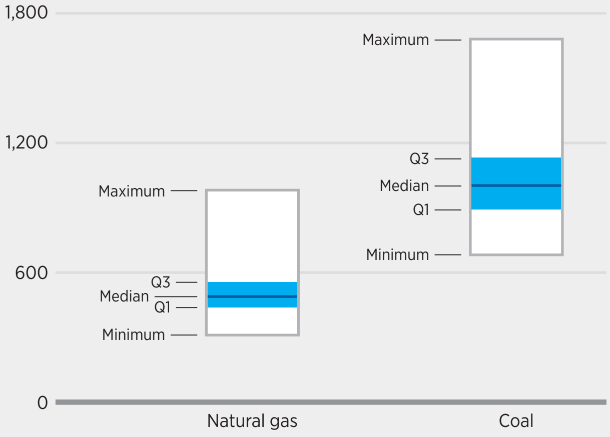
Sources: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A). Wood Mackenzie, *LNG Tool*, 2023 Q1 dataset, accessed April 4, 2023, spotfire.woodmac.com/Viewer; S&P Global LNG Analytics, LNG Supply-Demand Forecasts, Scenarios: Demand, accessed April 4, 2023, connect.ihsmarkit.com.

avoided emissions

The IEA and others have recognized the value and emissions reductions benefits of switching from coal to natural gas. Per the National Renewable Energy Laboratory's (NREL) analysis, electricity generated from natural gas is approximately 50% of the lifecycle carbon intensity of electricity from coal, inclusive of emissions associated with flaring, venting, fugitives and end use.[31]

Lifecycle GHG emissions estimates for electricity generation technologies powered by nonrenewable resources

(g CO_2e/kWh)



Source: NREL, *Life Cycle Assessment Harmonization*, nrel.gov/analysis/life-cycle-assessment.html.

3.3.5 View on refined-products demand

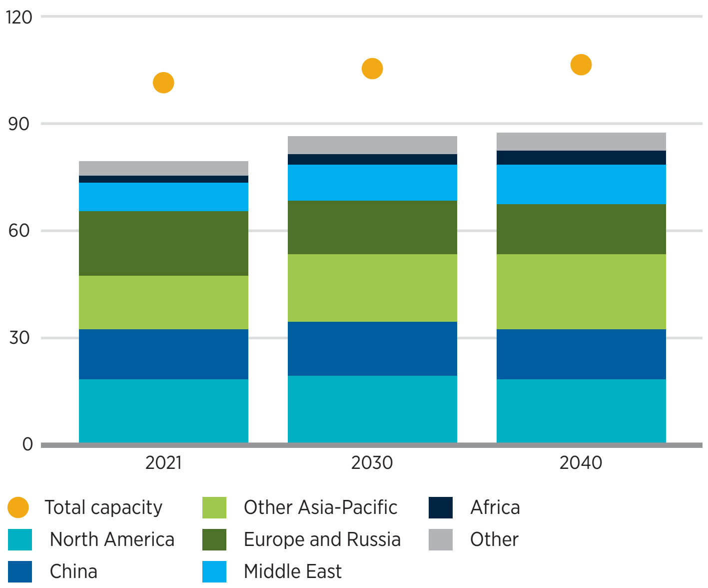
Transportation fuels and petrochemicals have accounted for most of the growth in global oil demand since 2010 and are expected to underpin sustained growth in demand over the next decade. In the STEPS, product-demand growth continues as increases in demand for transportation services and petrochemicals offset lower demand due to improved vehicle efficiency, greater use of biofuels and electrification. The STEPS assumes that EVs reach over 25% of new vehicle sales globally by 2030, enabling the EV fleet to expand by 11-fold this decade. Rising EV adoption and improving vehicle efficiency contribute to reduce gasoline demand by just over 2.2 mmbd by 2040. Overall liquid fuel demand increases by over 10 mmbd by 2040 in the STEPS, with growth primarily driven by air travel, trucking, shipping and petrochemical feedstocks. Demand for high-value petrochemicals, used to produce plastics, resins and fibers (among other products), is projected to rise by almost 20% between 2021 and 2030 in the STEPS. Policies and technologies aimed at reducing plastic waste and increased chemical recycling could reduce demand for oil and gas feedstocks, but even if recycling rates increase from roughly 5% today to 50% by 2050, as in the APS, oil demand from the petrochemicals sector is expected to remain in the 15 mmbd range.

3.3.6 View on refined-products supply

Global refining capacity stood at a little over 101 mmbd as of 2021 (Exhibit 20). As a result of COVID-related demand declines in early 2020, utilization collapsed to less than 75% due to historically low demand. Refinery closures and conversions have since removed 3.8 mmbd of capacity.[32] By 2022, refinery utilization had increased to over 91% in the United States and 75% globally, with China and Russia utilizations still running below pre-COVID or pre-conflict levels. On an annual average basis, fleetwide refinery utilization rarely climbs much higher than 95% in the United States because of maintenance periods and seasonal periods of less demand.[33] Most capacity additions are expected in Asia, where the majority of demand growth is expected to occur. Additional capacity growth is expected in the Middle East.[34] Some refiners in the United States and Europe may convert to renewable and biofuels production to take advantage of existing and emerging policies. Biofuels production is expected to increase by 57% by 2030.[35]

Exhibit 20. The gap between refinery runs and total capacity is expected to narrow by 15% by 2040

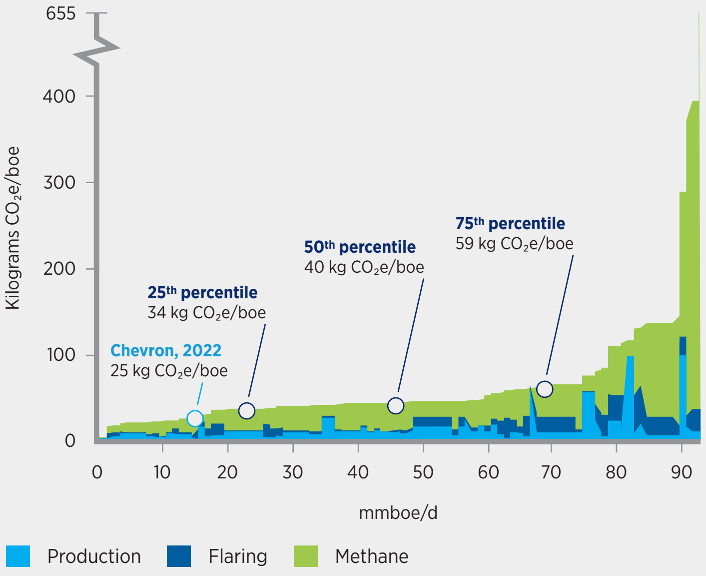
(mmbd)



Source: IEA, *World Energy Outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

Exhibit 21. The 2019 global average oil production carbon intensity was 52 kg CO_2e/boe

Higher-cost production is often correlated with more energy- and emissions-intensive production. For example, some heavy oil may require steam for production, which can impact both cost and emissions.

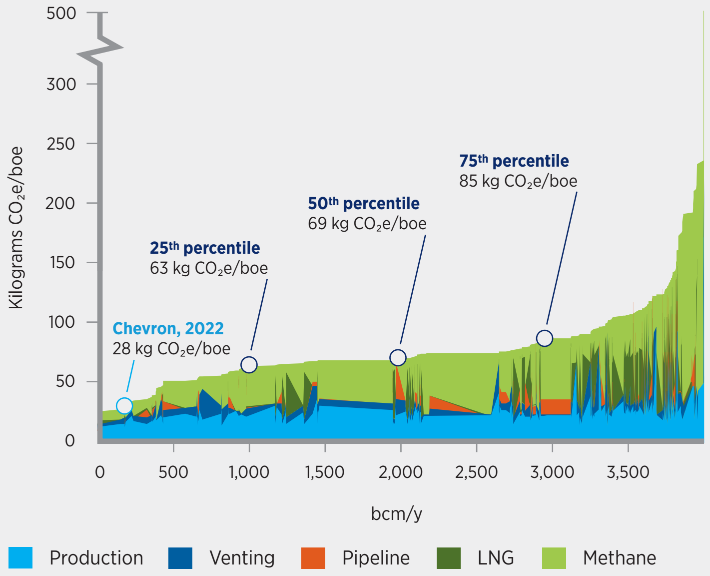


Note: Based on field-level data.

Source: IEA 2019, *Spectrum of the Well-to-Tank Emissions Intensity of Global Oil Production*, iea.org/data-and-statistics/charts/spectrum-of-the-well-to-tank-emissions-intensity-of-global-oil-production-2019, License: CC BY 4.0.

Exhibit 22. The 2018 global average gas production carbon intensity was 69 kg CO_2e/boe

LNG is generally more carbon-intensive than gas supplied via pipeline. Decisions about electrification, recovering waste heat, avoiding fugitive and vented emissions and flaring, and deploying CCUS technology can all impact the carbon intensity of gas.



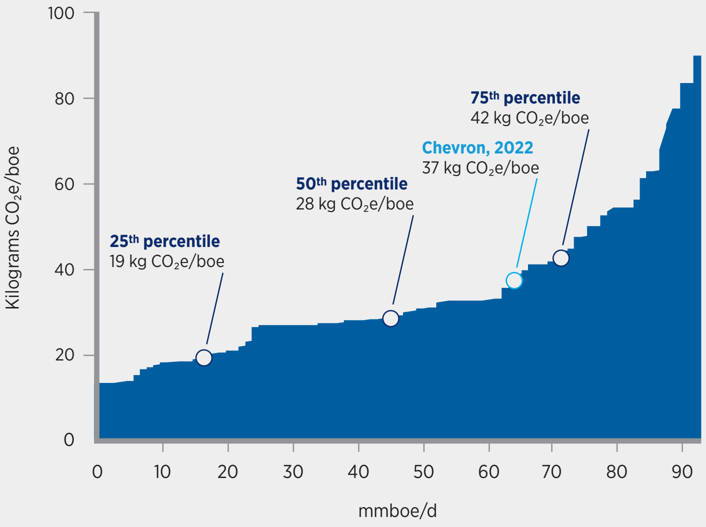
Note: Based on field-level data.

Source: IEA 2018, *Spectrum of the Well-to-Tank Emissions Intensity of Global Gas Production*, iea.org/data-and-statistics/charts/spectrum-of-the-well-to-tank-emissions-intensity-of-global-gas-production-2018, License: CC BY 4.0.

Carbon intensity of upstream production: Carbon intensity, or CO_2e per unit of production, of each resource type is loosely correlated to the resource's position, or cost of production, on the supply curve. Like the wide distribution of supply cost for each resource type, carbon intensity for each resource type is widely distributed and can be influenced by the producer. The charts from the IEA's *Spectrum of the Well-to-Tank Emissions Intensity of Global Oil Production (2019)* and *Global Gas Production (2018)* presented in Exhibits 21 and 22 above represent IEA estimates for global carbon intensity supply stacks for oil and gas, with the methane global warming potential (GWP) converted to the IPCC AR4 values. Per Ipieca, the preferred source for GWP factors is the IPCC's AR4.[36]*

Carbon intensity of refining: Generally, more-complex refineries are more carbon-intensive per unit of throughput than simpler refineries. More-complex refineries also have the ability to produce more higher-value products like gasoline, diesel and jet fuel. The IEA estimates global carbon intensity supply stacks for refining on a throughput basis (Exhibit 23).

Exhibit 23. The 2019 global average refining carbon intensity was 33 kg CO_2e/boe



Source: IEA 2019, *Spectrum of the Well-to-Tank Emissions Intensity of Global Oil Production*, iea.org/data-and-statistics/charts/spectrum-of-the-well-to-tank-emissions-intensity-of-global-oil-production-2019, License: CC BY 4.0.

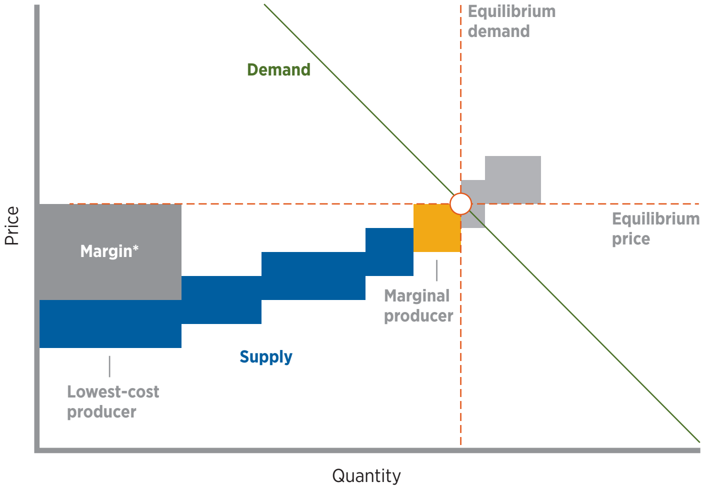
---

*As part of the IPCC review process, climate change scientists regularly review the GWP of different greenhouse gases and update their perspective on the current scientific consensus of the GWPs. Governments and industry then often use these GWPs in the development of their greenhouse gas inventories. The AR4 100-year Global Warming Potential (GWP 100) assigns a GWP of 25 to convert the mass of methane to its CO_2e value. AR5, released in 2014, assigns a GWP 100 of 28. AR6, released in 2021, assumes a GWP 100 of 29.8 for fossil fuel sources of methane.

3.4 prices: near term and long term

We analyze near- and long-term commodity prices with climate change policies and other regulatory and policy impacts. We utilize various quantitative methods to combine our supply-and-demand views and solve for equilibrium commodity prices at which the marginal producer can enter the market and still earn a reasonable rate of return (Exhibit 24).

Exhibit 24. Price is set where supply crosses demand



Note: For illustration only. Not drawn to scale.

Producers with costs lower than the marginal producer – lower and to the left on the blue stack – produce more and have larger margins than the marginal producer, in yellow. Producers with costs higher than the marginal producer – higher and to the right on the gray supply stack – typically would not develop assets.

*Margin is shared between all parties involved in production.

Near term: Markets are primarily characterized by the existing fixed capital stock, which was determined by past capital investment decisions. Generally, because production cannot respond quickly to changes in activity levels, near-term prices are a function of available production, spare capacity and near-term demand conditions. For a new conventional oil field, "first oil" may take three to 10 years, depending on multiple factors, including the asset type and regulation. Tight oil has shorter development times; however, as discussed on **page 31**, uncertainties about shale operators' access to capital could limit tight oil's impact on near-term prices.

Long term: Competitive markets are characterized by mobility of capital investment. Over the long term, prices are determined where long-term supply and long-term demand curves intersect at a point that reflects the marginal operating costs, the investment costs on both the supply side and the demand side, and a minimum rate of return.

commodity-price forecasts

Our comprehensive, proprietary forecasts of commodity prices significantly influence our strategic and business planning. Because price is determined in a competitive marketplace, scenarios are used to reflect market uncertainties, generating multiple price trajectories. Our price outlooks include carbon-price forecasts and cover a wide range of oil prices, natural gas prices, new energies prices, and costs of goods and services, among other considerations. These forecasts reflect long-range effects from population and economic growth, energy mix, energy efficiency standards, climate-related policy actions, demand response to prices, technology trajectory, and cost projection of supplies.

difference between carbon price and carbon cost

Although the terms are sometimes used interchangeably, a "carbon price," a "carbon cost," and a "shadow" or "proxy" carbon price are different. For example, the term "carbon cost" is sometimes used to refer to carbon pricing and sometimes used to refer to the societal impacts from carbon emissions. A shadow or proxy carbon price is a hypothetical, aggregated price of carbon, which may include estimates for nonpricing regulations, published for investment analysis purposes.

For us, the term "carbon price" refers to an external price resulting from a policy like a carbon tax or cap-and-trade system, and for us, a "carbon cost" is generally a function of a jurisdiction-specific carbon-price forecast and asset-specific characteristics that represent the cost for compliance the asset would face. Like oil price forecasts, the proprietary information and the analysis that go into carbon-price forecasts and carbon-cost calculations are important to our strategy. Disclosure of our carbon-price forecasts or carbon-cost calculations could compromise commercially and competitively sensitive information. Consistent with our proprietary oil and gas price forecasts, we do not disclose our carbon-price forecasts or carbon costs.

We support a carbon price.

section 4

portfolio

Photo: A worker analyzing a CO_2 capture system. Chevron and Svante are collaborating to demonstrate Svante's carbon capture technology at our San Joaquin Valley operations near Bakersfield, California.

section 4: portfolio

the future of energy

We will continue to maintain flexibility in our portfolio and seek investment opportunities to achieve superior shareholder value in any business environment. Our approach seeks to create value by driving returns across our portfolio of advantaged assets as we strive to be more capital-, carbon- and cost-efficient.

4.1 upstream

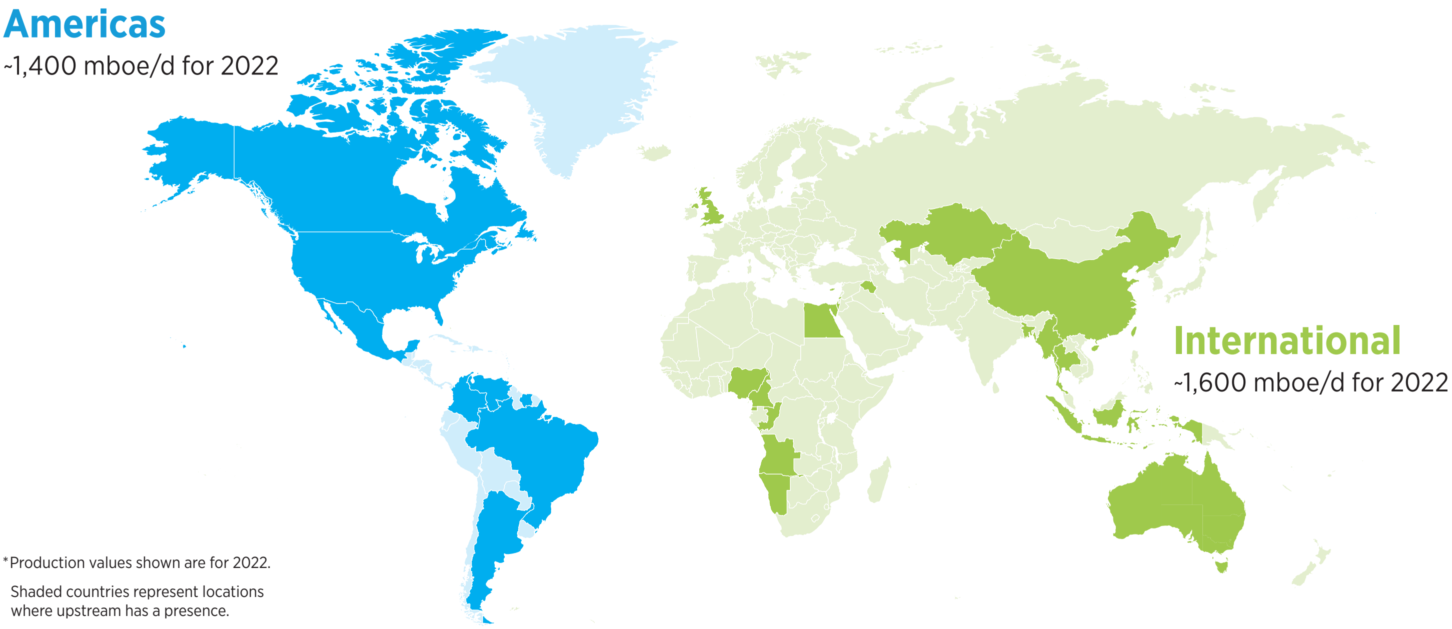
We strive to ensure our upstream business provides competitive returns, regardless of commodity prices. We are focused on improving return on capital employed and expanding cash and earnings margins by operating reliably, managing costs, growing attractive positions and completing major capital projects under construction. We are focused on achieving these outcomes while continuing to lower the carbon intensity of our operations.

Our upstream portfolio is anchored by key assets, including oil in Kazakhstan, LNG in Australia, shale and tight oil onshore U.S. and Argentina, deepwater assets in the U.S. Gulf of Mexico, and natural gas in the Eastern Mediterranean. These assets are complemented by other competitive assets globally (Exhibit 25).

We believe that the most appropriate approach for measuring the emissions performance of an upstream asset is GHG intensity by commodity on an equity basis – the same method we use to report production – which covers all emissions from both company-operated and nonoperated joint ventures. This is aligned with the intent to provide useful GHG information to stakeholders. Based on a comparison of the IEA's *Spectrum of the Well-to-Tank Emissions Intensity of Global Oil Production (2019)* and *Global Gas Production (2018)* data, we estimate that more than 75% of our production of both oil and gas is below the global average carbon intensity for each commodity.

The Permian Basin continues to deliver higher returns, production growth and lower carbon intensity. In 2023, we are running four grid-powered rigs and one natural gas-driven hydraulic fracturing spread. Approximately 40% of our grid-supplied power will be from wind and solar. In the deepwater, we have a robust portfolio that's delivering strong returns with lower carbon intensity. Our Australian assets shipped a record number of LNG cargoes in 2022 as Gorgon and Wheatstone together delivered first-quartile reliability.

Exhibit 25. A diverse and advantaged upstream portfolio*

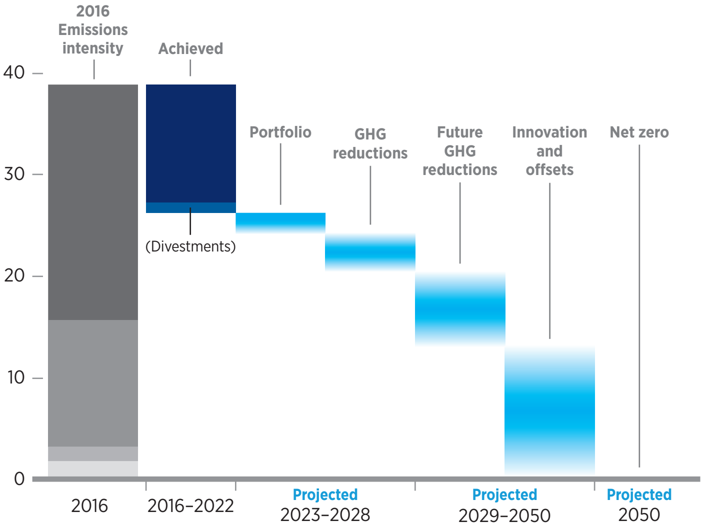


*Production values shown are for 2022.

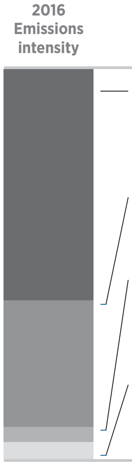
Shaded countries represent locations where upstream has a presence.

Exhibit 26. Upstream net zero 2050 aspiration

Scope 1 and 2 emissions (kilograms CO_2e/boe)



Potential Scope 1 and 2 reduction opportunities



Source type	Reduction strategies	Supporting policy
Direct energy use: combustion	Energy management, e.g., efficiency improvements, lower carbon fuels, electrification with lower carbon power, CCUS	Carbon pricing, carbon-related reporting,[*] support for innovation like CCUS and offsets, support for carbon markets[†]
Flaring	Gas market development, operational best practices, e.g., flow assurance for gas, facility reliability improvements	Infrastructure support for gas market development
Fugitives and venting	Methane management, e.g., operational best practices and facility design	Flexibility to use advanced technologies for methane detection
Indirect energy use: imported electricity and steam	Energy management, e.g., efficiency improvements, sourcing lower carbon power	Carbon pricing, carbon-related reporting,[*] support for innovation like CCUS, support for grid infrastructure

[*] See **page 62** on carbon-related reporting.
[†] See **page 61** on carbon markets.

We aspire to reach net zero upstream emissions (Scope 1 and 2) by 2050 (Exhibit 26). Accomplishing this depends on continuing progress on commercially viable technology, government policy, successful negotiations for carbon capture and storage and nature-based projects, availability of cost-effective, verifiable offsets in the global market, and granting of necessary permits by governing authorities.

We are taking actions to reduce carbon intensity by high-grading the portfolio, improving operations and using the MACC process to drive emissions reductions on existing facilities. For new facilities, we have identified opportunities to adjust our standards and pilot new technologies with the aim of lower-emission facility design for future production.

Active portfolio management is key to achieving our objectives. Growth or decline in production from different assets or acquisitions and divestitures or from changes in operations and accounting guidelines may result in emissions performance changes (Exhibit 26). Contrary to what some may believe, divestments represent a very small portion of achieved reductions.

We assess reduction opportunities in the key areas of energy management; methane management, consisting of venting, fugitives and flaring reductions; CCUS; and offsets. Any source of emissions can be offset with natural or technological removals, like nature-based solutions and CCUS. These GHG reduction approaches can be supported by policy on carbon pricing, well-designed carbon-related reporting, support for technologies like CCUS, and offsets.

Most of our direct emissions (Scope 1) and indirect emissions from imported energy (Scope 2) are related to energy use, which can be reduced by energy management, for example, efficiency improvements or fuel switching to lower carbon sources (e.g., from diesel to gas).

The next-largest source category of our direct emissions (Scope 1) is from activities related to methane, including flaring, fugitive emissions and venting. Flaring can be reduced by development of gas markets to enable gas takeaway capacity. We believe fugitive emissions can be addressed with reduction strategies like leak detection and repair (LDAR) programs and satellite monitoring and can be supported by policies for equipment performance standards. Venting can be reduced by pressure-management systems.

We have identified over 120 GHG abatement projects to advance to execution and plan to spend more than $350 million on these projects in 2023. In 2022, we made progress on 90 projects and completed 13. We expect to spend approximately $2 billion on similar projects through 2028. When completed, the opportunities are expected to deliver approximately 4 million tonnes of emissions reductions per year.

Based on the IEA's weighted global average of gas production used in electricity, we estimate[37] that the potential avoided emissions[*] associated with natural gas sold by Chevron, relative to coal, may enable 100 million tonnes of CO_2e reductions per annum by 2030.

[*] Chevron estimated avoided emissions associated with the share of its global natural gas sales utilized for electricity generation using an attributional lifecycle approach (World Resources Institute [WRI], 2019). The avoided emissions were calculated as the difference between lifecycle GHG emissions associated with the reference product (i.e., coal-based electricity generation) and the assessed product (i.e., natural gas-based electricity generation). The WRI working paper on avoided emissions can be accessed at ghgprotocol.org/sites/default/files/2023-03/18_WP_Comparative-Emissions_final.pdf.

energy management

Emissions associated with our own energy use make up approximately 70% of our direct emissions (Scope 1) and indirect emissions from imported energy (Scope 2),* which is why energy management is a key focus area. We are working on over 100 energy management projects forecasted to reduce emissions by more than 1.5 million tonnes of CO_2e per year once fully implemented. In addition to our internal efforts, we support external efforts, including venture capital investments, to contribute to the advancement of energy management. For example, we have a long-standing collaboration with the University of California at Davis Energy and Efficiency Institute sponsoring industry research and technology advancement in energy and energy efficiency solutions.

Our strategy to deploy mature, renewable power-generation solutions is focused and selective. We invest in wind and solar projects that have the greatest ability to cost-efficiently lower carbon emissions in our operations.

We are increasing the use of renewables in a number of our products as we aim to reduce lifecycle emissions and work to provide verified, low-cost, high-integrity carbon offsets to our customers around the world to help them achieve their own lower carbon goals.

Renewable power: By sourcing more electricity from renewable sources, we are switching to a lower carbon power source and working toward optimizing between purchased and self-generated power. These types of efforts can reduce the direct and indirect emissions associated with our operations and lower the overall lifecycle carbon intensity of our products.

Energy storage: Energy storage is an important component to help address intermittency with renewable generation. By combining energy storage solutions with lower carbon power sources, we can lower the overall carbon intensity of our products.

Algonquin: Chevron and Algonquin Power & Utilities Corporation seek to co-develop renewable-power projects that provide electricity to strategic assets across our global portfolio. Under the four-year agreement, we plan to source 500 megawatts of existing and future electricity demand from renewables and expect to make up to $250 million in investments by 2025.

TotalEnergies Renewables USA: Chevron and TotalEnergies Renewables USA completed construction in 2020 on a solar power project that supplies our Lost Hills production facilities in California with solar energy. We expect that the project will provide more than 1.4 billion kilowatt-hours of solar energy over the potential 20-year term of the agreement.

RayGen: Chevron is invested in RayGen, a startup developing technology that has the potential to impact long-duration energy storage and grid stability.

Malta: Chevron is invested in Malta Inc., a startup that is developing a long-duration energy storage system targeting eight-hour to multiday storage for grid-scale applications. Our investment in Malta supports innovation in the future of energy storage. Its technology has the potential to efficiently and cost-effectively create a scalable long-term energy storage system that can support renewables as they potentially become a greater portion of the future energy mix.

---

*Year-end 2022.

methane management

We believe addressing methane emissions has become a key part of being a responsible producer of oil, products and natural gas. Chevron's ambition is to be a global leader in methane emissions performance.

Our upstream methane-intensity target is 2.0 kg CO_2e/boe by 2028, and we have reduced the methane intensity of Chevron's oil and gas operations by more than 50% since 2016. OGCI, of which Chevron is a member, has a 2025 collective methane intensity target of well below 0.2% of marketed gas from operated assets. In 2022, our upstream methane intensity performance was estimated at 0.13% of marketed gas production from operated assets and 0.17% of marketed gas production on an equity basis.* In 2021, our methane intensity performance in the Permian Basin production segment was in the top quartile of oil and gas producers.

In 2022, Chevron committed to designing, where possible, new upstream facilities without routine methane emissions. We flare natural gas when necessary for safety and operational purposes and in areas where pipelines and other alternatives for transporting gas do not exist. During development planning in the Permian Basin, we consider gas takeaway availability as if it were a permitting condition. This approach has resulted in limited flaring during emergency and upset conditions. Our Angola LNG joint venture was built to provide access to a market for associated natural gas. We have reduced flaring intensity from our operated assets in Angola by more than 80% since 2016.

Chevron is trialing emerging technology and collaborating with third parties to help find better ways to detect and measure methane emissions. Improving our methane detection capabilities helps us better identify emissions reduction opportunities. We anticipate that our methane emissions monitoring and detection program will provide additional insights to improve how our facilities are operated and maintained.

Chevron is taking actions to improve the quality and transparency of methane emissions disclosures. As quantitative technologies become more widely available and protocols are developed to reconcile current inventories with actual measurements, we are working to incorporate field measurement into existing emission factor-based inventories.

Read more about Chevron's strategy, goals and action plan to prevent, detect and reduce methane emissions at **chevron.co/methanereport**.

The Environmental Partnership (TEP): Chevron is a founding partner of TEP, an industry initiative aimed at accelerating the adoption of practices that reduce methane emissions. The over 100 companies participating in this initiative have conducted nearly 1.9 million leak detection surveys and replaced more than 114,000 pneumatic controllers with lower- or non-emitting technologies or otherwise removed them from service.

Oil and Gas Climate Initiative (OGCI): Chevron is a member of OGCI. Member companies have a methane-intensity target to help reduce collective average upstream methane intensity to well below 0.20% by 2025, measuring the volume of methane emissions from upstream oil and gas operations as a percentage of the total volume of gas marketed.

Veritas: Chevron has joined Veritas, the GTI Energy Methane Emissions Measurement and Verification Initiative. The goal of Veritas is to develop and advance technical protocols for measurement and assurance to provide a widely accepted methodology to incorporate field-informed methane quantification into emissions inventories. In summer 2022, Chevron tested and provided technical feedback on the protocols. Chevron is continuing to test and provide feedback on the first official version of the protocols, which were made public in February 2023.

Project Astra: Chevron participates in Project Astra, a methane sensor network that leverages data sharing and analytics to provide near-continuous monitoring across some oil and gas facilities in the Permian Basin. Project Astra is led by the University of Texas at Austin.

Collaboratory to Advance Methane Science (CAMS) and Methane Emissions Technology Evaluation Center (METEC): Chevron is a founding member of CAMS and also serves on the Industrial Advisory Board of the METEC, a facility at Colorado State University (CSU) that provides realistic oil field settings to test new methane detection technologies. Our CAMS projects include an aerial survey in the Permian Basin, a review of satellite monitoring capabilities and a measurement study of emissions from LNG transport activities. Other projects include TOPBOT, where researchers will work to close the gap between top-down and bottom-up methane emissions estimates, and development of AI-based software to help improve quantification and localization capabilities of point methane sensors.

Chevron has supported CSU's methane work over the past two years by engaging in the Colorado Coordinated Campaign (C3), which has sought to build emissions models of the Denver-Julesburg Basin by incorporating data from flyovers, ground-based emissions measurement and the Methane Emissions Estimation Tool model. Chevron is also supporting CSU's Site Air Basin Emissions Reconciliation (SABER) project, which is working to demonstrate reconciliation between top-down and bottom-up estimates of emissions in a complex oil and gas production basin.

---

*While we are including this methane metric to allow for comparability with other reporting frameworks, we continue to use kg CO_2e/boe for our methane metric because it allows for allocation of emissions between multiple products of the same operation (oil, gas, NGLs) and is more useful for comparing different types of assets.

methane strategy in action

Our goal is simple – keep methane in the pipe. This starts with designing and operating facilities to help prevent methane emissions and includes deploying technologies to validate performance, inform repairs and improve inventories.

A proactive strategy to design and operate facilities can lead to meaningful reductions in methane emissions intensity. Detection and measurement can help assess whether operations are functioning as designed or identify leaks and other areas for improvement. Trialing emerging technology lets Chevron explore what is possible and incorporate innovative solutions into our methane management programs over time. We anticipate that our monitoring and detection program will provide additional insights to improve how our facilities are operated and maintained.

Design and operation

To evolve facility designs, process controls and systems are being reengineered to help remove, reduce or prevent methane venting as part of our normal operations.

We have completed several projects at the Ashdod Onshore Terminal in the Eastern Mediterranean, such as converting instrument gas to instrument air, connecting a tank with natural gas blanketing to a vapor recovery system and converting a facility vent stack natural gas purge to nitrogen purge.

In Nigeria, we have changed how we manage flaring at the Agbami deepwater production facility. Historically, when a compressor went down for any reason, gas would be routed to the flare system to support continued oil production. However, through focused technical applications, equipment reliability and effective flares management, we have significantly reduced flaring arising from process upsets while optimizing production.

Our assets in Colorado have reduced methane emissions by implementing an intermittent gas lift project. Gas lift compressor total horsepower has been downsized by operating gas lift on wells intermittently instead of full time.

Find and fix

Since 2016, we have trialed 14 advanced methane detection technologies. "Find and fix" campaigns in Angola, Argentina, Australia, Kazakhstan, Nigeria, the Denver-Julesburg Basin, the U.S. Gulf of Mexico and the Permian Basin have provided opportunities to test different methane emissions detection and measurement options (Exhibit 27). Detection results were used to validate performance and inform repairs.

In 2022, Chevron contracted GHGSat to monitor up to 22 onshore assets worldwide. At one asset, an investigation of satellite detection results found dry gas that had been diverted to a high-pressure flare to assist in decreasing or eliminating dark smoke emissions per local regulatory requirements. To resolve this, the dry gas was diverted to a low-pressure flare with a high-pressure assistance procedure for smoke reduction. In testing following the conversion, no methane emissions from flaring were found.

Chevron's 2022 LDAR program in the Denver-Julesburg Basin consisted of more than 2,000 optical gas imaging (OGI) camera inspections and more than 30,000 auditory, visual and olfactory (AVO) inspections. Each facility was visited multiple times throughout the year for the purpose of identifying potential emissions sources. The majority of detected emissions sources were repaired at the time of inspection.

In late 2022, we led a 20-day drone campaign offshore Angola. We also completed a similar 22-day drone campaign for our onshore and offshore assets in Nigeria. Findings from these surveys inform our project priorities and emissions inventories for our Angola and Nigeria operations.

Shared learning

Chevron, as an OGCI member, has supported OGCI's pilot program from late 2021 to mid-2022 to deploy GHGSat at six sites in Iraq. The program seeks to identify methane plumes and directly engage with local operators to help address the causes. OGCI is working to expand the pilot to additional sites in Iraq, as well as Algeria, Egypt and Kazakhstan, as an introduction to methane monitoring services.

Chevron signed a memorandum of understanding with the Egyptian Ministry of Petroleum and Mineral Resources to share best practices and expertise related to the reduction of methane emissions. Chevron plans to provide study tours and workshops to build awareness of technologies, measurement practices and examples of projects to reduce emissions.

Exhibit 27: Methane detection technology in our operations

technology type*	capability	benefits	current challenges	example operations
satellites	• Detection thresholds range from 25,000 kg/hr to 100 kg/hr • Monthly to daily global coverage	• Potential to be the lowest-cost option by site • Helpful in identifying super-emitters	• Detection thresholds are high and restrict detection to very large sources • Limited in producing facility-scale resolution • Does not work on cloudy days • Struggles with detection over water and identifying the emitter with multiple operators nearby • Needs accurate local wind data for quantification	🟦 Block 0/14, Angola 🟦 Eastern Mediterranean, Israel 🟦 El Trapial, Argentina 🟦 Gorgon and Wheatstone LNG, AU 🟦 Tengizchevroil, Kazakhstan ▨ Permian Basin, U.S.
aircraft	• Detection thresholds range from 50 kg/hr to less than 3 kg/hr • Scale of hundreds of sites per day	• Leading service providers can likely capture most facility emissions	• Not all technologies provide specific source or emission size information, meaning additional detection is needed to identify the source	🟦 Denver-Julesburg Basin, U.S. 🟦 Permian Basin, U.S. ▨ Gorgon and Wheatstone LNG, AU ▨ Vaca Muerta, Argentina ■ Gulf of Mexico, U.S.
facility-scale periodic monitoring (drone or mobile lab)	• Detection limits of less than 1 kg/hr are possible with the right wind conditions and site access • Scale of tens of sites per day in onshore applications	• Ability to scan an entire site, including areas that would otherwise be difficult to reach with handheld devices	• Field application requires individual site visits and travel time between sites or platforms • Challenges near electrical power lines and near airports for drones • Weight of the emissions sensors can reduce battery life and limit flight time for drones	▨ Agbami/Delta, Nigeria ▨ Block 0/14, Angola ▨ Denver-Julesburg Basin, U.S. ▨ Gulf of Mexico, U.S. ▨ Permian Basin, U.S. ■ Gorgon and Wheatstone LNG, AU
facility-scale near-continuous monitoring (fixed cameras, sensors, etc.)	• Detection limits vary with the sensor placement and wind conditions and range from 25 kg/hr to less than 1 kg/hr • Equipment is fixed at one site or location	• Potential for 24/7 site coverage • Could have uses beyond methane detection • May provide information on the duration of intermittent sources	• Research and development is needed to scale this approach • Generally need precise wind data to interpret detection results	▨ Denver-Julesburg Basin, U.S. ▨ Permian Basin, U.S. ▨ Tengizchevroil, Kazakhstan ▨ Wheatstone LNG, AU
manual leak detection (handheld screening like OGI and EPA Method 21)	• Detection limits vary based on environmental and human factors but are generally characterized at less than 1 kg/hr • Scale of a few sites per day	• Ability to identify exact location of a source of emissions • Third-party services available in locations with regulatory programs • Potential to incorporate into emissions reporting for fugitive components • Current industry and regulatory approach	• Labor-intensive • Travel time between sites • Human and site factors impact results • Does not quantify emissions • Can be difficult to reach elevated sources with handheld detection tools	🟦 Block 0/14, Angola 🟦 Denver-Julesburg Basin, U.S. 🟦 Eastern Mediterranean, Israel 🟦 Gorgon and Wheatstone LNG, AU 🟦 Gulf of Mexico, U.S. 🟦 Permian Basin, U.S. 🟦 San Joaquin Valley, U.S. 🟦 Tengizchevroil, Kazakhstan ▨ El Trapial, Argentina

*Since 2016, Chevron has trialed 14 advanced methane detection technologies. Trials have included multiple projects with seven continuous monitoring devices: Project Canary (Canary X), Scientific Aviation (ChampionX) SOOFIE®, Honeywell Gas Cloud Imaging (GCI and Mini GCI), Aeris MIRA Ultra Mobile LDS, Quanta3 and Qube (Axon). Trials have also involved four aerial survey vendors, Bridger Photonics, Kairos Aerospace, NASA JPL (AVIRIS-NG) and GHGSat; two drone-based solutions from SeekOps and DJI (U10); and a satellite provider, GHGSat.

AU = Australia

🟦 Commercial use
▨ Completed or ongoing pilot
■ Planning stages

4.2 downstream

We seek to grow earnings across the downstream value chain by making targeted investments in higher-return segments while strengthening our refining and marketing value chains. These investments are designed to strengthen our value chain, improve cost competitiveness and meet evolving customer needs. We continually examine ways to meet demand and policy changes.

Chevron's downstream portfolio is focused in areas of manufacturing strength on the U.S. West Coast, the U.S. Gulf Coast and in Asia-Pacific (Exhibit 28). We have created tightly integrated value chains in the markets where we operate and are well positioned to supply our customers. As our focus is on value, not volume, we expect to continue to improve our operations, lower carbon intensity and grow margins. In our petrochemicals business, our portfolio focus is on world-scale facilities, proprietary technology and low-cost feedstocks.

Complex refineries play an important role in transforming crude into high-value products. This process tends to have a higher carbon intensity when measured on a throughput basis, sometimes referred to as a "simple barrel" basis. Based on data from the IEA's *Spectrum of the Well-to-Tank Emissions Intensity of Global Oil Production (2019)*, over 40% of our refinery capacity is below the global average of refinery throughput carbon intensity, which is expected when using a throughput basis and taking into account our portfolio of complex refineries.

Lower carbon intensity of transportation fuels
Chevron is creating a portfolio of renewable fuel options, like renewable diesel and biodiesel, in policy-enabled markets. We believe an approach that embraces all forms of technologies and solutions is critical to achieving climate and air quality policy goals with transportation options that are affordable and accessible to everyone. We conducted demonstrations for policymakers across the United States to showcase our renewable gasoline blend that can reduce lifecycle carbon intensity by more than 40% compared with traditional gasoline. We are working in California's policy-enabled markets to scale biofuels, hydrogen, and renewable natural gas fuel solutions and technologies. We are also pursuing opportunities to lead in other markets where similar policies are expected and are exploring multiple consumer offerings, including EV charging at retail stations.

Exhibit 28. Optimizing downstream value chains to maximize value

U.S. West Coast

U.S. Gulf Coast

Asia-Pacific

— Products and intermediaries

renewable fuels

We are developing compressed natural gas (CNG), renewable natural gas (RNG), hydrogen, renewable diesel (RD) and biodiesel (BD). We have integrated renewable base oil into our lubricants product lines. We co-process biofeedstock in our own facilities, collaborate with others to produce and procure RNG, and market the RNG volumes for use in vehicles operating on CNG.

Processing biofeedstock: Sixty percent of our U.S. terminals are now capable of renewable or biodiesel distribution. With the renewable diesel project in Geismar, Louisiana, expected online in 2024, our renewable fuels capacity will increase by 30%. Leveraging our existing refining system and other anticipated actions, we are targeting production capacity of roughly 100 mbd of renewable diesel, sustainable aviation fuel, biodiesel and other biofuels by 2030. By building off the capabilities and assets of our new organization, Chevron Renewable Energy Group, we are halfway to achieving our 2030 capacity target.

RNG and CNG: RNG and CNG projects capture methane that would otherwise be emitted to the atmosphere and turn it into a valuable fuel, with negative carbon intensity on a lifecycle basis under the California Low Carbon Fuel Standard. Our primary focus is to develop lower lifecycle carbon intensity gas from renewable sources at dairy farms with the scale and proximity to natural gas pipelines to enable commercial projects. We expect to diversify our feedstock mix over time, likely to include wastewater and landfill gas. We aim to grow production of RNG to 40,000 million BTUs per day by 2030.

Renewable base oil: To date, we have a portfolio of patents, including some that target fuel economy, EV fluids and equipment life extension, all using renewable base oil. Chevron's renewable base oil and renewable lubricant are available in the market today.

Renewable fuels are important products that can help reduce the lifecycle carbon intensity of transportation fuels today while meeting the world's growing energy needs.

Brightmark: Chevron and Brightmark LLC have formed Brightmark RNG Holdings LLC, a joint venture to develop projects across the United States to produce RNG. The joint venture funds the construction of infrastructure and the commercial operation of dairy biomethane projects in multiple states, from which we purchase RNG and market the RNG volumes for use in vehicles operating on CNG.

Getting to Zero Coalition: Chevron has joined more than 160 companies in the Getting to Zero Coalition, an industry-led platform for collaboration that brings together stakeholders from across the maritime and fuels value chains with the financial sector and others. The coalition is committed to getting commercially viable deep-sea zero-emission vessels powered by zero-emission fuels into operation by 2030 toward full decarbonization by 2050. It is managed by the Global Maritime Forum, who initially founded the coalition together with the World Economic Forum and Friends of Ocean Action.

CalBio: Chevron has partnered with CalBio and dairy farmers to form CalBioGas LLC, a joint venture to produce and market dairy biomethane as an RNG transportation fuel in California. These efforts mitigate dairy methane emissions and reduce waste. In 2020, we began producing RNG at dairy farms in the California Central Valley.

Bunge: Chevron and Bunge North America, Inc. have formed Bunge Chevron Ag Renewables LLC, a joint venture leveraging Bunge's expertise in oilseed processing and farmer relationships and Chevron's expertise in fuels manufacturing and marketing. The 50-50 joint venture is intended to help us meet the demand for lower lifecycle carbon intensity fuels and develop renewable fuel feedstocks. It also is anticipated to establish a reliable supply chain from farmer to fueling station and double the current facility capacities from 7,000 tons per day by the end of 2024.

Airports of Tomorrow: Chevron is a member of Airports of Tomorrow (AoT), which consolidates the lower carbon aviation work previously done by the World Economic Forum through its Clean Skies for Tomorrow (CST) and Target True Zero initiatives. AoT is working to accelerate aviation's energy transition, including hydrogen propulsion, scale-up of biofuel and SAF, and new innovations in technology. Joining the AoT – and being a member in 2022 of its predecessor CST – supports our efforts to advance a lower carbon future by increasing the availability of fuels in sectors where emissions are harder to abate.

Beyond6: Chevron has acquired full ownership of Beyond6, LLC (B6) and its network of 55 CNG stations across the United States. With this acquisition, we can market the RNG we either produce or procure through a nationwide network of CNG locations.

Exhibit 29. Aiming to grow lower carbon businesses

Achievement of the ambitious goals set out in this section depends on the development of policy and regulatory support, technological advancement, and the granting of necessary permits by governing authorities.

2030 targets

100 mbd

renewable fuels production capacity

25 mmtpa

offsets business and CCUS

150 mtpa

hydrogen equity production capacity

4.3 new energies

We are building businesses in renewable fuels, CCUS and offsets, hydrogen, and emerging technologies (Exhibit 29). We believe we can build competitive advantages and target sectors of the economy that cannot be easily electrified. Chevron has a long history of advancing and adopting external innovation. Our goal is to help customers meet their lower carbon ambitions and reduce the carbon intensity of our own operations while pursuing opportunities that generate attractive returns.

> **we believe innovation, technology and policy will be key drivers of change**

We begin with a portfolio of Chevron's existing assets, deep technical expertise and decades of experience as a strong foundation for future growth. Our assets are in markets where we can meet growing demand based on cost-competitive supply combined with appropriate policy support. Our relationships with key customers and partners will be critical in developing economic projects that can scale across a complex value chain. We have strong commercial capabilities and experience managing rapidly changing businesses. Managing diverse stakeholder and government interests is something we do every day, and we've successfully managed complex joint ventures all over the world. Chevron's credibility and reputation make us the partner of choice, bringing access to new opportunities.

carbon capture, utilization and storage and offsets

We believe that CCUS and carbon offsets are important to achieving global net zero and to our aim of accelerating progress toward the lower carbon ambitions of our company and customers.

Chevron is working to develop and deploy CCUS technologies. Our strategy is twofold: lower the carbon intensity of our existing assets and grow a CCUS business that helps reduce emissions of the industries that enable modern society. Nature-based solutions, including those quantified via offsets, can be an important carbon sink.

We are growing a carbon offsets business to meet a range of internal and external needs. This includes investing in compliance markets where we are regulated and providing solutions for our customers to help achieve their emissions reduction goals. We have a global trading organization and actively invest in scalable solutions – like soil carbon storage, reforestation and mangrove restoration – to build a portfolio of high-integrity credits.

Bayou Bend CCS: Chevron has a membership interest in the Bayou Bend joint venture with Talos Energy and Equinor. Bayou Bend is a CCS project along the Texas Gulf Coast. In early 2023, the project was expanded to cover nearly 140,000 acres of geological formation both onshore and offshore, which has a gross potential storage resource of over 1 billion tonnes of CO_2. The expansion helps position Bayou Bend to be a CO_2 transportation and storage provider for industrial emitters in and around the Houston Ship Channel and the Beaumont/Port Arthur area.

Eastridge CCS Project: Chevron plans to reduce the carbon intensity of our Central California operations by installing post-combustion carbon capture equipment to capture CO_2 and store it thousands of feet underground. This potential CCS project will begin at our Kern River Eastridge cogeneration plant in Kern County, California.

Australia GHG assessment permits: Chevron is part of three joint ventures that have been granted an interest in three offshore GHG assessment permits. The permits authorize us to explore an area covering nearly 7.8 million acres – an area larger than Belgium – for potential GHG storage formations or injection sites.

Kern River Carbon Capture Project: Chevron, Svante and the U.S. Department of Energy National Energy Technology Laboratory (project #DE-FE0031944) are piloting technology that captures CO_2 from our Kern River facility in San Joaquin Valley, California.

Carbon Sync: Chevron has invested with Carbon Sync, a soil carbon farming project developer, to develop soil sequestration projects in Western Australia. Through holistic management and regenerative farming practices, Carbon Sync aims to improve soil health, enhancing its ability to capture and sequester carbon. Our investment with Carbon Sync intends to provide critical learning and insight related to the commercial and technical aspects of soil carbon projects.

Carbon Clean: Chevron is invested in Carbon Clean, a carbon capture company providing solutions for hard-to-abate industries. As part of the investment, Chevron and Carbon Clean are seeking to develop a carbon capture pilot for Carbon Clean's CycloneCC™ technology on a gas turbine in San Joaquin Valley, California.

Restore the Earth Foundation: Chevron is participating in a reforestation project for up to 18,800 acres, planting approximately 3.7 million trees in St. Charles Parish, Louisiana. The project brings together Chevron and Restore the Earth Foundation to develop a nature-based solution, with an aim to generate 4.7 million tonnes of carbon offsets through the reforestation of natural cypress forests in St. Charles Parish.

International Emissions Trading Association (IETA): Chevron is a member of IETA, a nonprofit created to establish an international framework for trading in GHG emissions reductions. IETA members seek to develop an emissions trading regime that results in real and verifiable GHG emissions reductions, while balancing economic efficiency with environmental integrity and social equity. Chevron is also a founding member of IETA's Markets for Natural Climate Solutions Initiative, which draws on the power of nature to actively manage land use emissions, remove carbon from the atmosphere and store it in natural systems.

hydrogen

We believe the use of lower carbon intensity hydrogen as a fuel source or feedstock can help reduce the amount of GHG emissions entering the atmosphere.

We are developing a lower carbon hydrogen and ammonia business where Chevron can build competitive advantages over time, focused on heavy-duty transport, power and other hard-to-abate sectors. Supply opportunities are centered in three core regions: U.S. West; Texas and U.S. Gulf Coast; and Asia-Pacific.

Chevron has decades of knowledge and experience with hydrogen. We are pursuing commercial opportunities to develop technology, build infrastructure, connect supply chains and grow the hydrogen market, which are all key components to deliver hydrogen at scale.

Chevron holds more than 75 patents from early commercial ventures that are applicable to our future development plans. We produce approximately 1 million tonnes of hydrogen per year for use in our refining operations. Further, we have the potential to supply and sell hydrogen to customers from our existing refineries by leveraging our distribution capabilities, sales channels and brands. We are currently building hydrogen fueling stations at select locations.

Our capabilities in CCS can position us to build natural gas-based, lower carbon intensity hydrogen, leveraging our upstream assets in several regions. We are investing in demonstration projects and innovative technology startups that can help lower the cost and carbon intensity of hydrogen production and delivery.

ACES Delta: Chevron has a majority interest in the Advanced Clean Energy Storage Delta (ACES Delta) electrolytic hydrogen production and storage project in Delta, Utah, with operations planned by mid-2025. The project is expected to initially produce up to 100 tonnes per day of electrolytic hydrogen and will utilize salt caverns to store the energy.

Solar-to-hydrogen project: Chevron aims to use existing solar power, land and produced water from Chevron's San Joaquin Valley assets to produce electrolytic hydrogen.

U.S. Gulf Coast: Chevron is collaborating with Air Liquide, LyondellBasell and Uniper on a joint study to evaluate and potentially advance the development of a hydrogen and ammonia production facility. The facility could support industrial carbon reduction and mobility applications in the U.S. Gulf Coast region and expand clean ammonia exports, helping to increase the supply of lower carbon power internationally. Chevron is also a founding member of the HyVelocity Hub, comprised of leading energy companies and organizations working to accelerate the development of hydrogen hubs in Texas, Southwest Louisiana and the U.S. Gulf Coast.

Iwatani: Chevron has an agreement with Iwatani to co-develop and construct up to 30 hydrogen fueling sites in California by 2026.

Raven SR and Hyzon: Chevron is collaborating with Raven SR and Hyzon to commercialize operations of a solid waste-to-hydrogen generation and production facility in Richmond, California, intended to supply lower carbon hydrogen fuel to transportation markets in Northern California.

Pertamina New & Renewable Energy and Keppel: Chevron signed a joint study agreement with Pertamina and Keppel to explore the development of select lower carbon hydrogen and ammonia projects using renewable energy located primarily in Sumatera, Indonesia.

Zero Emission Industries (ZEI): Chevron is invested in ZEI, a developer of hydrogen fuel cell power systems for the maritime industry.

Aurora Hydrogen: Chevron is invested in Aurora Hydrogen, a developer of hydrogen production technology that uses microwave energy without generating any CO_2 emissions or consuming water.

Syzygy Plasmonics: Chevron is invested in Syzygy, a developer of lower carbon hydrogen technology.

Hydrogenious LOHC Technologies: Chevron is invested in Hydrogenious, a developer and provider of liquid organic hydrogen carrier technology. Hydrogenious' technology has the potential to unlock the economic value of hydrogen through lower transportation, storage and distribution costs.

Caterpillar: Chevron and Caterpillar have a collaboration agreement to develop hydrogen demonstration projects and stationary power applications, including prime power. We also are working with Caterpillar-owned Solar Turbines to adapt a low-emissions turbine engine partially fueled by hydrogen. Blending hydrogen with traditional fuels to power the engine could help reduce its GHG emissions.

emerging technologies

We have a long history of identifying and driving innovation through investments in emerging technologies, research and development, and university partnerships. We are currently exploring opportunities to commercialize the next generation of emerging technologies. These efforts will build on our assets and capabilities to meet growing enterprise and customer needs.

Initially, we are leveraging core capabilities in subsurface, drilling, wells and facilities, and our operating history in geothermal, to advance and scale novel geothermal energy, which can potentially allow access to a widespread baseload, nonintermittent resource that can complement and add capacity to meet the world's growing renewable-power demand.

In addition to geothermal, we are exploring other emerging lower carbon power technologies, such as lithium extraction. Technologies such as long-duration storage or small, modular nuclear reactors can be part of the solutions needed to deliver on the world's growing demand for lower carbon energy. Through venture capital, we continue to invest in other lower carbon technologies.

Baseload Capital: Chevron is invested in Baseload Capital, a private investment company focused on the development and operation of low- and medium-temperature geothermal and heat power assets. We also have a joint venture with Baseload to develop geothermal projects in the U.S., the first of which is in Weepah Hills, Nevada.

Eavor Technologies: Chevron is invested in Eavor Technologies, a company that provides a closed-loop geothermal technology for both power and direct heat markets. Eavor's innovative system has dispatchability for power load balancing, which is becoming more essential as intermittent renewables become a larger part of power grids.

Mitsui Oil Exploration Company (MOECO): Chevron announced the signing of a joint collaboration agreement to explore the technical and commercial feasibility of advanced geothermal power generation in Japan. Building on Chevron and MOECO's long-standing relationship, the new collaboration will study geothermal resource potential across Japan and will evaluate the effectiveness of advanced closed-loop technology for a future joint pilot project there.

Sonoma Clean Power: Chevron is working with Sonoma Clean Power to identify and develop geothermal opportunities in Sonoma and Mendocino counties, California.

Texas Geothermal Energy Alliance (TXGEA): Chevron is a member of TXGEA, an education and advocacy organization created to enhance geothermal energy in Texas.

Zap Energy: Chevron is invested in Zap Energy, a startup developing a next-generation modular fusion energy system with an innovative approach to advancing cost-effective, flexible and commercially scalable fusion power.

Mainspring Energy: Chevron is invested in Mainspring Energy, a startup developing technology that has the potential to enable greater fuel flexibility and utilization of lower carbon fuels with near-zero NOx emissions.

integrated partnerships

We are collaborating in new ways with innovators, policymakers, communities and customers to accelerate progress toward integrated lower carbon products and solutions that can help reduce emissions of industries that enable modern society.

KazMunaiGas (KMG): Chevron has a memorandum of understanding to explore potential lower carbon business opportunities in Kazakhstan with KMG. Chevron and KMG have been evaluating the potential for lower carbon projects in areas such as CCUS, hydrogen, energy efficiency and methane management, and carbon financial disclosure methodology.

JERA: Chevron and JERA are collaborating on multiple lower carbon opportunities focused on the U.S. and Asia-Pacific regions. Opportunities include the production of lower carbon fuels, CCUS and new technology commercialization.

PT Pertamina: Chevron has collaborated with PT Pertamina (Persero) to explore potential lower carbon business opportunities in Indonesia. Aimed at serving local and potentially regional customers, we plan to consider novel geothermal technologies; carbon offsets through nature-based solutions; CCUS; and lower carbon hydrogen development, production, storage and transport.

section 5

performance and policy

Photo: Workers on a rig near Carlsbad, New Mexico. Our Permian Basin operations are among the lowest methane emissions per site of any operator.

section 5: performance and policy

measuring and advocating for what matters

To advance an orderly transition to a lower carbon future, we believe GHG emissions (carbon) data and policies that incentivize capital markets and customers to make rational choices are needed. In 2022, over 70% of Chevron's equity direct emissions were covered by mandatory GHG reporting programs and more than 50% of our direct emissions were in regions with existing or developing carbon-pricing policies. Chevron actively engages with stakeholders to advance lifecycle analysis and works with governments to help implement well-designed climate policies. We aim to find common ground among stakeholders and companies with varying views to achieve a lower carbon future for all.

5.1 assessing performance on a lifecycle basis

The world is not on track to meet the goals of the Paris Agreement* and needs better data to enable better decisions to advance these goals. Chevron believes lifecycle analysis (LCA) is a powerful tool to enable data-driven decisions. A lifecycle approach to carbon accounting facilitates informed decision making throughout the value chain. Carbon data that is consistent, reliable and transparent across sectors, products and firms of all sizes can be used to understand the carbon performance associated with a good or service at each stage of the lifecycle, from production to manufacturing to transport (Exhibit 30). Aggregating the data enables a full lifecycle assessment that can improve decision quality at each point at which policy, manufacturing or purchasing decisions are made. Such an approach could enable policymakers to drive the most pragmatic policy, incentivize producers to abate more, inform buyers on making lower carbon choices in a standardized manner and identify more cost-efficient emissions reduction options.

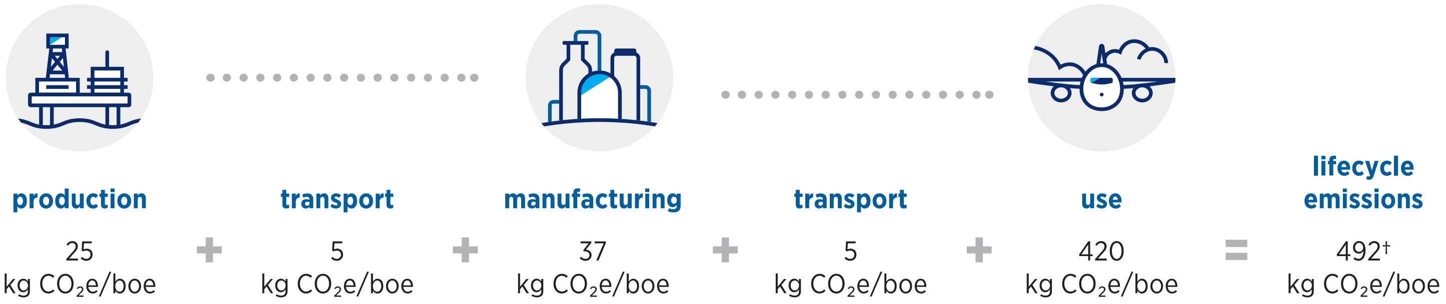
We need to advance lifecycle assessment. Corporate GHG emissions inventory reporting has been around for approximately 20 years.[38] Emissions inventory reporting developed from the top down, starting with global calculated emissions moving to national calculations and then, more recently, corporate reporting. The more we can integrate a lifecycle approach, the more we can improve decision making across specific value chains.

Absolute reporting emissions provides insight into company size, sector or types of activities in which a company engages. Intensity- or performance-based reporting is useful for assessing relative carbon efficiency, or carbon performance, of different suppliers of products and services for similar activities (Exhibit 31). Being able to assess, quantify and communicate carbon performance in a standardized way across the lifecycle of products and services can help promote reduction activities and policies. Steps have been made by some jurisdictions in assessing carbon performance using intensity data, which can be a building block to a lifecycle analysis, also known as "carbon footprinting."

5.1.1 Standardized lifecycle accounting for emissions, reductions and removals would enable more complete and comparable data and enable standardized assessments of carbon performance relative to alternatives.

Actual: Primary data are key to differentiating between product suppliers. Primary data – via methods specific to the underlying product, process and supplier – are needed to assess the relative

Exhibit 30: It is important to assess carbon performance for comparable stages in the lifecycle



---

*The UN Environment Programme's *Emissions Gap Report 2022,* unep.org, shows that the world is not on track to meet the Paris Agreement goal of limiting global warming to well below 2° C, preferably 1.5° C.

† Illustrative values are based on production and manufacturing values from Chevron's oil and refining carbon intensities, respectively, as stated on **page 66** in Chevron's GHG reporting equity metrics and targets table; transport value based on Chevron internal analysis of IEA, *World Energy Outlook 2018*, iea.org/reports/world-energy-outlook-2018; end-use value from API, *GHG Compendium (2021)*, api.org.

performance of multiple suppliers of the same product and to incentivize performance improvements.

Allocations: A consistent allocation approach is important to ensure comparability of product-level emissions. The inherent bias imposed by allocation choices can lead to potential "methodology arbitrage" wherein one product appears superior based solely on accounting choices. When more than one product is produced at a facility, there are multiple ways to allocate emissions across products – based on quantity, mass, energy or economic value at various levels of granularity, including regional, facility or process unit – all of which result in different values for a carbon footprint.

Consistency in allocation decisions can facilitate comparability. For example, in mining gems, both gems and waste rocks result. Some propose that all emissions resulting from mining activities should be allocated to the gems, as they are the primary economic value driver of the mine. However, others propose that the emissions should be distributed to both the gems and the waste rocks based on the proportional volume produced given the physical processing. Chevron believes it is important to consider both the economic value and physical processing requirements when allocating emissions across products from the same facility.

Attribution: Effective use of carbon attributes can harness market forces to promote carbon efficiency at the least cost to society. GHGs are global in nature, having the same impact on climate change no matter where emissions occur.* Therefore, in the pursuit of the Paris Agreement goals, GHG emissions reductions could be encouraged no matter where they occur and as cost-efficiently as possible. One way to achieve this is to decouple the carbon performance of a product or service via the creation of an environmental attribute paired with another product. This system, sometimes referred to as "book-and-claim,"† enables one party to incentivize and claim an emissions reduction even if the reduction physically occurs elsewhere.

chevron was an early adopter of emissions reporting

For more than 20 years, Chevron has reported, at the company level, both direct emissions and the largest category of its indirect emissions (combustion of our products). We recently achieved reasonable assurance‡ of our corporate inventory.

There are many reasons that avoidance, abatement or removal may be undertaken by a different party. For example:

- Lower cost of avoidance, abatement or removals.
- Products may be commingled in storage or transport, which makes tracing differentiated products impossible (common in energy products).
- Local markets for a lower carbon activity may not exist, and shipping of the physical products – when and if possible – to markets that value carbon efficiency may increase overall carbon emissions.
- Entities with the desire to fund emissions reductions may be geographically separated from the lower-cost carbon emissions reduction, in which case, decoupling environmental attributes enables broader access to markets, which can accelerate a more cost-efficient lower carbon future.[39]

Consistent methodologies that track both physical and contracted carbon performance are needed to enable efficient markets, ensure emissions are counted once and enable effective reconciliation of emissions.

Exhibit 31: Differences between absolute emissions reporting and intensity- or performance-based reporting

term	definition	uses
absolute emissions reporting	Total emissions emitted over a period of time, usually associated with an activity, product or area	• Indicates relative size of business • Drives absolute emissions reductions through operational and design changes • Incentivizes divestment, shutdowns and reporting methodology arbitrage
intensity- or performance-based reporting	Emissions divided by production or energy units	• Establishes a normalized performance measure • Provides insight on carbon efficiency • Drives absolute reductions through operational and design changes • Incentivizes more carbon-efficient production growth

---

* Other reasons, such as local air criteria pollution, may influence location of emissions, but the emissions still contribute to climate change. The impact is global, not local.

† A number of regulatory and nonregulatory programs use this practice, such as in renewable fuels and renewable electricity.

‡ "Reasonable assurance" refers to a high level of confidence that stated information is accurate and complete, allowing a verifier to conclude that the GHG information is fairly stated, contrasted with no assurance or limited assurance. "Limited assurance" refers to a negative form of conclusion which allows verifiers to conclude that nothing has come to their attention to cause them to believe that GHG information is misstated. For our most recent ESG assurance statement, visit chevron.co/ESGassurance.

lifecycle carbon accounting

A more effective and reliable lifecycle approach to carbon accounting and associated digital tools are necessary to advance a lower carbon future. Chevron continues to invest, directly and through partnerships, in advancing lifecycle carbon accounting and developing critical digital products, such as for lifecycle tracking and tracing to create data to inform policies, capital markets and customers.

123Carbon: Chevron worked with 123Carbon to complete an "insetting," or reductions from within a company's value chain, pilot by tokenizing the bunkering of biofuel for Chevron-owned vessels in Singapore. 123Carbon was founded to accelerate the decarbonization of transportation and provides a blockchain-based platform to create insets derived from multimodal low carbon transport.

Smart Freight Centre (SFC): Chevron collaborated with other stakeholders on the development of market-based approaches to decarbonize transportation through SFC. SFC, a nonprofit organization focused on reducing GHG emissions from freight transportation, publishes the approaches in their *Voluntary Market Based Measures Framework for Logistics Emissions Accounting and Reporting*.

Xpansiv and CMS: Chevron collaborated with Carbon Management Solutions (CMS) and Xpansiv to pilot a lower carbon fuel oil transaction that provides auditability and traceability for fuel oil in Singapore on a blockchain-based asset ledger. CMS is a decarbonization platform built for the commodities market, and Xpansiv is a market infrastructure provider for registering, managing, trading, settling, retiring, analyzing and reporting data-driven environmental commodities.

Open Footprint Forum: Chevron is collaborating with other stakeholders through the Open Footprint Forum. The Open Group is a global consortium that enables the achievement of business objectives through technology standards, using the Open Footprint Forum to create a common model for footprint-related data covering all types of emissions, consumptions (e.g., water, land, energy) and base calculations to normalize and aggregate data.

ISO 6338: 2023 Method to Calculate GHG Emissions at LNG Plant: Chevron collaborated with other stakeholders through IOGP, an international industry association of oil and gas producers, and through the International Organization for Standardization (ISO), an independent, nongovernmental organization with a membership of 168 national standards bodies, to develop a method to calculate the GHG emissions from an LNG liquefaction plant, onshore or offshore.

The Statement of Greenhouse Gas Emissions (SGE) Methodology: Chevron collaborated with Pavilion Energy and QatarEnergy on developing the SGE, a published methodology to quantify the GHG emissions associated with a delivered LNG cargo. It provides a measurement, reporting and verification methodology that complements common GHG reporting processes to deliver a consistent, verified SGE for each delivered LNG cargo.

Pathfinder Framework: Chevron collaborated in the Partnership for Carbon Transparency (PACT) with stakeholders across the value chain, in an effort facilitated by the World Business Council for Sustainable Development (WBCSD), to develop the Pathfinder Framework. It was created with the aim of addressing the existing challenges to data transparency. It seeks to help businesses develop a better understanding of the carbon emissions of their products and empower smart, carbon-informed decision making by encouraging and guiding the exchange of primary carbon footprint data across value chains. The framework provides supplementary guidance for accounting, verification and exchange of cradle-to-gate product carbon footprints, with the aim of creating more granular, comparable and consistent emissions data.

Pathfinder Network: Through the WBCSD and PACT, Chevron is collaborating with stakeholders from across the value chain and technology companies to develop technical specifications for the standardized exchange of carbon emissions data. Based on Pathfinder Framework guidelines, the specifications will, for the first time, allow different emissions and accounting tech solutions to connect to and understand each other, making it easier for businesses to access data.

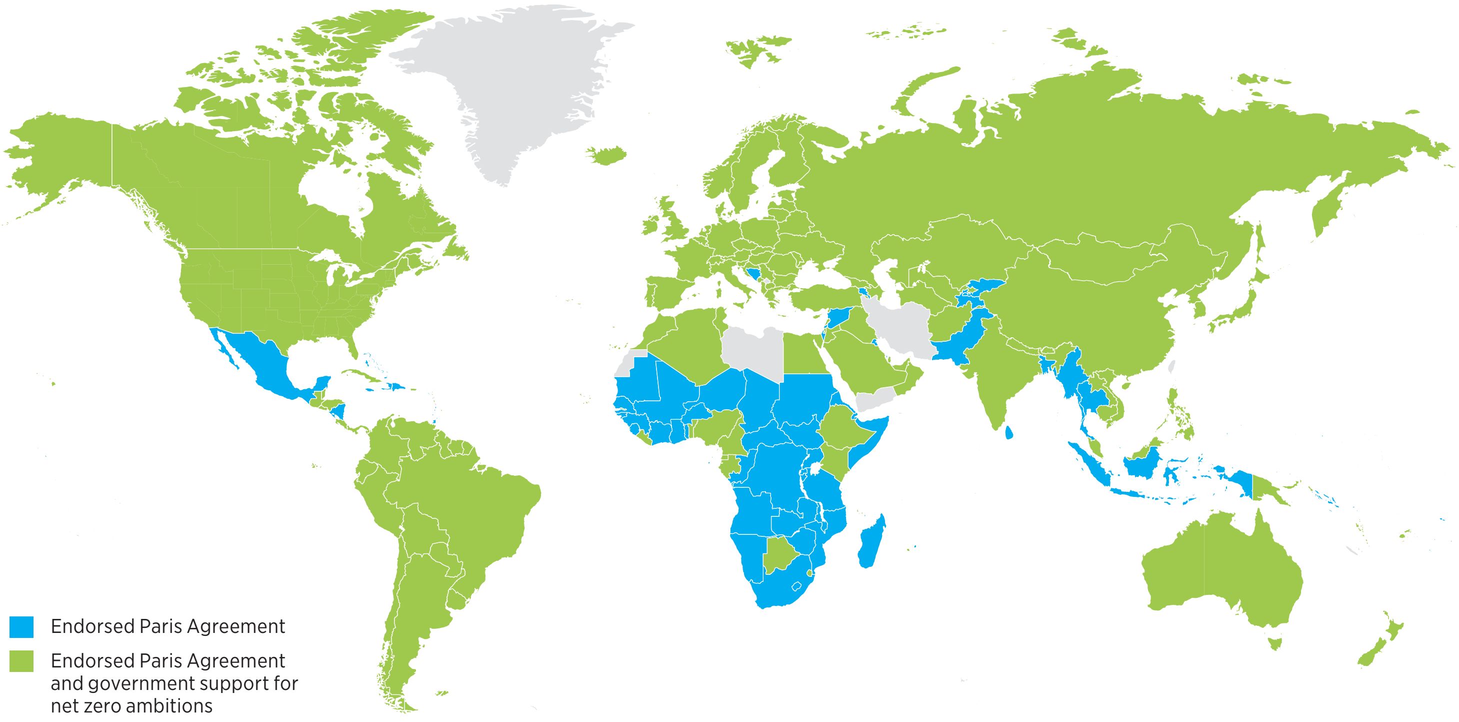
5.2 policy

we believe policy should empower markets to incentivize the most cost-efficient GHG abatement, avoidance and removals

We support the goals of the Paris Agreement. We believe policy should drive the most efficient and cost-effective abatement economywide, along with natural and technological emissions removals. Narrow sectoral or geographic approaches are less efficient than broad economywide solutions, which are better able to incentivize more efficient and cost-effective reductions. Chevron supports a price on carbon, applied as widely and broadly as possible, as the best approach to reduce emissions. We work to encourage national policies to support international linkages (e.g., through Article 6 of the Paris Agreement), with the goal of ultimately establishing a liquid and integrated global carbon market.

Individual companies contribute to achieving the goals of the Paris Agreement through their participation in policies that may be included in the NDCs of the countries in which the companies operate (Exhibit 32). We work with governments to encourage well-designed policies, such as carbon pricing and encouraging the most efficient and least carbon-intensive producers of goods and services. Most energy forecasts agree that oil and gas will continue to be a significant source of energy – even in a net zero scenario – for years to come. We believe that transparent performance reporting will enable the market to reward the most carbon-efficient producers.

Exhibit 32. Nearly all countries have endorsed the Paris Agreement, and many are supporting net zero ambitions



As of September 2023.

Sources: United Nations Treaty Collection, treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en; United Nations Framework Convention on Climate Change, unfccc.int.

Policy organizational framework: Given the scale of the global challenge to address climate change, allocation of resources as efficiently and effectively as possible is critical to creating the greatest progress. Curtailing emissions at the lowest cost per tonne, irrespective of where or in which sectors those abatements occur, is the most economically efficient approach. Such efforts, grouped by category, can be ordered by cost of the reduction on a per-tonne basis in a graphical representation (Exhibit 33), often referred to as a “marginal abatement cost curve,” or MACC.*

Each bar represents one category of mitigation opportunity. The height of each bar represents the cost of abatement, generally expressed in a cost per tonne of carbon dioxide-equivalent (CO_2e), and the width of each bar represents the volume of abatement, usually in tonnes of CO_2e. Generally, efficiency and some renewable-power applications are less costly than nature- and land-based reductions, which are generally less costly than CCUS and other technologies still in early development. Potential carbon reduction costs and volumes can also vary by geography or application.[40]

Many economists believe the most efficient way to achieve economywide emissions reduction is through a price on carbon.[41] We agree. Carbon pricing incentivizes reductions across the economy and investment in reduction technologies for the future. A price in the form of either a tax – which sets a price on emissions – or a cap-and-trade system – which sets the volume of emissions reduction – can incentivize solutions within a market-based framework, strengthening and compounding its comparative advantages over time (Exhibit 34). In addition, a carbon tax could raise revenue that may be invested or returned to impacted communities and consumers.

The wider the coverage of a price, the more opportunities to find carbon reductions. For example, for economies that are not members of the Organization for Economic Co-operation and Development (OECD), it is often less expensive to reduce emissions because investment may not have been made in more efficient technologies. By linking OECD and non-OECD economies, financing can be mobilized to incentivize reductions at the lowest cost. It is estimated that with global cooperation (e.g., through the Paris Agreement), reductions can be made at half the cost of an inefficient and unlinked system.[42]

Policies narrowly targeted at specific geographic regions, sectors or technologies are likely to miss the efficiencies of a comprehensive market-based system. The impact of a targeted approach may be a reordering of the MACC opportunities – by shifting a higher-cost activity to the left on the graph (Exhibit 35). This typically achieves less emissions reduction, at any given cost.

Exhibit 33. A MACC can be a helpful organizational framework for policy analysis and abatement-potential analysis†

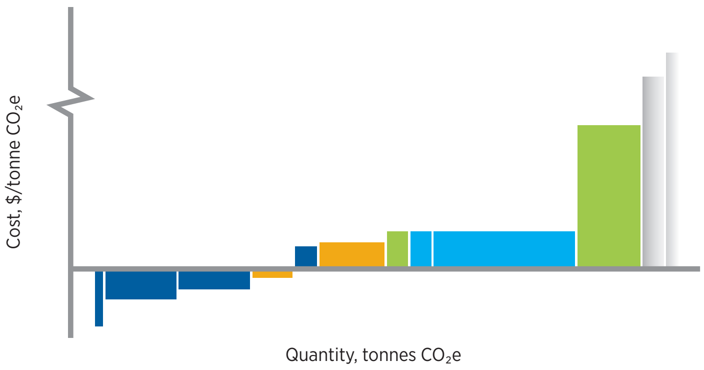


Exhibit 34. In markets with carbon pricing, the carbon cost often follows the cost of abatement in the market†

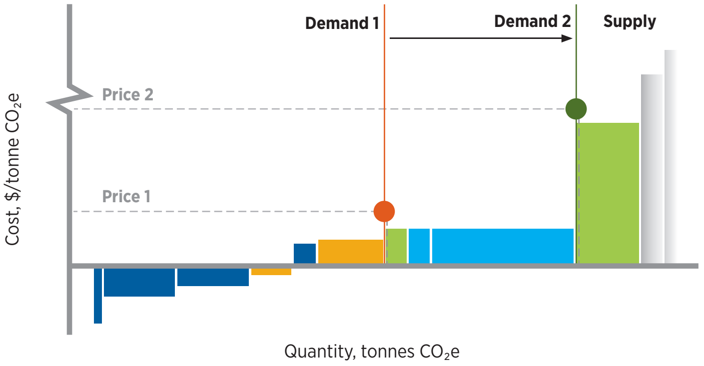
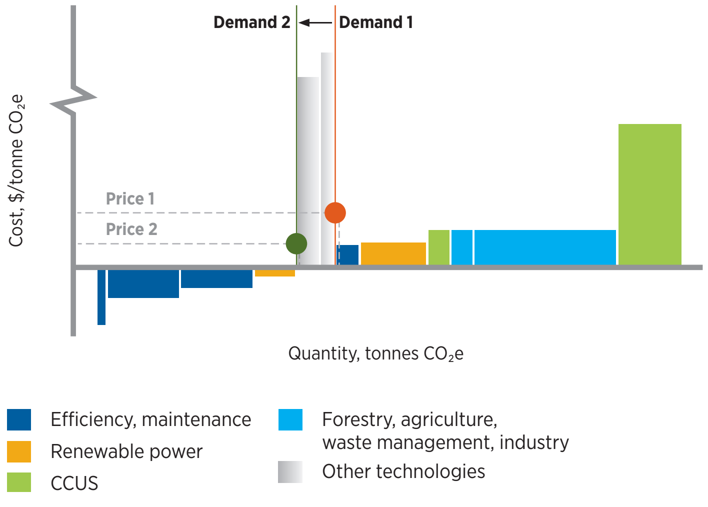


Exhibit 35. In markets with narrowly targeted policies, abatement opportunities may be reordered†



---

*Construction of a MACC requires detailed understanding of a wide range of technologies and mitigation options across the various sectors of the economy. Numerous decisions are also necessary, such as the grouping of technologies and the choice of discount rate, which can affect both the volume and the cost calculations. MACCs should be taken as qualitative, rather than quantitative, representations of the costs and potential magnitudes of mitigation options unless done with facility- and project-specific information.

†For illustration only. Not drawn to scale. Example of a marginal abatement cost curve; project ranking represents average prices, but specific projects within categories vary.

Although carbon pricing is generally regarded as the most efficient way to reduce emissions,[43] governments may want to support innovation by investing in technologies that, through commercialization, could unlock further reduction opportunities even though they are currently more expensive and have a so-called "green premium." This term refers to the "additional cost of choosing a clean technology over one that emits a greater amount of greenhouse gases."[44] Similarly, targeted policies are sometimes helpful for addressing instances in which a desirable reduction activity would not otherwise occur because of a barrier. For example, although efficiency projects often are economic, the entity that needs to invest in the reduction activity may not be the same entity that receives the benefit from the investment (e.g., in situations that involve leased equipment).

Policy impacts: The timing, scope, scale and design of policies to support the goals of the Paris Agreement will vary and could have direct and indirect impacts on the company. Policies can change the amount of energy consumed, the rate of energy-demand growth and the relative economics of one fuel versus another. Examples include:

- Efficiency improvements are expected to have the largest impact on moderating energy-demand growth (e.g., consumers purchase vehicles, appliances or homes that are more efficient). Efficiency policies are often some of the most cost-efficient on a per-tonne basis. Read more about our actions on efficiency on **page 40**.

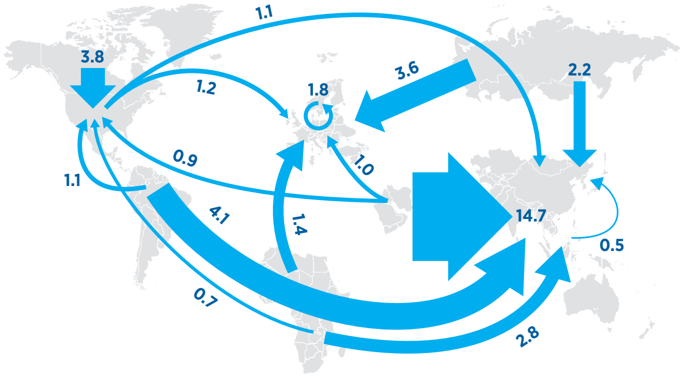
- Technology mandates, like renewable fuel and portfolio standards and EV mandates, can override the economics of different energy sources and may change the energy mix. Read more about our actions on renewables on **pages 40** and **45**.

- Carbon pricing and fuel taxes can increase the cost of fossil fuels and can affect the relative economics of the fuel mix. In addition, carbon pricing can incentivize the most carbon-efficient producer of a particular product. Read more about our approach to carbon pricing on **page 36** and our approach to carbon-efficient production on **page 39**.

- Policy design in major demand centers and markets is increasingly important because of impacts on the relative economics of fuel choices, particularly for those that trade in global markets (Exhibits 36 and 37). Carbon border adjustment mechanisms, which are applied in carbon-pricing programs, and import requirements under renewable fuels mandates to prevent offshoring of emissions to other jurisdictions (also known as "leakage"), can raise the cost of an imported product. Impact is often tied to the carbon intensity of the product's production.

Exhibit 36. Approximately 50% of global daily oil production crosses borders

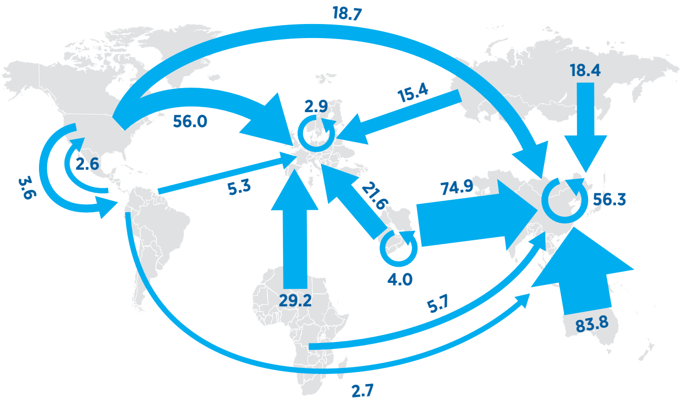
(mmbd)



Source: S&P Global Commodity Insights, *2022 Crude Oil Market*, ihsmarkit.com.

Exhibit 37. Virtually all LNG produced crosses borders

(mmtpa)



Source: Cedigaz, *2022 LNG Flows*, cedigaz.org.

direct policy cost impact analysis

The extent to which a policy can affect commodity prices and margins depends on the ability to recover the costs in the marketplace (Exhibits 38–41). Many jurisdictions take this into consideration in the context of local production and refining trade competitiveness.

Exhibit 38. Policy applied to producer below the marginal producer leads to the least ability to recover costs*

If a policy is applied to a single producer or jurisdiction, the cost can erode margins and may make the supply, refining or sale uncompetitive.

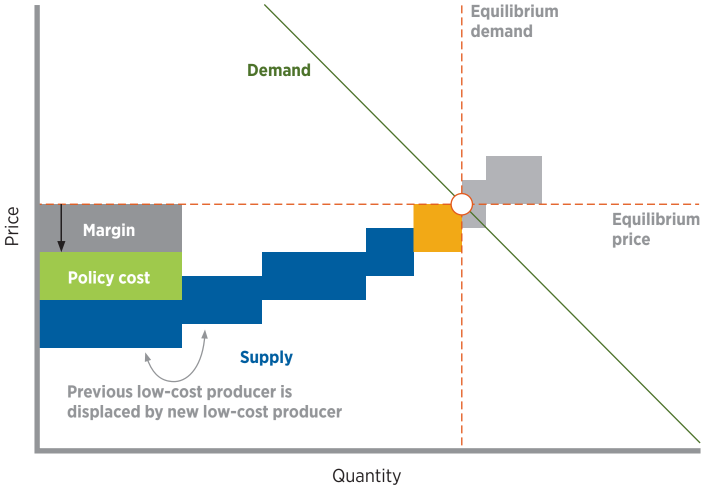


Exhibit 39. Policy applied to the marginal producer leads to some ability to recover costs*

If a policy is applied to the marginal producer, the commodity price can rise to recover a portion of the cost or to the level at which the next producer becomes the marginal producer, whichever is less.

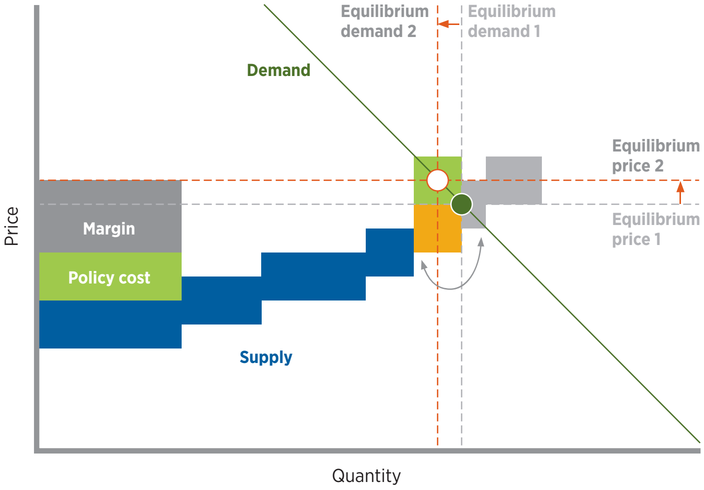


Exhibit 40. Policy applied to all producers leads to the greatest ability to recover costs*

If a policy is applied to all producers by the same amount per unit of production, the cost of supply rises, thus enabling the greatest cost-recovery potential; however, less total supply is needed.

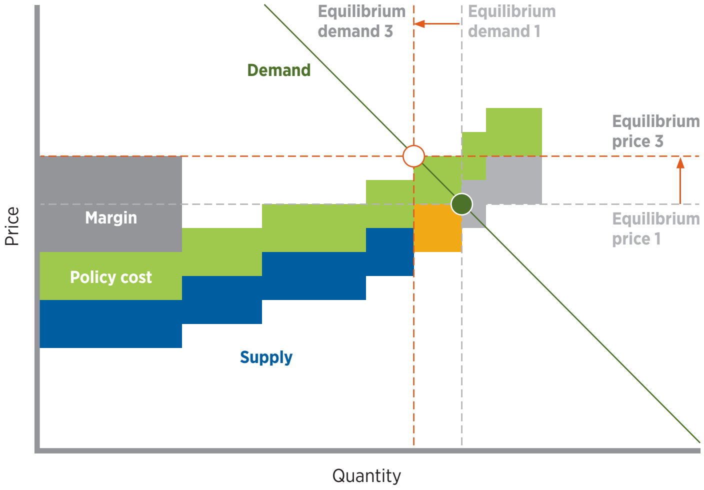
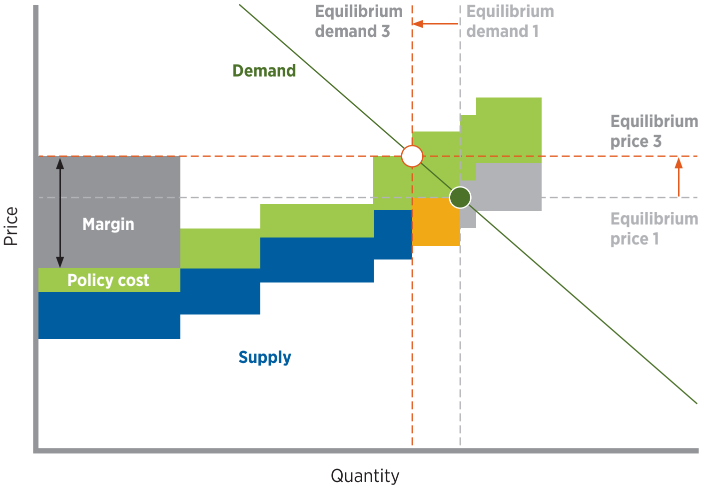


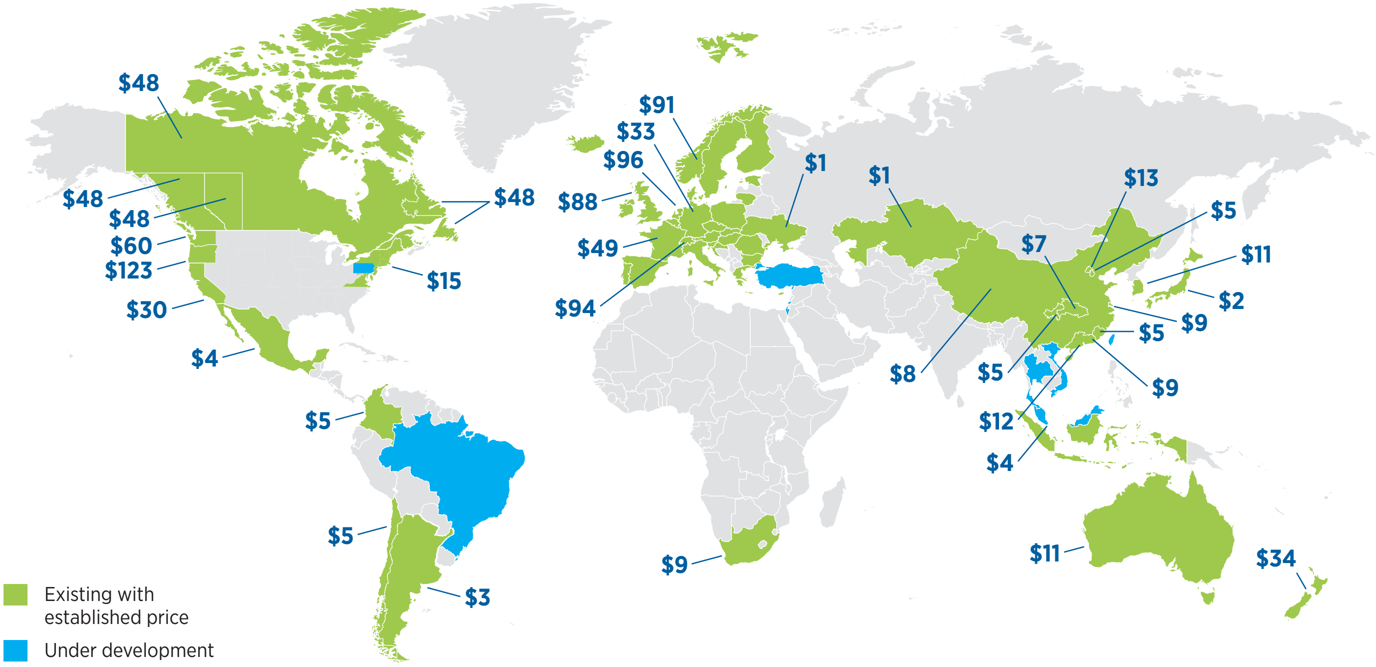
Exhibit 41. Policy applied to all producers; production efficiency incentivized and leads to the ability to recover more than costs*

If a policy cost is applied to all producers by the same amount per tonne of emissions, such as via a performance benchmark, those producers with more-efficient production have a greater ability to recover costs, which may increase margins even though less total supply is needed. Conversely, less-efficient producers may incur higher costs and be priced out of the market.



*For illustration only. Not drawn to scale.

Exhibit 42. Carbon-pricing mechanisms are in place or under development in 39 national and 33 subnational jurisdictions around the world, in many of which we operate



Source: Chevron analysis: The World Bank, *Carbon-Pricing Dashboard*, March 2023, carbonpricingdashboard.worldbank.org.

In 2022, more than 50% of our equity direct emissions were in regions with existing or developing carbon-pricing policies.

Australia Our upstream facilities are regulated by the federal Safeguard Mechanism in effect since 2016, which caps facility-level emissions and requires emissions above this cap to be offset, creating an indirect carbon-pricing policy. As of March 2023, the price for an offset was $11/tonne.

California Our upstream oil assets, refineries, and refined gasoline and diesel sales are regulated under a cap-and-trade policy in effect since 2013. In upstream and refining, allowance allocations are aligned with a performance benchmark to consider competitiveness of trade-exposed industries. Distributors of transportation fuels, natural gas and other fuels have been covered since 2015. As of March 2023, the price for an allowance was $30/tonne.

Oregon Our refined gasoline and diesel sales are regulated under the Climate Protection Program in effect since 2022. Allowances are allocated free according to cap declining rates; emissions above allocated levels can be met with Community Climate Investment credits, which are set at $123/tonne for 2023.

Washington Our refined gasoline and diesel sales are regulated under a cap-and-invest policy that took effect in 2023. As of March 2023, the price for an allowance was $60/tonne.

Canada Federal The government implemented a carbon tax of $15/tonne (CAD20) in 2019 that will increase to $150/tonne (CAD170) in 2030, which may be met with an equivalent program at the provincial level. The federal price acts as a backstop and is applied in provinces not deemed equivalent to provincial pricing programs.

Alberta Our joint venture upstream assets are subject to the carbon price of $48/tonne (CAD65) in 2023. A performance benchmark for large emitters was established under the Technology Innovation and Emissions Reduction Regulation program in 2020 and is designed to protect trade-exposed industries.

Newfoundland and Labrador Our joint venture assets in Newfoundland and Labrador are subject to a performance-based large-emitter program which is part of a carbon-pricing program that tracks the federal program.

Colombia Our fuel supplies, along with others sold in the country, are subject to a carbon tax in effect since 2017. The tax is $5/tonne in 2023. The tax liability can be met using offsets, but the percentage was reduced to 50% starting from 2023. Most developed offset projects are related to reducing emissions from deforestation and forest degradation (REDD+) and hydroelectric. Chevron has participated in this compliance program since its inception and has purchased 12.3 million tonnes of CO_2e reductions to meet our in-country obligations.

European Union Our Oronite plant in France is regulated under the EU cap-and-trade system in effect since 2005. Allowance allocations are aligned with a performance benchmark to consider the competitiveness of trade-exposed industries. As of March 2023, the price for an allowance was $96/tonne.

Kazakhstan Our joint venture upstream assets are regulated under a cap-and-trade policy in effect since 2013. Allowance allocations are aligned with a performance benchmark to consider the competitiveness of trade-exposed industries. As of March 2023, the price for an allowance was $1/tonne.

Singapore Our joint venture refinery and Oronite additive facility are subject to a carbon tax in effect since 2019. The tax is $4/tonne for 2023.

South Korea Our joint venture refinery is regulated under a cap-and-trade system in effect since 2015. Allowance allocations are aligned with a performance benchmark to consider the competitiveness of trade-exposed industries. As of March 2023, the price for an allowance was $11/tonne.

Others *Jurisdictions such as Brazil, Israel and Thailand are analyzing or developing carbon-pricing programs. Coverage and other details regarding these programs are still under consideration. China's national emissions trading scheme started in 2021 but currently covers only the power sector.*

Italics indicates a policy is under development.

we believe it is a competitive advantage to already operate in a lower carbon policy environment

We have direct exposure to carbon pricing via our operations in some of these jurisdictions. We also operate in areas (Exhibit 43) that incentivize low-carbon intensity via GHG regulations such as low-carbon fuel standards.

biofuels

Australia Renewable-fuel-blending mandates in the state of New South Wales, in effect since 2007, and in the state of Queensland, in effect since 2017, apply to all fuel suppliers and require that volumes of biofuels be blended into diesel and gasoline fuels.

Colombia A renewable-fuel-blending mandate, in effect since 2001, applies to all fuel suppliers and requires that volumes of biofuels, if available domestically, be blended into motor fuels.

Indonesia A renewable-fuel-blending mandate, in effect since 2006, applies to all fuel suppliers and requires that volumes of biofuels be blended into gasoline and diesel fuel.

Malaysia A renewable-fuel-blending mandate, in effect since 2006, applies to all fuel suppliers and requires that volumes of biofuels be blended into diesel fuel.

Philippines A renewable-fuel-blending mandate, in effect since 2007, applies to all fuel suppliers and requires that volumes of biofuels be blended into gasoline and diesel fuels.

South Korea A renewable-fuel-blending mandate, in effect since 2012, applies to all fuel suppliers and requires that volumes of biodiesel be blended into diesel fuel.

Thailand A renewable-fuel-blending mandate, in effect since 2007, applies to all fuel suppliers and requires that volumes of biofuels, if available, be blended into gasoline and diesel fuel.

U.S. Federal A renewable-fuel-blending mandate, in effect since 2006, requires the introduction of increasing volumes of biofuels into the U.S. fuel supply. This obligation applies to all refiners and importers of gasoline and diesel fuels.

California A low-carbon fuel mandate, in effect since 2011, applies to all fuel suppliers and sets carbon intensity standards for gasoline, diesel and the fuels that replace them.

New Mexico *Discussion and efforts are underway to establish a clean fuels program.*

Oregon A low-carbon fuel mandate has been in place since 2016. This is in addition to existing renewable-fuel-blending mandates applicable to all fuel suppliers, in effect since 2009.

Washington A low-carbon fuel mandate went into effect in 2023. This is in addition to existing renewable-fuel-blending mandates applicable to all fuel suppliers, in effect since 2008.

Vietnam A renewable-fuel-blending mandate, in effect since 2018, applies to all fuel suppliers and requires that volumes of ethanol be blended into gasoline.

methane

Canada Federal Our upstream operations are included in existing methane regulations for the oil and gas sector that were developed in 2018. *In 2022, Environment and Climate Change Canada began public consultations on regulatory designs to meet a new goal for sectoral methane emissions reductions of 75% by 2030 from a 2012 baseline. A final rule is expected in 2024.*

Kazakhstan Our upstream operations are subject to the Environmental Code, which includes provisions for the phased adoption of Best Available Techniques (BAT) across multiple sectors. *In 2022, a draft directory on BAT for oil and gas production was circulated for stakeholder comment.*

Nigeria Our upstream operations are subject to the Nigerian Upstream Petroleum Regulatory Commission guidelines for the management of methane and other GHG emissions in the upstream oil and gas sector, released in November 2022. The guidelines are designed to support Nigeria's emissions reduction targets, including the elimination of routine flaring by 2030 and a 60% reduction in methane emissions from the sector by 2030, relative to a 2020 baseline.

U.S. Federal Our upstream operations are subject to proposed rule revisions to New Source Performance Standards (NSPS) and Mandatory Greenhouse Gas Reporting Program (GHGRP) *Subpart W* that will add and modify requirements to new and existing regulated sources. The proposed *NSPS OOOOb* will require modifications to LDAR programs for new and modified facilities, among other requirements. The proposed *OOOOc* will direct states to implement rules on existing sources in the oil and gas sector.

Our U.S. operations are affected by sections of the 2022 Inflation Reduction Act, which directs the EPA to impose and collect a charge on methane emissions that exceed segment-specific thresholds in the domestic natural gas value chain, beginning for reporting year 2024. *The EPA has issued proposed regulation potentially significantly affecting the GHGRP.*

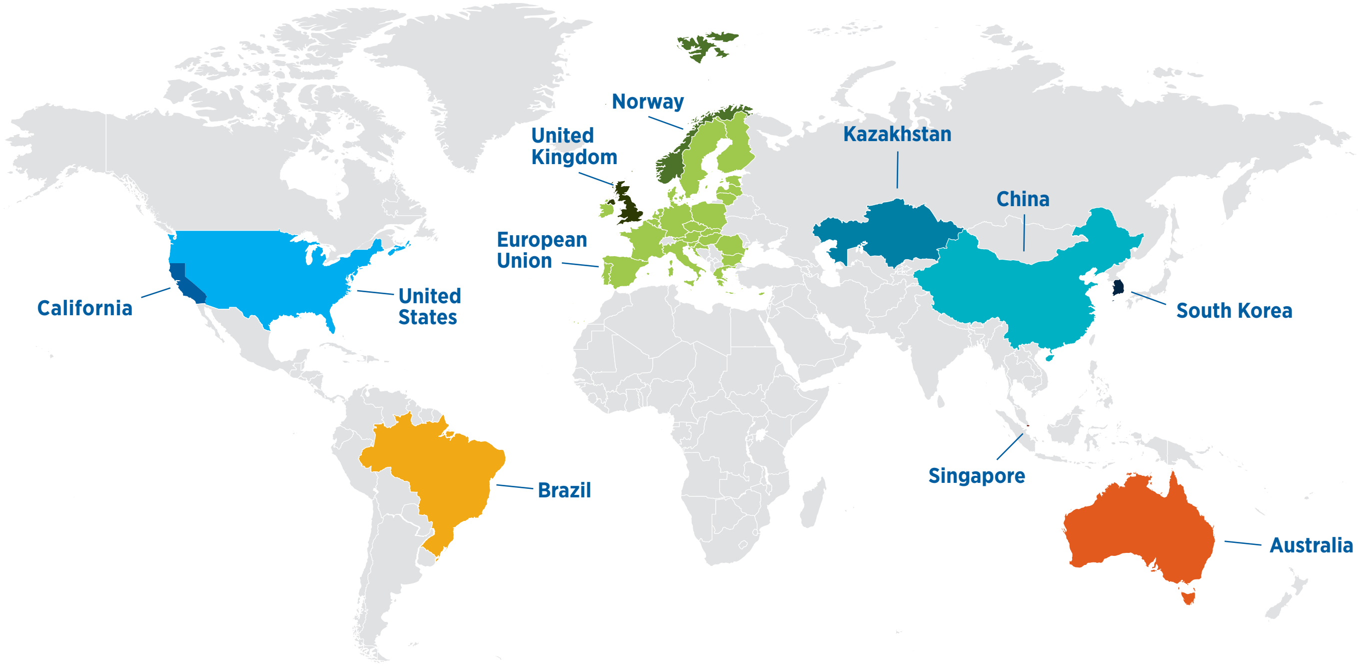
California Our upstream operations are subject to a methane rule that requires LDAR, storage tank controls and controls for other equipment. Most requirements have been in effect since 2018 and apply to both new and existing facilities.

Colorado Our upstream operations are subject to methane rules that require LDAR, storage tank controls and controls for other equipment. The rules apply to new and existing facilities and have been in effect since 2014. Updates in 2020 added emissions monitoring requirements on new flowback operations. Updates in 2023 added GHG emissions inventory verification requirements.

New Mexico Our upstream operations are subject to natural gas waste reduction rules that establish a statewide enforceable regulatory framework to secure reduction in oil and gas emissions and prevent the waste of natural gas from new and existing sources, such as targeting volatile organic compounds and methane reductions as a co-benefit.

Italics indicates a policy is under development.

Exhibit 43. From mandatory reporting requirements to renewable portfolio standards to carbon capture regulations, policy-enabled markets are advancing around the world



United States

Renewable power

- 100% carbon-free electricity target by 2035
- $369 billion in funding and incentives for renewable-energy and low-carbon initiatives through IRA

Carbon capture

- 45Q tax credit expanded and extended, providing up to $85/t for permanent CO_2 storage and $60/t for CO_2 industrial uses

Hydrogen

- $7 billion of funding for regional hydrogen hubs

Mandatory reporting

- *SEC has proposed a rule for climate change disclosure*
- EPA GHGRP requires facility-level emissions reporting for emissions >25k tCO_2e

California

Renewable power

- 90% of energy from renewables target by 2035

Carbon capture

- CCS projects qualify for Low Carbon Fuel Standard credit generation

Hydrogen

- $2.9 billion zero-emission investment plan includes $90 million for hydrogen infrastructure
- 200 hydrogen refueling stations by 2025 goal

Mandatory reporting

- CARB covers facilities with GHG emissions >10k tCO_2e

Brazil

Carbon capture and hydrogen

- *Exploring CCUS for emissions reduction paired with blue and green hydrogen generation from natural gas and biogas*

European Union

Renewable power

- 40% renewable-energy mix target by 2030

Carbon capture and hydrogen

- $3 billion in public funding for CCS and $5.2 billion in public funding for hydrogen
- Up to $41 billion innovation fund between 2020 and 2030 to scale up hydrogen and CCUS projects and other low-carbon technologies

Mandatory reporting

- Reporting directive for companies with more than 250 employees, $39 million turnover or $19.4 million assets

United Kingdom

Renewable power

- 100% renewable-power target by 2035

Carbon capture and hydrogen

- $1.3 billion to support four CCUS clusters
- $145 million to support hydrogen strategy
- Up to $24.3 billion allocated to fund the early deployment of CCUS, which includes a $1.2 billion CCUS Infrastructure Fund

Mandatory reporting

- Emissions Trading Scheme for industries with thermal input exceeding 20 megawatts
- *Green Taxonomy to allow two years of voluntary reporting before introducing mandatory reporting*
- Companies that have consumed (in the U.K.) more than 40,000 kilowatt-hours of energy in the reporting period to disclose energy and carbon information

Norway

Carbon capture

- $1.8 billion to support Longship CCS project

Kazakhstan

Mandatory reporting

- Emissions Trading System for facilities with emissions >20k tCO_2

China

Renewable power

- Increase wind and solar generation capacity to 1,200 gigawatts by 2030, with 25% of total energy consumption from renewable sources

Hydrogen

- Up to $220 million per chosen city to build hydrogen infrastructure and promote fuel cell vehicle adoption
- Target fleet of 50,000 hydrogen-fueled vehicles by 2025

Mandatory reporting

- Emissions Trading System for power sector >26k tCO_2e

Singapore

Carbon capture and hydrogen

- Low-Carbon Energy Research Funding Initiative awarded $39 million to low-carbon hydrogen and CCUS projects, with planned additional funding of $91.7 million

Mandatory reporting

- *Proposed mandatory climate-related disclosures, starting from financial year 2025*
- Carbon Pricing Act charges facilities with emissions ≥25k tCO_2e at $3.6/$tCO_2e$, which increases to $18 in 2024 and $33 in 2026

South Korea

Renewable power

- 20% renewable-power targets by 2030 and 30%–35% for 2040

Hydrogen

- Roadmap to develop hydrogen and fuel cell economy, with $3 billion in planned investment
- Safety management law provides legal framework for government efforts, including subsidies
- $383 million fund to promote development of the hydrogen industry

Mandatory reporting

- Emissions Trading System for facilities with emissions >25k tCO_2e

Australia

Renewable power

- Some state- and territory-level renewable-power targets of 50%–100% by 2030

Carbon capture and hydrogen

- Carbon credit units awarded to CCS operators, where each unit represents 1 tonne CO_2e stored
- 106 active planned or operational hydrogen projects, with 48 more in the investment pipeline

Mandatory reporting

- *Proposed Safeguard Mechanism reform requires heavy emitters (>100k tCO_2e) to cut emissions by 4.9% per year*
- *Proposed requirement that large, listed entities and large financial institutions disclose climate risks, commencing with the 2024/2025 financial year*
- National Greenhouse and Energy Reporting Act covers facilities with emissions ≥25k tCO_2e

Source, as modified by Chevron Corporation: consolidation of publicly available information.

Italics indicates a policy is under development.

chevron supports well-designed climate policy

Chevron supports the global ambitions of the Paris Agreement and continues to take actions to help lower the carbon intensity of our operations while continuing to meet the world's demand for energy. Chevron believes that broad, market-based mechanisms are the most efficient approach to addressing GHG emissions reductions.

Chevron supports carbon pricing, innovation and efficient policies. Chevron supports:

- **Global engagement:** Build up an integrated global carbon market that creates a level playing field and mitigates trade distortions. Incentivizing the lowest-cost abatement on the widest scale possible is critical to mitigating climate change, as it allocates limited resources as efficiently and effectively as possible to create the greatest opportunity for success.
- **Research and innovation:** Support promising pre-commercial technologies designed to spur innovation and mitigation across all sectors of the economy. Investments in pre-commercial early-stage abatement technologies can lead to commercially viable businesses and ultimately reduce the need for incentives over time.
- **Balanced and measured policy:** A balanced and measured approach aims to meet long-term economic, environmental and energy-security needs; allocates costs in an equitable, gradual and predictable way; and considers both GHG mitigation and climate change adaptation. Involve all sectors, technologies and solutions to maximize efficient and cost-effective reductions and avoid duplicative and inefficient regulations.
- **Transparency:** Strive for transparency and efficiency in measuring and driving the lowest-cost emissions reductions. Transparently communicate policy benefits, costs and trade-offs to the public.

Marginal abatement cost curve, promoting carbon efficiency at the least cost to society

(Quantity, tonnes CO_2e)

innovation support

Investments in pre-commercial early-stage abatement technologies can lead to commercially viable businesses and ultimately reduce the need for incentives over time.

carbon pricing

Carbon pricing should be the primary policy tool to achieve GHG emissions reduction goals. It incentivizes the most efficient and cost-effective emissions reductions when applied broadly across the economy while enabling support to affected communities, consumers and businesses.

targeted policies

Direct regulations should be narrowly and efficiently targeted to enable cost-effective lower carbon opportunities not addressed by carbon pricing or innovation policies (e.g., apartment efficiency standards, because the owner pays for efficiency improvements, but the renter pays the utility bill).

chevron supports a lifecycle approach to carbon accounting

The best decisions are made with reliable data. Pursuing a lower carbon future is no different. The world is not on track to meet the goals of the Paris Agreement[*] and needs better data to enable better decisions to advance these goals. Chevron believes lifecycle analysis (LCA) is a powerful tool to enable data-driven decisions.

A lifecycle approach to carbon accounting facilitates informed decision making throughout the value chain. Also known as "carbon footprinting," this accounting approach can be used to quantify the carbon intensity associated with a good or service, inclusive of both direct and indirect emissions. Such an approach could enable policymakers to drive the most pragmatic policy, incentivize producers to abate more, inform buyers on making lower carbon choices in a standardized manner and identify more cost-efficient emissions reduction options.

A lifecycle assessment is a comprehensive method for assessing a range of environmental impacts across the full lifecycle of a product system, from materials acquisition to manufacturing, use and final disposition. When focused on carbon emissions, this approach enables product differentiation by enabling a holistic comparison of product carbon performance.

Chevron is working within and beyond our sector to help develop global standards and guidance to advance carbon accounting as we seek to lead in carbon transparency. Actual data, a standardized approach to allocating emissions, and single-attribution to avoid double counting are all needed as the foundation for consistent carbon accounting.

principles

- **Relevant:** Actual data compared on a common basis enables day-to-day decision making.
- **Consistent:** Data enable performance comparisons across suppliers and over time.
- **Accurate:** Common set of assurance standards promotes the reliability of information.
- **Complete:** Lifecycle summation, inclusive of all relevant emissions, and annual global reconciliation of emissions are achieved.

It is important to assess carbon performance for comparable stages in the lifecycle

Lifecycle emissions are the sum of GHG emissions and removals in a product system expressed as CO_2-equivalents.

production		transport		manufacturing		transport		use		lifecycle emissions
25 kg CO_2e/boe	+	5 kg CO_2e/boe	+	37 kg CO_2e/boe	+	5 kg CO_2e/boe	+	420 kg CO_2e/boe	=	492[†] kg CO_2e/boe

---

[*] The UN Environment Programme's *Emissions Gap Report 2022,* unep.org, shows that the world is not on track to meet the Paris Agreement goal of limiting global warming to well below 2° C, preferably 1.5° C.

[†] Illustrative values are based on production and manufacturing values from Chevron's oil and refining carbon intensities, respectively, as stated on **page 66** in Chevron's GHG reporting equity metrics and targets table; transport value based on Chevron internal analysis of IEA, *World Energy Outlook 2018*, iea.org/reports/world-energy-outlook-2018; end-use value from API, *GHG Compendium (2021)*, api.org.

chevron supports policy to advance innovation and lower carbon solutions

Chevron supports energy policies that incentivize the investment in projects and products that promote new technologies. We believe carbon pricing should be the primary policy tool to achieve GHG emissions reduction goals. In regions lacking sufficient carbon markets, government incentives and grants can be useful tools in encouraging a lower carbon future.

If designed properly, incentives, research and innovation, grants, and public partnerships can be effective policy tools to enable lower carbon operations and products. Chevron supports:

- **A focus on emissions:** Public research, development, demonstration and deployment should be based on opportunity for scalable emissions reduction, supporting the most promising pre-commercial opportunities, irrespective of energy source.

- **Balanced and transparent government policies:** Policy should be balanced to enable research, development and demonstration of promising technologies while minimizing market distortions. Policy should be open to participation and competition from across sectors and transparent in order to build public trust and communicate benefits, costs and trade-offs to the public.

- **Pre-commercial support:** To maximize limited public resources and minimize harmful market distortions, innovation policy should focus on advancing emerging technologies so they become commercially scalable without subsidy within a carbon-pricing program. Incentive-oriented programs should be designed with the goal of ultimately enabling technologies and products to compete without government support.

- **Scalable solutions:** Innovation policy should leverage scientific research to advance promising technologies that can offer scalable economic solutions to climate change. Policy should aim to drive down costs so these opportunities are commercially scalable and reduce the need for incentives over time.

incentives

We acknowledge and support incentives for nascent technologies and regions lacking a viable carbon market. Incentives should be designed with the intent to create cost competitiveness and scalability for lower carbon businesses and reduce the need for incentives over time.

research and innovation

We support policies that promote research, development and deployment of technologies to enable scalable solutions, drive down costs and improve performance. Investments in pre-commercial technologies can lead to commercially viable businesses and ultimately reduce the need for incentives over time.

grants and public partnerships

We believe competitive grant programs, public-private partnerships or co-investments in lower carbon technologies can be useful tools if designed to be competitive, results-oriented, transparent and inclusive of appropriate investment terms. Innovation policy grants should focus on advancing emerging and pre-commercial technologies. Grants for existing commercial opportunities that distort markets and create unfair competition should be avoided.

participating in methane policy

chevron believes that methane management is critical to a lower carbon future and that methane reductions are possible through adoption of industry best practices, advancement in measurement technologies, carbon pricing and methane regulations

We support carbon pricing as the primary tool to most efficiently and effectively enable GHG emissions reductions, including methane. However, carbon pricing requires robust measurement, reporting and verification (MRV) programs to accurately quantify emissions, and continued advances in methane measurement technologies and protocols are needed. In jurisdictions where MRV programs for methane are not robust and mature, we continue to engage on and support effective methane regulations as the transitional policy approach.

chevron supports:

- **MRV programs:** Methodologies need detection technology performance specifications, measurement protocols and verification to ensure consistent quantification and reporting of methane emissions across all covered operators and sectors. Currently, there is greater measurement uncertainty with methane emissions than with CO_2 emissions. A robust MRV framework will need to balance the use of emission factors, engineering estimates and advanced technologies.
- **Technological innovation:** Policy should flexibly incorporate advanced technologies, such as aerial and drone monitoring, that can detect and measure methane emissions most effectively, particularly from super-emitters that have a disproportionate impact on overall emissions. Policy frameworks should be based on realistic current capabilities of measurement technologies and encourage further technology advancement.
- **All sectors contributing:** Improving methane performance is important for oil and natural gas, which generate approximately 24% of global methane emissions, and the other sectors that generate the remaining 76%. Policy should apply to all key sectors.
- **Performance-based regulation:** When jurisdictions pursue methane regulations, they should set appropriate methane targets based on industry best practices, including reasonable minimum equipment standards, while providing flexibility for companies to determine the optimal way to meet those targets.

we share our experiences on what has been effective within our operations and are committed to engaging in the public policy process

chevron engages:

We believe learning from and sharing best practices within the oil and gas industry can help improve industrywide methane management. We engage policymakers and other entities for knowledge sharing on methane emissions. This includes participation in groups that develop and share best practices for methane reduction, such as The Environmental Partnership in the United States and Insitituto Argentino Del Petroleo Y Del Gas in Argentina, as well as direct feedback on specific policy proposals, such as in Kazakhstan, Nigeria and the United States.

Additional examples of our engagements include:

- **Low Carbon Working Group (LCWG):** Chevron participates in the LCWG, which hosted the Roundtable on Methane Emission Quantification and Reduction in the Oil and Gas Industry in Kazakhstan. The roundtable included members of government, industry and experts, who discussed reduction opportunities.
- **National Petroleum Council (NPC):** Chevron is leading a task group on baseline and expected emissions pathways for a study by the NPC, which is a federal advisory committee for the U.S. Department of Energy, on methane and other GHG emissions reduction opportunities for the U.S. natural gas supply chain.
- **Global Methane Pledge:** Chevron supports efforts like the Global Methane Pledge to reduce global human-made methane emissions by at least 30% from 2020 levels by 2030. We participated in the Methane Guiding Principles initiative to develop a policy toolkit for use by the 150 countries that have committed to the effort.
- **United States Agency for International Development (USAID):** At the USAID Southeast Asia Smart Power Program workshop on oil and gas methane emissions, we gave a presentation on the current deployment of methane detection technologies and participated in a capacity-building session on regional needs for methane reduction.
- **U.S. Trade and Development Agency (USTDA):** As part of the Global Methane Pledge launched at COP26, the U.S. government, through the USTDA, invited government officials from Algeria, Egypt and Libya to visit the U.S. to showcase U.S. methane detection technology and reduction practices. Chevron hosted a field tour in Midland and a discussion in Houston with the delegates during their visit.

To view our public statements and comment letters, go to **chevron.com/newsroom/media/publications**.

section 6

metrics

Photo: A worker conducting checks aboard the Agbami floating production, storage and offloading vessel.

section 6: metrics

increasing transparency by annually reporting metrics and performance data*

The following data tables compile our greenhouse gas (GHG) emissions and other metrics for environmental performance in alignment with several reporting standards. Due to the overlapping reporting of GHG emissions across scopes between different entities within the same value chain, Chevron's reporting on metrics, targets, aspirations and projections does not preclude other entities in the value chain from calculating or reporting emissions performance associated with Chevron-sold products or services.

We consider reporting guidelines, indicators and terminology in the frameworks of the Sustainability Accounting Standards Board (SASB), Task Force for Climate-related Financial Disclosures (TCFD), the Sustainability Reporting Guidance for the Oil & Gas Industry (2020) by Ipieca, the International Association of Oil and Gas Producers (IOGP) and the American Petroleum Institute (API), as well as other reporting frameworks, to determine which data to include in our tables.

To promote comparability, we map our reporting data to the relevant SASB and Ipieca frameworks to help provide information for investors and other stakeholders. Please note that the references in the index columns are based solely on Chevron's interpretation and judgment and do not indicate the application of definitions, metrics, measurements, standards or approaches set forth by third-party groups, including the SASB and Ipieca frameworks.

Chevron is also working with peers, stakeholders and voluntary framework developers to foster increasingly consistent and comparable information for investors and other stakeholders.

We were among the first oil and gas companies to publish a report aligned with the TCFD framework in 2018, and this report constitutes our sixth climate change resilience report. We will strive to advance our performance and transparently communicate progress. As an example of this, see the table below, which tracks annual progress toward our 2028 GHG emissions intensity targets.

GHG reporting equity metrics and targets

	2018	2019	2020	2021	2022	2028 target
Portfolio carbon intensity (grams CO_2e/megajoule)[1]	**73.4**	**72.7**	**71.4**	**71.3**	**71.0**	**71.0**
Upstream carbon intensity[2]						
Oil intensity (kilograms CO_2e/boe)	37.0	33.3	28.2	28.6	25.2	**24.0**
Gas intensity (kilograms CO_2e/boe)	34.7	30.4	26.8	28.6	27.5	**24.0**
Methane intensity (kilograms CO_2e/boe)	2.8	2.4	2.0	2.1	1.9	**2.0**
Flaring intensity (kilograms CO_2e/boe)	6.3	4.7	3.8	4.3	3.5	**3.0**
Refining carbon intensity (kilograms CO_2e/boe)[3]	**34.9**	**35.9**	**38.6**	**37.9**	**37.0**	**36.0**

---

*Unless otherwise noted, this section reflects 2022 data collected as of April 11, 2023. All data are reported on an operated basis unless otherwise noted. Data from Renewable Energy Group, Inc. are included in this section unless otherwise noted. Operated GHG emissions and environmental performance tables include data from Tengizchevroil LLP (TCO) and the Partitioned Zone between Saudi Arabia and Kuwait (SAPZ). Traditionally in this report, Chevron has included TCO data as if TCO were operated by Chevron; however, Chevron does not own a controlling interest in, does not operate and does not have the authority to force implementation of Chevron management systems within TCO. TCO is a separate legal entity operated under the direction of a partnership council that Chevron does not control. Inclusion of SAPZ data within the operational data is a reflection of alignment to OE reporting and not reflective of the underlying legal structure or governance practices. All restatements are restated against the May 2022 release of the *Corporate Sustainability Report* (2021). Variations year-on-year or across multiple years of performance data may result from a variety of causes such as methodology updates, portfolio changes, economic conditions, and business performance and initiatives. Performance data are not a guarantee of future performance nor intended to be a demonstration of linear progress against aspirations, targets or objectives. See Forward-Looking Statements Warning on **page 84** of this report. Numbers in the table may not sum due to rounding.

calculation methodology

portfolio carbon intensity

grams CO_2e/megajoule

$$\frac{\sum_i[(\text{GHG intensity})_i * (\text{Energy})_i] - \sum_j(\text{Net GHG removals})_j}{\sum(\text{Energy})_i}$$

Where: $(\text{GHG intensity})_i$ is the simplified value chain GHG intensity of marketed product_i, $(\text{Net GHG removals})_j$ is the net GHG emissions stored, or offset, and $(\text{Energy})_i$ is the energy of the marketed product_i.

our portfolio carbon intensity methodology

Introduction: The portfolio carbon intensity (PCI) methodology is designed to facilitate carbon intensity accounting of a company's portfolio. It uses a representative value chain that includes equity-based emissions associated with bringing products to market, including the indirect emissions from use of sold products (Scope 3). The PCI methodology facilitates transparency in calculations and data with information taken from financial statements and emissions disclosures. This approach enables comparison of companies that may participate in different parts of the value chain and the use of real data when possible.

Chevron's PCI represents the products we sell, including our own emissions, emissions from third parties and emissions from customer use of our products. For Chevron, the volume of emissions produced by users of our products is larger than our volume of emissions associated with either upstream production or manufacturing.

Intent: The PCI methodology provides a framework for transparent and consistent comparisons of the mix of energy products provided by a company and their associated carbon performance, inclusive of elements of direct emissions (Scope 1), indirect emissions from imported energy (Scope 2), and indirect emissions associated with the value chain and use of sold products (Scope 3). The methodology is broadly applicable to oil and gas companies involved in exploration and production, manufacturing or marketing activities.

PCI definition: Estimated energy-weighted average GHG emissions intensity from a simplified value chain from the production, manufacturing, distribution and end use of marketed energy products per unit of energy delivered.

Units: Grams of carbon dioxide-equivalent GHG emissions per megajoule of energy delivered (g CO_2e/MJ) on a higher-heating-value basis to align with prior frameworks on gas value chain emissions and with heating values commonly used in commercial contracts.†

Scope: The PCI is calculated on an annual basis as the weighted-average GHG intensity of energy delivered across gas, natural gas liquid (NGL), oil, biofuel, hydrogen and lower carbon power products. Carbon removals are deducted from total lifecycle emissions estimates.

The following energy products (*i*) are included in the PCI methodology:

- **Gas:** piped gas, LNG, compressed natural gas and renewable natural gas
- **Natural gas liquids:** NGLs from upstream and refining
- **Liquid fuels:** crude oil and its refined products (gasoline, diesel, jet fuel, fuel oil and other petroleum products), ethanol, renewable diesel, biodiesel and sustainable aviation fuel
- **Hydrogen:** external sales of hydrogen, including lower carbon hydrogen
- **Lower carbon power:** external sales of wind, solar and geothermal power

The following removals (*j*) are included in the PCI methodology calculation:

- **CCUS** removes CO_2 either directly from the atmosphere or from streams that would be released to the atmosphere. It does not include CO_2 produced from naturally occurring reservoirs that is used for enhanced oil recovery.
- **High-integrity offsets** include nature-based solutions

For traditional hydrocarbon products (gas, NGL and oil), marketed volumes are based on the business segment (production, manufacturing or marketing) with the largest overall commodity volume, inclusive of all traded volumes.

Chemicals and other business lines that do not primarily supply energy products are excluded from this calculation.

---

† Several prior product-intensity frameworks have used lower heating value for intensity calculations.

Methodology and data sources

Traditional hydrocarbon products: The intent of the framework is to capture value chain emissions associated with the largest hydrocarbon product volume for a company among its production, manufacturing and marketing activities. For all products that a company produces or manufactures, the PCI methodology uses the company's equity GHG emissions and corresponding GHG intensity. To estimate the emissions for marketed products that the company does not produce or manufacture, the PCI methodology uses industry-average segment factors from the International Energy Agency's *World Energy Outlook*. Hydrocarbon transportation emissions are estimated in the PCI using IEA *World Energy Outlook* estimates for transportation emissions from oil and gas. Emissions associated with end use of marketed products are based on industry-standard combustion factors and assume all sold energy products are combusted, although this is not the case (e.g., plastics and lubricants). Exhibit 44 is a depiction of the value chain approach for the refined-product value chain.

Biofuels, hydrogen and lower carbon power: GHG emissions are calculated based on lifecycle assessment data and the energy provided by Chevron in the most recent year. Lifecycle assessment data sources include California Air Resources Board (CARB) Low Carbon Fuel Standard (LCFS) Pathway Certified Carbon Intensities for similar feedstocks and pathways, a Hydrogen Council report on a lifecycle assessment for hydrogen pathways, and harmonized lifecycle assessments of electricity generation from the (U.S.) National Renewable Energy Laboratory and the Intergovernmental Panel on Climate Change Working Group 1.

The model does not adjust for the energy efficiency gains associated with some applications of electricity and hydrogen relative to existing hydrocarbon infrastructure. For example, CARB estimates that energy provided as electricity to an electric vehicle is 3.4 times more efficient than energy provided by gasoline to an internal combustion engine. Model updates could be made in the future, if supported by the end use of electricity or hydrogen products.

Inputs are collected from financial disclosures and public GHG reporting, with the exception of the biofuels component. Biofuel volumes are based on purchase data and production volumes for ethanol, renewable diesel, sustainable aviation fuel, and biodiesel and production volumes for renewable natural gas in the United States, Hong Kong, Malaysia, Philippines, Thailand and Australia. Volumes from international GS Caltex operations in South Korea are assumed to be zero. For 2016–2022, aggregate biofuel volumes used in the PCI calculation are 60,000, 61,000, 62,000, 68,000, 61,000, 70,000 and 105,000 barrels of oil-equivalent per day, by respective year. Biofuel carbon intensity values are based on CARB LCFS default pathway values. For 2016–2022, the weighted-average biofuel carbon intensity values used in the PCI calculation were 52, 52, 51, 50, 48, 47 and 38 grams carbon dioxide-equivalent GHG emissions per megajoule, respectively.

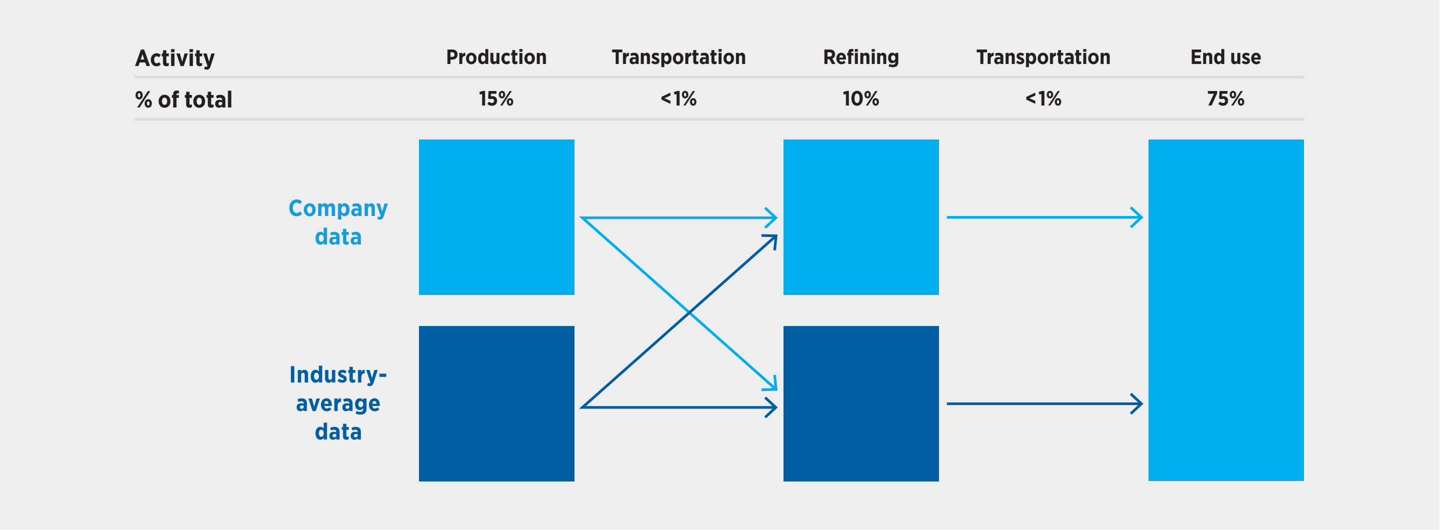
CCUS: Net GHG removal emissions associated with CCUS represent the emissions that would be permanently sequestered underground or utilized in other products with a deduction for supply chain emissions associated with capture, transport or storage. CCUS projects that reduce direct emissions (Scope 1) and indirect emissions from imported energy (Scope 2) would reduce the production, manufacturing or other sectoral intensity and would not be double-counted as removals; for example, CO_2 captured by an integrated CCS plant would already be accounted for in the facility's direct emissions (Scope 1) intensity.

Offsets: Offsets that are retired by the company or on behalf of customers for use of product provided by the company.

Improvements over time: Methodologies and emissions factors may be updated in future years to reflect additional information or data that become available. For example, updates may include updated industry averages, primary data from third-party producers and refiners, and adjustments to energy efficiency assumptions, if warranted, based on the end-use applications for volumes of energy marketed by the company.

A PCI calculator is available on our website and can be used by integrated energy providers and specialized value chain participants to compare energy companies' carbon intensities. To access the PCI calculator, visit **chevron.co/chart-generator**.

Exhibit 44. PCI approach for the refined-product value chain



Illustrative percentages are based on data from Chevron's PCI calculator; Rocky Mountain Institute (RMI)'s Oil Climate Index plus Gas, "Profiling Supply Chain Emissions," April 2023, ociplus.rmi.org/supply-chain; and IEA, *World Energy Outlook 2018*, iea.org/reports/world-energy-outlook-2018.

upstream carbon intensity

kilograms CO_2e/boe

Upstream carbon intensity (UCI) includes emissions intensity metrics for oil production, gas production, flaring and methane. Chevron’s UCI metrics are equity-based, which means that they include our pro rata share of emissions both from the assets that Chevron operates and from our nonoperated joint ventures. The metrics reflect commodity basis to align with end use and enable value chain reporting.

upstream oil intensity

$$\frac{\left(\text{Direct emissions (Scope 1)} + \text{Indirect emissions associated with imported electricity and steam (Scope 2)} - \text{Emissions associated with exported electricity and steam}\right)}{\text{Net production of liquids}} \longleftarrow \text{Allocated to liquids on a production basis (boe)}$$

upstream gas intensity

$$\frac{\left(\text{Direct emissions (Scope 1)} + \text{Indirect emissions associated with imported electricity and steam (Scope 2)} - \text{Emissions associated with exported electricity and steam}\right)}{\text{Net production of gas (including LNG and GTL)}} \longleftarrow \text{Allocated to gas on a production basis (boe)}$$

upstream flaring intensity

$$\frac{\text{Direct flaring emissions as } CO_2e \text{ (Scope 1)}}{\text{Net production of gas and liquids (including LNG and GTL)}}$$

upstream methane intensity

$$\frac{\text{Direct methane emissions as } CO_2e \text{ (Scope 1)}}{\text{Net production of gas and liquids (including LNG and GTL)}}$$

Emissions reported are net (Scope 1 and 2). The emissions included in the metrics generally represent Chevron’s equity share of emissions from upstream, including LNG and GTL facilities, which are emissions from operated and nonoperated joint venture assets based on Chevron’s financial interest. For reporting, Chevron includes certain indirect sources of GHG emissions within direct emissions that are outside of the traditional Scope 1 definition, such as GHG emissions from processes like drilling and completions, and tolling agreements up to the point of third-party custody transfer of the oil or gas product. For oil and gas production intensity metrics, production is aligned with net production values reported in the *Chevron Corporation Supplement to the Annual Report*, which represent the company’s equity share of total production after deducting both royalties paid to landowners and a government’s agreed-upon share of production under a production sharing agreement. Chevron’s equity-share emissions include emissions associated with these excluded royalty barrels in accordance with the Ipieca *Guidance*. Also in accordance with the Ipieca *Guidance*, Chevron’s equity-share emissions do not include emissions associated with royalty payments received by the company. Allocation of emissions between oil and gas is based on the fraction of production represented by liquids or gas. Flaring and methane intensities use the total of liquids and gas production. Oil and gas production intensities use liquids production and natural gas production, respectively.

refining carbon intensity

kilograms CO_2e/boe

The refining carbon intensity (RCI) metric provides a measure of GHG released during the transformation of raw materials into refined products. RCI is throughput-based and includes GHG emissions from Chevron's own refining operations and estimates of emissions associated with third-party processing of imported feedstocks such as hydrogen.[*][†] Throughput includes net crude and other feedstocks (including bio-based feedstocks). Scope includes crude refineries, biorefineries and co-processing facilities.[‡]

The metric is on an equity basis.

$$\frac{\left(\begin{array}{c}\text{Refinery direct}\\ \text{GHG emissions}\\ \text{(Scope 1)}\end{array} + \begin{array}{c}\text{Refinery indirect GHG emissions}\\ \text{associated with imported}\\ \text{electricity and steam (Scope 2)}\end{array} + \begin{array}{c}\text{Third-party processing emissions}\\ \text{associated with imported}\\ \text{feedstocks* (a type of Scope 3)}\end{array} - \begin{array}{c}\text{Emissions associated}\\ \text{with exported electricity}\\ \text{and steam}\end{array}\right)}{\text{Crude + Other feedstocks, including bio-based feedstocks}}$$

---

[*] Emissions from third-party processing of imported feedstocks are estimated using information including supplier data, industry segment averages and engineering estimates. Emissions included in the calculation represent refinery processing only and do not include terminals or chemical, additive, base oil and lubricant facilities not integrated into a refinery. Feedstocks include hydrogen and intermediate products that will be further refined or used in conversion units. Feedstocks do not include natural gas used as fuel or products intended solely for blending into finished products. Feedstocks are assessed on a net basis (imports minus exports).

[†] Emissions associated with the production of hydrogen can account for 25% of total refinery emissions, and more than half of the hydrogen used in U.S. refining is imported from a third party. ("Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from the Petroleum Refinery Industry," US EPA Office of Air and Radiation 2010 and U.S. Energy Information Administration, *EIA-820 Annual Refinery Report* and *EIA-810 Refinery and Blender Net Input*).

[‡] Chevron's 2022 RCI metric excludes biorefineries acquired from Renewable Energy Group, Inc. in June 2022. The 2023 RCI metric is expected to include these biorefineries.

equity emissions

	2018	2019	2020	2021	2022	SASB	ipieca
direct GHG emissions (scope 1)[4,5,6,7]							
direct GHG emissions (scope 1) – all GHGs (million tonnes CO_2e)	**66**	**62**	**54**	**57**	**53**		CCE4: C1/A1
Upstream – all GHGs (million tonnes CO_2e)[8]	**28**	**27**	**23**	**23**	**18**	EM-EP-110a.1	CCE4: C3
CO_2 (million tonnes)	25	24	21	20	16		
CH_4 (million tonnes CH_4)[9]	0.10	0.10	0.08	0.08	0.07		
CH_4 (million tonnes CO_2e)[9]	2.5	2.4	2.1	2.1	1.8		
Other GHGs (million tonnes CO_2e)	0.1	0.1	0.1	0.1	0.1		
Upstream flaring (subset of Scope 1) – all GHGs (million tonnes CO_2e)	**5**	**5**	**4**	**4**	**3**	EM-EP-110a.2	CCE7: C4
CO_2 (million tonnes)	5	4	3	4	3		
CH_4 (million tonnes CH_4)[9]	0.02	0.01	0.01	0.01	0.01		
CH_4 (million tonnes CO_2e)[9]	0.5	0.4	0.3	0.3	0.2		
Other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Midstream – all GHGs (million tonnes CO_2e)	**2**	**1**	**1**	**1**	**1**	EM-MD-110a.1	CCE4: C3
CO_2 (million tonnes)	2	1	1	1	1		
CH_4 (million tonnes CH_4)[9]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
CH_4 (million tonnes CO_2e)[9]	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Downstream – all GHGs (million tonnes CO_2e)[10]	**20**	**19**	**18**	**20**	**20**	EM-RM-110a.1	CCE4: C3
CO_2 (million tonnes)	20	19	18	19	19		
CH_4 and other GHGs (million tonnes CO_2e)	0.1	0.1	0.1	0.2	0.2		
Liquefied Natural Gas (LNG) – all GHGs (million tonnes CO_2e)	**9**	**8**	**7**	**8**	**9**	EM-EP-110a.2	CCE4: C3
CO_2 (million tonnes)	9	8	7	8	8		
CH_4 and other GHGs (million tonnes CO_2e)	0.5	0.3	0.2	0.3	0.3		
Chemicals – all GHGs (million tonnes CO_2e)[11,12]	**5**	**5**	**4**	**4**	**4**		CCE4: C3
CO_2 (million tonnes)	5	5	4	4	4		
CH_4 and other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Other – all GHGs (million tonnes CO_2e)[13]	**2**	**1**	**1**	**1**	**1**		CCE4: C3
CO_2 (million tonnes)	2	1	1	1	1		
CH_4 and other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		

equity emissions table continues on **page 72**

equity emissions, cont.

	2018	2019	2020	2021	2022	SASB	ipieca
emissions associated with exported electricity and steam – all GHGs (million tonnes CO_2e)[14]	**1**	**1**	**1**	**1**	**< 1**		CCE4: C3/A6
Upstream – all GHGs (million tonnes CO_2e)[8]	< 1	< 1	< 1	< 1	< 1		
Midstream – all GHGs (million tonnes CO_2e)	0	0	0	0	0		
Downstream – all GHGs (million tonnes CO_2e)[10]	< 1	< 1	< 1	< 1	< 1		
LNG – all GHGs (million tonnes CO_2e)	0	0	0	0	0		
Chemicals – all GHGs (million tonnes CO_2e)[11,12]	0	0	0	0	0		
Other – all GHGs (million tonnes CO_2e)[13]	1	1	< 1	1	< 1		
indirect GHG emissions from imported energy (scope 2)[4,6,7,15]							
indirect GHG emissions from imported energy (scope 2) – all GHGs (million tonnes CO_2e)	**3**	**2**	**4**	**4**	**4**		CCE4: C2/C3
Upstream – all GHGs (million tonnes CO_2e)[8]	1	1	1	1	1		
Midstream – all GHGs (million tonnes CO_2e)	< 1	< 1	< 1	< 1	< 1		
Downstream – all GHGs (million tonnes CO_2e)[10]	1	1	1	1	1		
LNG – all GHGs (million tonnes CO_2e)	0	0	0	0	0		
Chemicals – all GHGs (million tonnes CO_2e)[11,12]	< 1	< 1	1	1	1		
Other – all GHGs (million tonnes CO_2e)[13]	< 1	< 1	< 1	< 1	< 1		
indirect GHG emissions (scope 3)[16]							CCE4: A2
Category 11 use of sold products – production method – all GHGs (million tonnes CO_2e)	396	412	412	408	391		
Category 11 use of sold products – throughput method – all GHGs (million tonnes CO_2e)	380	382	372	389	391		
Category 11 use of sold products – sales method – all GHGs (million tonnes CO_2e)	628	639	583	611	668		
third-party verification[17]							
Assurance level	Limited	Limited	Limited	Limited	Reasonable		
Assurance provider	**ERM CVS**	**ERM CVS**	**ERM CVS**	**DNV**	**DNV**		

operated emissions

	2018	2019	2020	2021	2022	SASB	ipieca
direct GHG emissions (scope 1)[4,5,6]							
direct GHG emissions (scope 1) – all GHGs (million tonnes CO_2e)	**68**	**63**	**56**	**57**	**53**		CCE4: C1/A1
Upstream – all GHGs (million tonnes CO_2e)	**35**	**34**	**30**	**29**	**24**	EM-EP-110a.1	CCE4: C3
CO_2 (million tonnes)	32	31	28	26	22		
CH_4 (million tonnes CH_4)[9]	0.14	0.12	0.11	0.11	0.09		
CH_4 (million tonnes CO_2e)[9]	3.5	3.0	2.7	2.7	2.3		
Other GHGs (million tonnes CO_2e)	0.1	0.1	0.1	0.1	0.1		
Upstream flaring (subset of Scope 1) – all GHGs (million tonnes CO_2e)	**9**	**8**	**6**	◤ **7**	**4**	EM-EP-110a.2	CCE7: C4
CO_2 (million tonnes)	8	7	5	6	4		
CH_4 (million tonnes CH_4)[9]	0.03	0.02	0.02	0.02	0.01		
CH_4 (million tonnes CO_2e)[9]	0.8	0.6	0.4	0.5	0.3		
Other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Midstream – all GHGs (million tonnes CO_2e)	**2**	**1**	**1**	**1**	**1**	EM-MD-110a.1	CCE4: C3
CO_2 (million tonnes)	2	1	1	1	1		
CH_4 (million tonnes CH_4)[8]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
CH_4 (million tonnes CO_2e)[8]	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Downstream – all GHGs (million tonnes CO_2e)[10]	**15**	**14**	**14**	**15**	**14**	EM-RM-110a.1	CCE4: C3
CO_2 (million tonnes)	15	14	14	14	14		
CH_4 and other GHGs (million tonnes CO_2e)	0.1	0.1	0.1	0.2	0.2		
LNG – all GHGs (million tonnes CO_2e)	**13**	**11**	**9**	**11**	**12**	EM-EP-110a.2	CCE4: C3
CO_2 (million tonnes)	12	11	9	11	12		
CH_4 and other GHGs (million tonnes CO_2e)	0.8	0.4	0.3	0.5	0.5		
Chemicals – all GHGs (million tonnes CO_2e)[11]	**< 1**	**< 1**	**< 1**	**< 1**	**< 1**		CCE4: C3
CO_2 (million tonnes)	< 1	< 1	< 1	< 1	< 1		
CH_4 and other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
Other – all GHGs (million tonnes CO_2e)[13]	**2**	**1**	**1**	**1**	**1**		CCE4: C3
CO_2 (million tonnes)	2	1	1	1	1		
CH_4 and other GHGs (million tonnes CO_2e)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		

◤ Indicates restatement of data from 2021 reporting.

operated emissions table continues on **page 74**

operated emissions, cont.

	2018	2019	2020	2021	2022	SASB	ipieca
emissions associated with exported electricity and steam – all GHGs (million tonnes CO_2e)[14]	**1**	**1**	**1**	**1**	**< 1**		CCE4: C3/A6
Upstream – all GHGs (million tonnes CO_2e)	< 1	< 1	< 1	< 1	< 1		
Midstream – all GHGs (million tonnes CO_2e)	0	0	0	0	0		
Downstream – all GHGs (million tonnes CO_2e)[10]	< 1	< 1	< 1	< 1	< 1		
LNG – all GHGs (million tonnes CO_2e)	0	0	0	0	0		
Chemicals – all GHGs (million tonnes CO_2e)[11]	0	0	0	0	0		
Other – all GHGs (million tonnes CO_2e)[13]	1	1	< 1	1	< 1		
indirect GHG emissions from imported energy (scope 2)[4,6,15]							
indirect GHG emissions from imported energy (scope 2) – all GHGs (million tonnes CO_2e)	**2**	**1**	**1**	**2**	**1**		CCE4: C2/C3
Upstream – all GHGs (million tonnes CO_2e)	1	1	1	1	1		
Midstream – all GHGs (million tonnes CO_2e)	< 1	< 1	< 1	< 1	< 1		
Downstream – all GHGs (million tonnes CO_2e)[10]	1	< 1	< 1	1	1		
LNG – all GHGs (million tonnes CO_2e)	0	0	0	0	0		
Chemicals – all GHGs (million tonnes CO_2e)[11]	< 1	< 1	< 1	< 1	< 1		
Other – all GHGs (million tonnes CO_2e)[13]	< 1	< 1	< 1	< 1	< 1		
indirect GHG emissions (scope 3)[16]							CCE4: A2
Category 11 use of sold products – production method – all GHGs (million tonnes CO_2e)	617	622	588	621	592		
Category 11 use of sold products – throughput method – all GHGs (million tonnes CO_2e)	406	411	392	450	442		
GHG mitigation							
Carbon capture, utilization and storage (CCUS) – all GHGs (million tonnes CO_2e)[18]	< 1	1	3	1	1		CCE3: A6
Renewable Energy Credits (RECs for indirect emissions) – all GHGs (million tonnes CO_2e)[19]	0	< 1	< 1	< 1	< 1		CCE3: A7
Offsets – all GHGs (million tonnes CO_2e)[20]	3	1	2	13	10		

operated other environmental metrics

	2018	2019	2020	2021	2022	SASB	ipieca
energy efficiency							CCE6
Total energy consumption, operated assets and nonoperated joint venture refineries (trillion BTUs)[21]	**940**	**916**	**851**	◤ **859**	**784**		CCE6: C1
Total energy consumption, operated assets and nonoperated joint venture refineries (million gigajoules)[21]	992	967	898	◤ 906	828		CCE6: C1
Total energy consumption, operated assets (trillion BTUs)[21]	**778**	**758**	**701**	◤ **703**	**626**		CCE6: C1
Total energy consumption, operated assets (million gigajoules)[21]	821	800	739	◤ 741	661		CCE6: C1
Manufacturing Energy Index (Refining)[22]	**85**	**85**	**88**	**88**	**92**		CCE6: A4
Upstream Energy Intensity (thousand BTUs per barrel of oil-equivalent)[23]	**358**	**362**	**341**	**306**	**255**		CCE6: A2
Pipeline Energy Intensity (BTUs per barrel of oil-equivalent-mile)[24]	**10**	**8**	**10**	**10**	**10**		CCE6: A2
Shipping Energy Intensity (BTUs per metric ton-mile)	**75**	**70**	**69**	◤ **60**	**58**		CCE6: A2
Non-Manufacturing Energy Index[25]	**74**	**67**	**71**	**65**	**67**		CCE6: A3
water management[26]							
water withdrawn[27]							ENV1
Fresh water withdrawn (million cubic meters)	**71**	**70**	**63**	**67**	**63**		ENV1: C1
Fresh water consumed (million cubic meters)	**70**	**69**	**62**	**66**	**62**	EM-EP-140a.1	ENV1: C2
Nonfresh water withdrawn (million cubic meters)	**39**	**45**	**34**	**33**	**33**		ENV1: A4
Fresh water withdrawn in regions with high or extremely high baseline water stress (%)[28,29]	**0**	**0**	**0**	**19**	**24**	EM-EP-140a.1 EM-RM-140a.1	ENV1: C4
Fresh water consumed in regions with high or extremely high baseline water stress (%)[28,29]	**0**	**0**	**0**	**19**	**25**	EM-EP-140a.1 EM-RM-140a.1	ENV1: C4

◤ Indicates restatement of data from 2021 reporting.

notes to pages 66 through 75

1 See Calculation Methodology, Portfolio Carbon Intensity, **pages 67–68**.

2 See Calculation Methodology, Upstream Carbon Intensity, **page 69**.

3 See Calculation Methodology, Refining Carbon Intensity, **page 70**.

4 Unless otherwise noted, Scope 1 and Scope 2 data collected as of February 9, 2023. Data include estimates.

5 Scope 1 includes direct emissions. For reporting, Chevron includes indirect sources of GHG emissions within Scope 1 that are outside of the traditional Scope 1 definition, such as GHG emissions from processes like drilling and completions, and tolling agreements up to the point of third-party custody transfer of the oil or gas product. Direct GHG emissions related to production of energy in the form of electricity or steam exported or sold to a third party are included in the reported Scope 1 emissions to align with Ipieca's *Sustainability Reporting Guidance for the Oil & Gas Industry* (2020). Chevron's Scope 1 includes emissions of six Kyoto GHGs – carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride, perfluorocarbons and hydrofluorocarbons, as well as nitrogen trifluoride (NF_3).

6 Calculation methods for Scope 1 and Scope 2 GHG emissions are based on the American Petroleum Institute's *Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry* (2021) or, where relevant, local regulatory reporting methodologies.

7 When a nonoperated joint venture (NOJV) provides consolidated emissions data, Chevron seeks to allocate its equity share of those emissions to the most representative scope and GHG based on best available knowledge of the NOJV's operations.

8 Consistent with our financial accounting, Venezuela NOJV emissions are not included for 2022 emissions reporting.

9 We provide methane emissions data and intensity performance as a mass of methane as well as its conversion under the *Intergovernmental Panel on Climate Change Fourth Assessment Report* (AR4) 100-year global warming potential (GWP) to a CO_2e. Although we strive to provide consistent data from our operated and nonoperated assets, some nonoperated assets may provide their data only on a CO_2e basis. Given the common industry practice of using the AR4 100-year GWP, we have assumed that nonoperated assets that did not provide methane mass data use a 100-year GWP of 25. We continue to work with our joint venture partners to provide information on a standardized basis to increase transparency.

10 Downstream includes emissions from refineries, terminals, marketing and distribution, including renewable fuels. Chemical and base oil facilities located within refineries are included in refinery emissions.

11 Chemicals includes emissions from stand-alone chemical, additive and lubricant facilities.

12 Chevron Phillips Chemical Company LLC (**CPChem.com**) data received April 4, 2023.

13 Other emissions include GHG emissions from Corporate Aviation, Chevron Environmental Management Company, energy management and power from Chevron Pipeline and Power, and the North American Data Center.

14 Exported emissions are direct GHG emissions related to production of energy in the form of electricity or steam that are exported or sold to a third party. Direct GHG emissions related to production of energy in the form of electricity or steam exported or sold to a third party are included in the reported Scope 1 emissions for each segment.

15 Scope 2 includes indirect emissions from imported electricity and steam. CO_2, CH_4 and N_2O are accounted for in Chevron's Scope 2 emissions. Scope 2 emissions are accounted for using the market-based approach as described in the World Resources Institute's *GHG Protocol Scope 2 Guidance* (2015), including calculating Scope 2 emissions net of contractual instruments such as renewable energy credits (RECs).

16 Chevron calculates emissions from third-party use of sold products in alignment with methods in Category 11 of Ipieca's Estimating Petroleum Industry Value Chain (Scope 3) Greenhouse Gas Emissions (2016). Emissions are based on aggregate production, throughput and sales numbers that include renewable fuels.

17 For assurance statements, visit **chevron.co/GHGassurance-library**. Figures in assurance statements may vary from figures reported in each subsequent Corporate Sustainability Report due to restatements and assurance scope. 2022 assurance excludes Renewable Energy Group, Inc. and Chevron Phillips Chemical Company, LLC data.

18 Carbon capture, utilization and storage includes both CO_2 sold to third parties and CO_2 (and other gas) injected for carbon storage.

19 RECs are credits generated from renewable electricity generation within the United States that are retired by Chevron. Reported Scope 2 emissions are net of contractual instruments such as RECs.

20 Offsets are credits generated from the avoidance or reduction of GHG emissions or the removal of GHGs from the atmosphere that are retired by Chevron, excluding RECs. Includes offsets retired in compliance programs. For programs with multiyear compliance periods, offsets are reported in the calendar year they are retired.

21 Total Energy Consumption includes energy generated from Chevron's operations and imported energy. Exported energy is not subtracted from the total.

22 Manufacturing Energy Index (MEI) (Refining) is an analysis of Chevron's refining energy performance based on the Solomon Energy Intensity Index methodology. Chevron's MEI includes the refining assets at Chevron's operated and nonoperated joint venture refineries. Energy consumption from Renewable Energy Group, Inc. is not included in this metric.

23 2022 Upstream Energy Intensity reflects continued updates to Chevron's calculation methodology.

24 Pipeline Energy Intensity covers assets operated by Chevron Pipe Line Company.

25 Chevron's Non-Manufacturing Energy Index includes operations from Chevron's chemicals and additives, products and services, and lubricants businesses. It reflects the energy required to produce Chevron's products compared with the energy that would have been required to produce the same products in 1992 (the index's base year). Energy consumption from Renewable Energy Group, Inc. is not included in this metric.

26 Renewable Energy Group, Inc. data are not included in water management or wastewater metrics.

27 Fresh water withdrawn from the environment is defined per local legal definitions. If no local definition exists, fresh water is defined as water extracted, directly or indirectly, from surface water, groundwater or rainwater that has a total dissolved solids concentration of less than or equal to 2,000 mg/L. Fresh water withdrawn does not include effluent or recycled/reclaimed water from municipal or other industrial wastewater treatment systems, as this water is reported under nonfresh water withdrawn. Nonfresh water withdrawn could include: seawater; brackish groundwater or surface water; reclaimed wastewater from another municipal or industrial facility; desalinated water; or remediated groundwater used for industrial purposes. Produced water is excluded from fresh water withdrawn, fresh water consumed and nonfresh water withdrawn. Water quantities may be determined using direct measurement techniques or engineering estimation methods.

28 Chevron reports fresh water withdrawn and consumed in water-stressed regions according to the World Resources Institute's definition and categorization of "baseline water stress." WRI Aqueduct map version 3.0 was used to identify water-stressed areas. Baseline water stress measures the ratio of total water withdrawals to available renewable surface and groundwater supplies. Water withdrawals include domestic, industrial, irrigation and livestock consumptive and nonconsumptive uses. Available renewable water supplies include the impact of upstream consumptive water users and large dams on downstream water availability. Higher values indicate more competition among users.

Chevron's fresh water withdrawn and consumed in high and extremely high water stress areas excludes Chevron's Fuels and Lubricants businesses and Chevron Environmental Management Company. Freshwater withdrawals for the Fuels and Lubricants businesses and Chevron Environmental Management Company are minimal (1% of the total) compared with the overall use in the corporation. For purposes of this reporting, Chevron categorizes all of the water withdrawn and consumed by Chevron's Mid-Continent business unit as being in a high-stress or extremely high-stress region.

29 Freshwater use in water-stressed areas increased in 2022 due to completion activity increases.

climate-related disclosure

Chevron recognizes climate change is a growing area of interest for our stakeholders, including investors. The table below shows how the disclosures in this report align with the recommendations of the Financial Stability Board's Task Force on Climate-related Financial Disclosures, as the TCFD has described the categories, and where the relevant information can be found in this report. Further information can be found in Chevron's *Methane Report* (2022), Climate Change Resilience reports and Corporate Sustainability reports. For Chevron's latest reports, see our **reports and publications center**.

TCFD recommendation*		disclosure	report section
governance			
Disclose the organization's governance around potential climate-related risks and opportunities.	**(a)** Describe the board's governance around potential climate-related risks and opportunities.	Board oversight	1.1
		Public Policy and Sustainability Committee	1.1.1
		Other Board-level committees	1.1.2–1.1.4
		Director qualifications and nominating process	1.1.4
	(b) Describe management's role in assessing and managing potential climate-related risks and opportunities.	Executive management of climate risks	1.2
		Organizational capability on energy transition	1.3
strategy			
Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy and financial planning where such information is material.	**(a)** Describe the potential climate-related risks and opportunities the organization has identified over the short, medium and long terms.	Chevron's strategic and business planning processes	3
	(b) Describe the impact of potential climate-related risks and opportunities on the organization's businesses, strategy and financial planning.	Chevron's strategic and business planning processes	3
		Portfolio	4
	(c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2° C or lower scenario.	Stress-testing our portfolio under the IEA NZE Scenario	2.2.6
risk management			
Disclose how the organization identifies, assesses and manages potential climate-related risks.	**(a)** Describe the organization's processes for identifying and assessing potential climate-related risks.	Physical risks	2.1
		Transition risks	2.2
	(b) Describe the organization's processes for managing potential climate-related risks.	Physical risks	2.1
		Transition risks	2.2
	(c) Describe how processes for identifying, assessing and managing potential climate-related risks are integrated into the organization's overall risk management.	Risk management	2
metrics and targets			
Disclose the metrics and targets used to assess and manage potential climate-related risks and opportunities where such information is material.	**(a)** Disclose the metrics used by the organization to assess potential climate-related risks and opportunities in line with its strategy and risk management process.	Advancing energy progress	page 4
		Assessing performance on a lifecycle basis	5.1
	(b) Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 GHG emissions estimates and the potential related risks.	Metrics	6
	(c) Describe the targets used by the organization to manage potential climate-related risks and opportunities and performance against targets.	Advancing energy progress	page 4

*See **Section 7: About This Report**.

citations

section 1

1 Chevron Corp., *2022 annual report* on form 10-K, chevron.com/investors/financial-information#secfilings.

section 2

2 Richters, O. et al., *NGFS climate scenarios data set, phase 3 scenario explorer*, 2022, data.ene.iiasa.ac.at/ngfs//#/workspace.

3 International Energy Agency (IEA), *World energy outlook 2022*, p. 21, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

4 Ibid., p. 338.

section 3

5 IEA, *Defining energy access: 2020 methodology*, October 2020, iea.org/articles/defining-energy-access-2020-methodology; The World Bank and the World Health Organization, *Measuring energy access: a guide to collecting data using the core questions on household energy use*, October 2021, LSMS Guidebook Washington, D.C.: World Bank Group.

6 U.S. Energy Information Administration (EIA), *International energy outlook 2021 with projections to 2050 (narrative)*, October 2021, p. 12, eia.gov/outlooks/ieo/pdf/IEO2021_Narrative.pdf; IEA, *World energy outlook 2022*, p. 239, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

7 EIA, *Natural gas explained*, eia.gov/energyexplained/natural-gas/use-of-natural-gas.php.

8 Ibid.

9 IEA, *World energy outlook 2022*, p. 59, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

10 UN Intergovernmental Panel on Climate Change (IPCC), *Paris Agreement*, 2015, p. 3, unfccc.int/sites/default/files/english_paris_agreement.pdf.

11 IEA, *World energy outlook 2022*, p. 107, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

12 IPCC, *Summary for policymakers in: Global warming of 1.5 °C, an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, 2018, p. 17, ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf.

13 Ibid.

14 IEA, *Energy technology perspectives 2020*, iea.org/reports/energy-technology-perspectives-2020; IPCC, *Special report: global warming of 1.5 °C*, 2018, ipcc.ch/sr15/.

15 IPCC, *Summary for policymakers in: Climate change 2022: mitigation of climate change*, 2022, p. 28, ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf.

16 Global CCS Institute, *Carbon removal with CCS technologies*, January 2021, p. 4, globalccsinstitute.com/wp-content/uploads/2021/02/Carbon-Removal-with-CCS-Technologies.pdf.

17 Global CCS Institute, *Global status of CCS 2022*, March 2023, status22.globalccsinstitute.com/2022-status-report/global-status-of-ccs/; Greenhouse Gas Protocol, *Land sector and removals guidance*, ghgprotocol.org/land-sector-and-removals-guidance; United Nations Framework Convention on Climate Change (UNFCC), *Article 6.4 mechanism supervisory body on carbon markets achieves important progress*, September 2022, unfccc.int/news/article-64-mechanism-supervisory-body-on-carbon-markets-achieves-important-progress.

18 U.S. Office of Energy & Renewable Energy, Hydrogen shot, energy.gov/eere/fuelcells/hydrogen-shot; IEA, *World energy outlook 2022*, pp. 164, 369, 384, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

19 IEA, *Towards hydrogen definitions based on their emissions intensity*, April 2023, iea.org/reports/towards-hydrogen-definitions-based-on-their-emissions-intensity, License: CC BY 4.0.

20 BloombergNEF (BNEF), *Lithium-ion battery pack prices rise for first time to an average of $151/kWh*, December 2022, about.bnef.com/blog/lithium-ion-battery-pack-prices-rise-for-first-time-to-an-average-of-151-kwh.

21 McKinsey & Company, *The race to decarbonize electric-vehicle batteries*, February 2023, mckinsey.com/industries/automotive-and-assembly/our-insights/the-race-to-decarbonize-electric-vehicle-batteries.

22 Argonne National Laboratory, *GREET model fuel specifications*, 2022, greet.anl.gov; Advanced automotive battery conference (AABC) for Li-ion battery performance, 2018, with Chevron internal compilations.

23 IEA, *World energy outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A); BNEF scenarios (2022); Wood Mackenzie scenarios (2022); S&P Global Commodity Insights scenarios (2022).

24 IEA, *World energy outlook 2022*, pp. 51, 149–150, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

25 IEA, *Oil market report – December 2022*, iea.org/reports/oil-market-report-december-2022.

26 IEA, *Oil market report – March 2023*, iea.org/reports/oil-market-report-march-2023.

27 IEA, *Change in upstream oil and natural gas investment, 2019-2022*, iea.org/data-and-statistics/charts/change-in-upstream-oil-and-natural-gas-investment-2019-2022, License: CC BY 4.0.

28 Al-Fattah, S., *Non-OPEC conventional production: decline analysis, implications and outlook* (April 4, 2019), Available at SSRN: ssrn.com/abstract=3378011.

29 Energy Institute, *Statistical review of world energy 2023*, 72nd Edition, pp. 37–38, energyinst.org/__data/assets/pdf_file/0004/1055542/EI_Stat_Review_PDF_single_3.pdf.

30 IEA, *World energy outlook 2022,* p. 372, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

31 National Renewable Energy Laboratory (NREL), *Life cycle greenhouse gas emissions from electricity generation: update*, 2021, p. 3, nrel.gov/docs/fy21osti/80580.pdf.

32 International Energy Forum and S&P Global, *Oil refining industry insights, stretched sector fuels market volatility*, September 2022, pp. 3, 5, ief.org/_resources/files/news/stretched-sector-fuels-market-volatility/ief-sp-global-downstream-investment-outlook---vf.pdf.

33 EIA, *EIA forecasts U.S. refinery utilization to average more than 90% in 2023 and 2024*, February 2023, eia.gov/todayinenergy/detail.php?id=55499.

34 IEA, *World energy outlook 2022*, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A).

35 Ibid., p. 452.

36 International Petroleum Industry Environmental Conservation Association (Ipieca), *Ipieca sustainability reporting guidance for the oil and gas industry*, 2020, rev. 2023, p. 3.12, ipieca.org/work/sustainability/performance-reporting/sustainability-reporting-guidance.

section 4

37 For natural gas, avoided emissions are estimated only for the portion of natural gas used in power globally (37% in 2021) and it is assumed coal is the displaced competing alternative power source (i.e., if power had not been generated by natural gas, it would have been generated from coal). The 37% number is based on Chevron analysis of the IEA's *World energy balances.*

section 5

38 Gibassier, D., El Omari, S. and Naccache, P. (2020), "Institutional work in the birth of a carbon accounting profession," *Accounting, Auditing & Accountability Journal*, Vol. 33 No. 6, pp. 1447–1476, emerald.com/insight/content/doi/10.1108/AAAJ-12-2014-1912.

39 International Emissions Trading Association (IETA), University of Maryland, and Carbon-Pricing Leadership Coalition (CPLC), *The economic potential of Article 6 of the Paris Agreement and implementation challenges,* September 2019, k5x2e9z8.rocketcdn.me/wp-content/uploads/2023/09/IETAA6_CLPCReport_2019.pdf.

40 U.S. Office of Energy & Renewable Energy, *Energy efficiency: buildings and industry*, energy.gov/eere/energy-efficiency-buildings-and-industry; IEA, *Multiple benefits of energy efficiency*, iea.org/reports/multiple-benefits-of-energy-efficiency/energy-prices; IEA, *World energy outlook 2022*, pp. 246, 290, 345–346, 393, iea.org/reports/world-energy-outlook-2022, License: CC BY 4.0 (report), CC BY NC SA 4.0 (Annex A); U.S. Wind Energy Technology Office, *Experts predict 50% lower wind costs than they did in 2015*, energy.gov/eere/wind/articles/experts-predict-50-lower-wind-costs-they-did-2015-0; OECD, The World Bank and UN Environment, *Financing climate futures, rethinking infrastructure, policy highlights*, 2018, p. 6, oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf.

41 World Bank Group, *State and trends of carbon pricing 2023*, May 2023, hdl.handle.net/10986/39796, License: CC BY 3.0 IGO.

42 IETA, University of Maryland, and CPLC, *The economic potential of Article 6 of the Paris Agreement and implementation challenges*, September 2019, k5x2e9z8.rocketcdn.me/wp-content/uploads/2023/09/IETAA6_CLPCReport_2019.pdf.

43 UNFCC, *About carbon pricing*, unfccc.int/about-us/regional-collaboration-centres/the-ciaca/about-carbon-pricing.

44 Breakthrough Energy, *The green premium*, October 2022, breakthroughenergy.org.

glossary

definition of selected energy terms

Avoided emissions The reduction in GHG emissions associated with a product or service relative to alternatives.

Barrels of oil-equivalent (boe) A unit of measure to quantify crude oil, natural gas liquids and natural gas amounts using the same basis. Natural gas volumes are converted to barrels on the basis of energy content.

Carbon capture, utilization and storage (CCUS) The process of capturing carbon dioxide emissions and either using them as a feedstock (utilization) or permanently storing them in geological formations deep underground (storage).

Carbon efficiency The extent to which a given level of output is produced with fewer carbon emissions relative to average output.

Carbon footprint (of product) Sum of greenhouse gas emissions and greenhouse gas removals in a product system expressed as CO_2-equivalents based on a lifecycle assessment using the simple impact category of climate change. A carbon footprint can represent the complete lifecycle of a product or a partial lifecycle based on selected lifecycle stages (sometimes referred to as a "partial carbon footprint").

Carbon intensity The amount of carbon dioxide or carbon dioxide-equivalent (CO_2e) per unit of measure.

Combustion The combustion of gas in fuel-burning equipment is not 100% efficient, and some methane emissions occur as a result of uncombusted gas being released via the equipment exhaust stream. The uncombusted proportion of gas varies between internal and external combustion sources (engines, turbines, heaters and boilers); therefore, equipment-specific data or emission factors are typically used for emissions quantification.

Decarbonization Generally refers to the process of stopping or reducing release of greenhouse gases, especially carbon dioxide, into the atmosphere as the result of a process. For Chevron, decarbonization can refer to reducing absolute emissions or reducing the carbon intensity of a process or asset.

Detection threshold The minimum quantity or concentration of a gas (e.g., methane) that is reliably detectable by detection equipment. This is sometimes called minimum detection limit. Detection limits can vary based on the type of technology selected as well as the conditions during the measurement period.

Emission factor A numerical factor relating activity data (e.g., tonnes of fuel consumed, tonnes of product produced or number of pneumatic controllers) to emissions. Emission factors generally represent the amount of emissions per activity unit, for example standard cubic feet of gas per hour per pneumatic controller. Emission factors are typically developed based on a population of direct measurements of emission sources or activities.

Flaring The controlled burning of gas, including associated gas, in the course of oil and gas operations. In many types of operations, including those where gas is sold, reinjected or otherwise utilized, safety flaring can be an important and necessary activity to ensure safe operations. The combustion efficiency of a well-designed and operated flare is generally assumed to be greater than 98%, meaning that less than 2% of the gas passes through the flare stack unburnt. At the individual flare level, local parameters, such as gas content and quality, flare design, flow rates, exit velocities and steam use, contribute to overall combustion efficiency. There are currently no straightforward methods to continuously measure or monitor the actual combustion efficiency or destruction and removal efficiency of a flare.

Gas-to-liquids (GTL) A process that converts natural gas into high-quality liquid transportation fuels and other products.

Hydrogen, lower carbon intensity (LCI) hydrogen LCI hydrogen includes specified hydrogen production pathways like steam methane reforming with carbon capture and storage and electrolysis with lower carbon power.

Lifecycle analysis/assessment (LCA) A tool that can be used to evaluate the potential environmental impacts of a product, material, process or activity. An LCA is a comprehensive method for assessing a range of environmental impacts across the full lifecycle of a product system, from materials acquisition to manufacturing, use and final disposition.

Liquefied natural gas (LNG) Natural gas that is liquefied under extremely cold temperatures to facilitate storage or transportation in specially designed vessels.

Lower carbon A term describing environments, technologies, business sectors, markets, energy sources and mixes of energy sources, including traditional energy sources, among other things, characterized by or enabling the reduction of carbon emissions or carbon intensities.

Lower carbon energy Energy sources and mixes of energy sources, including traditional energy sources, that, in their production and use, emit less carbon emissions or have lower carbon intensity than other forms.

Lower carbon intensity oil, products and natural gas Oil, natural gas and hydrocarbon-based products that are produced and sold to customers with a carbon intensity below that of traditional oil, natural gas and hydrocarbon-based products.

Methane intensity The amount of methane per unit of measure. Methane intensity can be determined for a facility (e.g., compressor station), an area (e.g., production basin) or even an entire value chain (e.g., from natural gas production to distribution).

Methane management A holistic approach to addressing methane emissions performance across multiple dimensions, including actions to reduce methane emissions intensity through facility design and operational best practices; deployment of advanced technology to detect, measure and quantify site- and source-level emissions; and development and assurance of methane emissions inventories for reporting and disclosures.

Methane measurement The process of taking a reading of the methane concentration or methane emissions rate within an air sample at a specific point in time. Typical measurement units are parts per million, parts per billion and kilograms per hour. Understanding global and local background methane concentrations is necessary to contextualize the data. Emissions measurements may be performed as one-time activities, at regular intervals or on a continuous basis, but whatever the frequency, obtaining representative measurements is important.

Methane quantification Methods for determining the size of a methane emission source in customary units of emissions rate, such as mass per time (e.g., kilograms per hour) or volume per time (e.g., standard cubic meters per hour). Methane can be quantified through engineering estimations, direct measurement of a methane source (e.g., by utilizing bagging procedures), and modeling that uses ambient measurements and meteorological data to infer an emissions rate.

Natural climate solutions Actions that reduce or avoid emissions and/or enhance the capture and storage of carbon in nature include conservation, restoration, and improved land management interventions on natural and agricultural lands.

Nature-based solutions Per the International Energy Agency (IEA), these include the repurposing of land use by growing forests where there were none before (afforestation) or reestablishing a forest where there was one in the past (reforestation). Other nature-based solutions include restoration of coastal and marine habitats to ensure they continue to draw CO_2 from the air.

Net positive impact Per Ipieca, a target for project outcomes in which the impacts on biodiversity (i.e., the variety of ecosystems and living things) caused by the project are outweighed by the actions taken to avoid and reduce such impacts, rehabilitate affected species and landscapes, and offset any residual impacts.

Net zero upstream aspiration (Scope 1 and 2) Chevron aspires to reach net zero upstream emissions (Scope 1 and 2) by 2050. Accomplishing this aspiration depends on continuing progress on commercially viable technology; government policy; successful negotiations for carbon capture and storage and nature-based projects; availability of cost-effective, verifiable offsets in the global market; and granting of necessary permits by governing authorities.

Pneumatic controller An automated instrument used for maintaining a process condition such as liquid level, pressure, delta-pressure and temperature.

Portfolio carbon intensity (PCI) Representation of the estimated energy-weighted average greenhouse gas emissions intensity from a simplified value chain from the production, refinement, distribution and end use of marketed energy products per unit of energy delivered.

Routine flaring The flaring of gas during normal oil production operations in the absence of sufficient facilities or amenable geology to reinject the produced gas, utilize it onsite or dispatch it to a market.

Super-emitter A methane source that emits a disproportionate amount compared to emissions from the total source category. Super-emitters can be continuous or episodic and can have a wide range of underlying causes, such as a failing tank control, lack of takeaway or pipeline blowdown. A study by NASA defines a super-emitter as a source that emits greater than 10 kilograms of methane per hour.

definition of selected units and terms

American Petroleum Institute (API) Trade association representing all segments of the oil and gas industry in the United States.

bbl Barrel or barrels.

bcm Billions of cubic meters.

bcm/y Billions of cubic meters per year.

International Association of Oil and Gas Producers (IOGP) Global forum of oil and gas producers.

International Petroleum Industry Environmental Conservation Association (Ipieca) Global not-for-profit oil and gas industry association for environmental and social issues.

mbd Thousands of barrels per day.

mboe/d Thousands of barrels of oil-equivalent per day.

mmbd Millions of barrels per day.

mmboe/d Millions of barrels of oil-equivalent per day.

mmbtu Millions of British thermal units.

mmbtu/d Millions of British thermal units per day.

mmtpa Millions of tonnes per annum.

mtpa Thousands of tonnes per annum.

section 7

about this report

Photo: A worker on scaffolding at the facility in Kazakhstan. Chevron holds a 50% interest in Tengizchevroil (TCO), which operates the Tengiz Field in Kazakhstan, the world's deepest producing supergiant oil field. TCO has applied innovative technologies to redirect gas for its own use, for delivery to consumers and for reinjection into the reservoir.

section 7: about this report

This report covers our owned and operated businesses and does not address the performance or operations of our suppliers, contractors and partners unless otherwise noted. In the case of certain joint ventures for which Chevron is the operator, we exercise influence but not control. Thus, the governance, processes, management and strategy for those joint ventures are known to differ from those detailed in this report. At the time of writing, Chevron has completed acquisitions of Beyond6, LLC, Chacraservicios S.r.l. (with Bunge) and PDC Energy, Inc. This report does not speak to these companies' historic governance, risk management, strategy approaches or emissions performance unless specifically referenced. All financial information is presented in U.S. dollars unless otherwise noted.

This report contains forward-looking statements relating to the manner in which Chevron intends to conduct certain of its activities, based on management's current plans and expectations. These statements are not promises or guarantees of future conduct or policy and are subject to numerous risks, uncertainties and other factors, many of which are beyond our control and are difficult to predict, including government regulation and oil and gas prices. See the Forward-Looking Statements Warning on **page 84** of this report.

Therefore, the actual conduct of our activities, including the development, implementation or continuation of any program, policy or initiative discussed or forecasted in this report, may differ materially in the future. As with any projections or estimates, actual results or numbers may vary. The protocols, methodologies and standards ("methodologies") for tracking and reporting on emissions, emissions reductions, offsets and related issues are relatively new, have not been harmonized and continue to evolve. Chevron methodologies continue to evolve and may change from time to time, which may result in a lack of comparative data for different periods. Our methodologies may not always align with evolving voluntary standards for identifying, measuring, and reporting metrics; our interpretation of reporting standards may differ from those of others; and such standards may change over time; any of which could result in significant revisions to our goals, targets and aspirations or reported progress, or lack thereof, in achieving them. The statements of intention in this report speak only as of the date of this report. Chevron undertakes no obligation to publicly update any statements in this report.

This report contains information from third parties, such as the IEA. Chevron makes no representation or warranty as to the third-party information. Where necessary, Chevron received permission to cite third-party sources, but the information and data remain under the control and direction of the third parties. Where Chevron has used information, such as displaying data from third parties in graphical form, it has noted the source.

Chevron has also provided links in this report to third-party websites for ease of reference. Chevron's use of the third-party information in this report and the inclusion of links to third-party content is not an endorsement or adoption of such information. This report contains terms used by the TCFD, as well as information about how the disclosures in this report align with the recommendations of the TCFD, as it has described the categories. In doing so, Chevron does not intend to endorse or adopt and is not endorsing or adopting these phrases or recommendations. In using these terms and referencing the recommendations, Chevron is not obligating itself to use the terms in the way defined by the TCFD, nor is it obligating itself to comply with any specific recommendations or to provide any specific disclosure. Chevron makes no representation or warranty as to the TCFD's use or definition of specific terms or recommendations. For example, with respect to the use of the term *material*, individual companies are best suited to determine what information is material, under the long-standing U.S. Supreme Court definition of that term, and whether to disclose this information in U.S. Securities and Exchange financial filings.

Chevron participates, along with other companies, institutes, universities and other organizations, in various initiatives, campaigns, projects and other collaborations that express various ambitions, aspirations and goals related to climate change, emissions and energy transition. Chevron's participation or membership in such collaborations is not a promise or guarantee that Chevron's individual ambitions, future performance or policies will align with the collective ambitions of the organizations or the individual ambitions of other participants, all of which are subject to a variety of uncertainties and other factors, many of which may be beyond Chevron's control, including government regulation, availability of technologies, and market forces and other risks and uncertainties detailed throughout this report. Such third parties' statements of collaborative or individual ambitions and goals frequently diverge from Chevron's own ambitions, goals and commitments. Chevron will continue to make independent decisions regarding the operation of its business, including its climate-related ambitions, goals, commitments and investments. Chevron's goals, targets and aspirations reflect Chevron's current plans, and Chevron may unilaterally change them for various reasons, including market conditions; changes in its portfolio; and financial, operational, regulatory, reputational, legal and other factors. Chevron's individual ambitions and goals, and its progress toward reaching those ambitions and goals, are stated in its own corporate reports, including this report, Chevron's *Corporate Sustainability Report* and Chevron's *Methane Report*, which contain necessary context and disclaimers regarding Chevron's aspirations and goals and how Chevron measures its progress toward reaching them.

As used in this report, the term “Chevron” and such terms as “the company,” “the corporation,” “our,” “its,” “we” and “us” may refer to one or more of Chevron’s consolidated subsidiaries or affiliates or to all of them taken as a whole. All of these terms are used for convenience only and are not intended as a precise description of any of the separate entities, each of which manages its own affairs.

This report and additional information on how we view and address potential climate change-related issues can be found at **chevron.com/sustainability/environment/energy-transition**

Produced by Corporate Strategy and Sustainability, Chevron Corporation

Design Sequel Studio, New York, **sequelstudio.com**

Photo credits Cover and first spread: Robert Seale; 6: Raanan Cohen; 12: Evan Martin; 22: Steve Babuljak and George Rosales; 37, 50: Steve Babuljak; 65, 82, inside back cover and back cover: Marc Marriott/Rezolution Films

forward-looking statements warning

CAUTIONARY STATEMENTS RELEVANT TO FORWARD-LOOKING INFORMATION FOR THE PURPOSE OF “SAFE HARBOR” PROVISIONS OF THE PRIVATE SECURITIES LITIGATION REFORM ACT OF 1995 AND OTHER IMPORTANT LEGAL DISCLAIMERS

This report contains forward-looking images and statements relating to Chevron’s energy transition plans and operations that are based on management’s current expectations, estimates, and projections about the petroleum, chemicals, and other energy-related industries. Words or phrases such as “anticipates,” “expects,” “intends,” “plans,” “targets,” “advances,” “commits,” “drives,” “aims,” “forecasts,” “projects,” “believes,” “approaches,” “seeks,” “schedules,” “estimates,” “positions,” “pursues,” “progress,” “may,” “can,” “could,” “should,” “will,” “budgets,” “outlook,” “trends,” “guidance,” “focus,” “on track,” “goals,” “objectives,” “strategies,” “opportunities,” “poised,” “potential,” “ambitions,” “aspires” and similar expressions are intended to identify such forward-looking statements.

These statements are not guarantees of future performance and are subject to numerous risks, uncertainties and other factors, many of which are beyond the company’s control and are difficult to predict. Therefore, actual outcomes and results may differ materially from what is expressed or forecasted in such forward-looking statements. Our ability to achieve any aspiration, target or objective outlined in this report is subject to numerous risks, many of which are outside of our control. Examples of such risks include: (1) the continuing progress of commercially viable technologies and low- or non-carbon-based energy sources; (2) the granting of necessary permits by governing authorities; (3) the availability of cost-effective, verifiable carbon credits; (4) the availability of suppliers that can meet our sustainability and other standards; (5) evolving regulatory requirements affecting ESG standards or disclosures; (6) evolving standards for tracking and reporting on emissions and emissions reductions and removals; (7) customers’ and consumers’ preferences and use of the company’s products or substitute products; and (8) actions taken by the company’s competitors in response to legislation and regulations. Further, standards of measurement and performance set forth in this report made in reference to our environmental, social, governance, and other sustainability plans and goals may be based on protocols, processes and assumptions that continue to evolve and are subject to change in the future, including due to the impact of future regulation. The reader should not place undue reliance on these forward-looking statements, which speak only as of the date of this report. Unless legally required, Chevron undertakes no obligation to update publicly any forward-looking statements, whether as a result of new information, future events or otherwise.

Among the important factors that could cause actual results to differ materially from those in the forward-looking statements are: changing crude oil and natural gas prices and demand for the company’s products, and production curtailments due to market conditions; crude oil production quotas or other actions that might be imposed by the Organization of Petroleum Exporting Countries and other producing countries; technological advancements; changes to government policies in the countries in which the company operates; public health crises, such as pandemics (including coronavirus (COVID-19)) and epidemics, and any related government policies and actions; disruptions in the company’s global supply chain, including supply chain constraints and escalation of the cost of goods and services; changing economic, regulatory and political environments in the various countries in which the company operates; general domestic and international economic, market and political conditions, including the military conflict between Russia and Ukraine and the global response to such conflict; changing refining, marketing and chemicals margins; actions of competitors or regulators; timing of exploration expenses; timing of crude oil liftings; the competitiveness of alternate-energy sources or product substitutes; development of large carbon capture and offset markets; the results of operations and financial condition of the company’s suppliers, vendors, partners and equity affiliates; the inability or failure of the company’s joint venture partners to fund their share of operations and development activities; the potential failure to achieve expected net production from existing and future crude oil and natural gas development projects; potential delays in the development, construction or start-up of planned projects; the potential disruption or interruption of the company’s operations due to war, accidents, political events, civil unrest, severe weather, cyber threats, terrorist acts, or other natural or human causes beyond the company’s control; the potential liability for remedial actions or assessments under existing or future environmental regulations and litigation; significant operational, investment, or product changes undertaken or required by existing or future environmental statutes and regulations, including international agreements and national or regional legislation and regulatory measures to limit or reduce greenhouse gas emissions; the potential liability resulting from pending or future litigation; the ability to successfully integrate the operations of Chevron and PDC Energy, Inc. and achieve the anticipated benefits from the transaction, including the expected incremental annual free cash flow; the company’s future acquisitions or dispositions of assets or shares or the delay or failure of such transactions to close based on required closing conditions; the potential for gains and losses from asset dispositions or impairments; government-mandated sales, divestitures, recapitalizations, taxes and tax audits, tariffs, sanctions, changes in fiscal terms, or restrictions on scope of company operations; foreign currency movements compared with the U.S. dollar; higher inflation and related impacts; material reductions in corporate liquidity and access to debt markets; the receipt of required Board authorizations to implement capital allocation strategies, including future stock repurchase programs and dividend payments; the effects of changed accounting rules under generally accepted accounting principles promulgated by rule-setting bodies; the company’s ability to identify and mitigate the risks and hazards inherent in operating in the global energy industry; and the factors set forth under the heading “Risk Factors” on pages 20 through 26 of the company’s 2022 Annual Report on Form 10-K and in subsequent filings with the U.S. Securities and Exchange Commission. Other unpredictable or unknown factors not discussed in this report could also have material adverse effects on forward-looking statements.

the power of human ingenuity to deliver progress

We all have a stake in a lower carbon future. Affordable energy is vital for economies to flourish. Reliable energy is essential for national security. As we look to the future, technology solutions and innovation are critical. We've been solving difficult energy challenges for decades, and we're working on the next generation of breakthrough technologies to deliver the energy solutions of tomorrow.

Photo: The blend services laboratory at Chevron's Richmond Technology Center, Richmond Refinery, California. Chevron's renewable base oil and renewable lubricant are available in the market today.

the human energy company® Chevron

There are many paths the future could take, but a few things are certain: The global demand for energy continues to grow; more affordable and reliable energy is needed; current energy forms are becoming cleaner; and new energy solutions are emerging.

learn more

chevron.com/sustainability/environment/energy-transition

Chevron Corporation
6001 Bollinger Canyon Road,
San Ramon, CA 94583-2324 USA

www.chevron.com

913-0386 (10-23) (300)