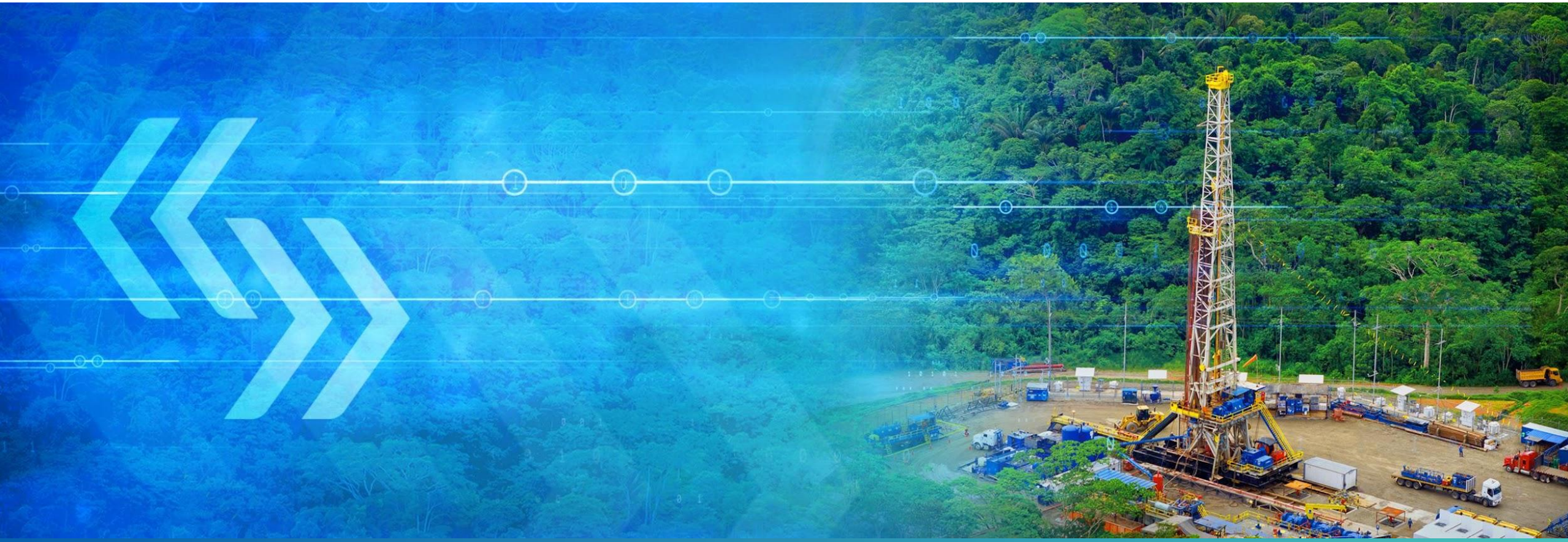
Energy Service Providers Journey to Net Zero

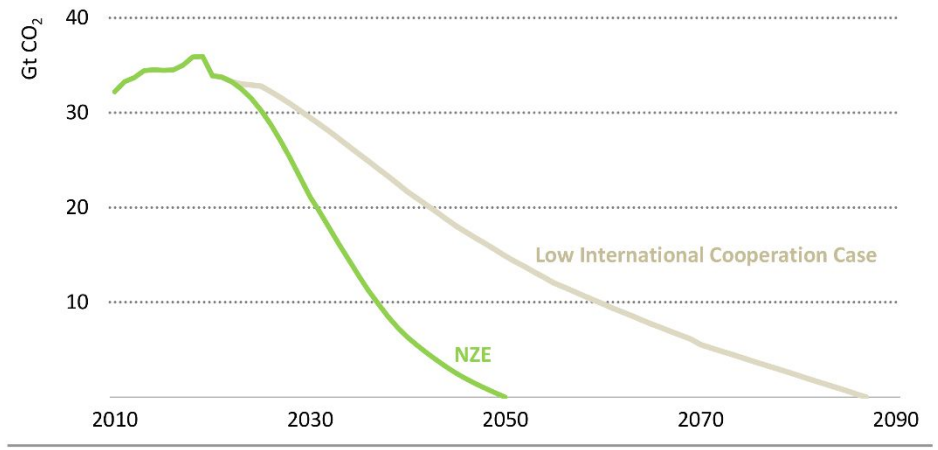
Quantifiably reducing carbon footprint in the value chain and driving high performance

(David Shackleton, August 2022)



Dual Challenge creates new Industry Imperative

Global Energy-related CO_2 emissions; IEA net zero and Low Co-operation case



Note: Gt = gigatonnes.

Dual challenge

40% Growth in World Economy by 2030

+

40% Reduction in Energy-related CO_2 emissions by 2030 for 1.5^{0}C

Source: IEA NZ2050 (2021)

Industry Imperatives

RETURNS
Capital Efficiency

+

SUSTAINABILITY
More Energy, less Carbon

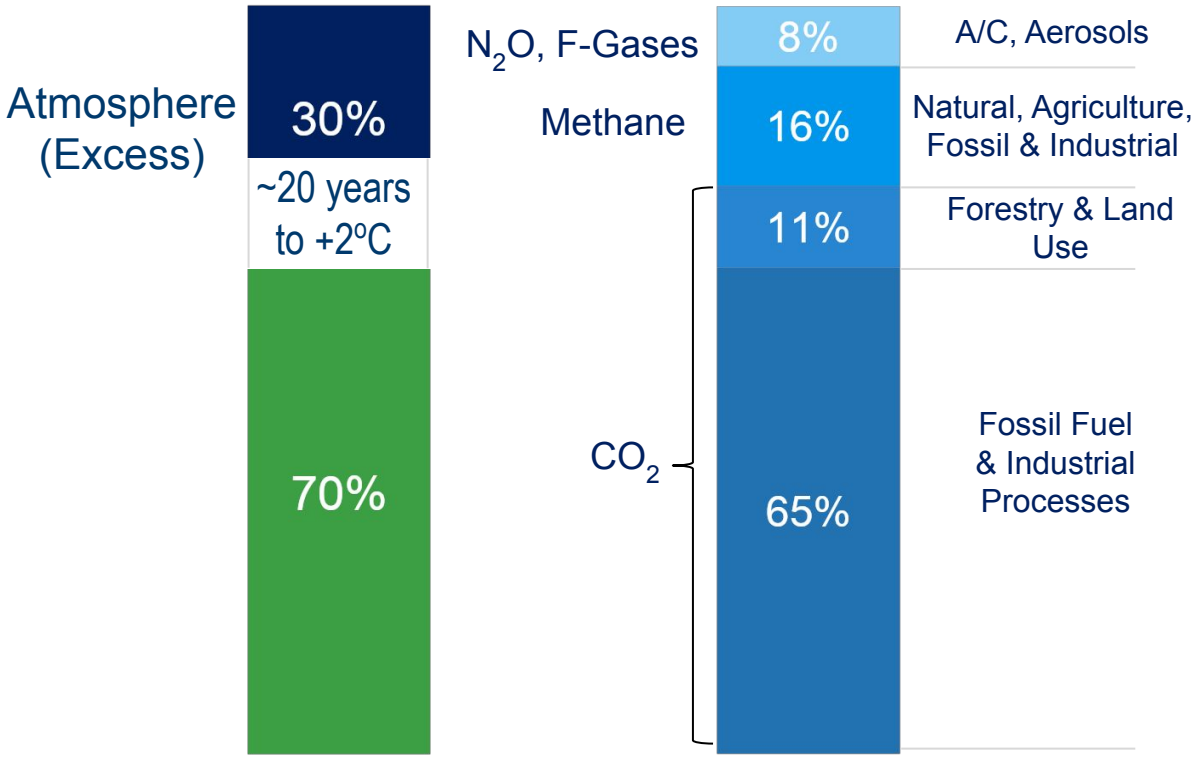
+

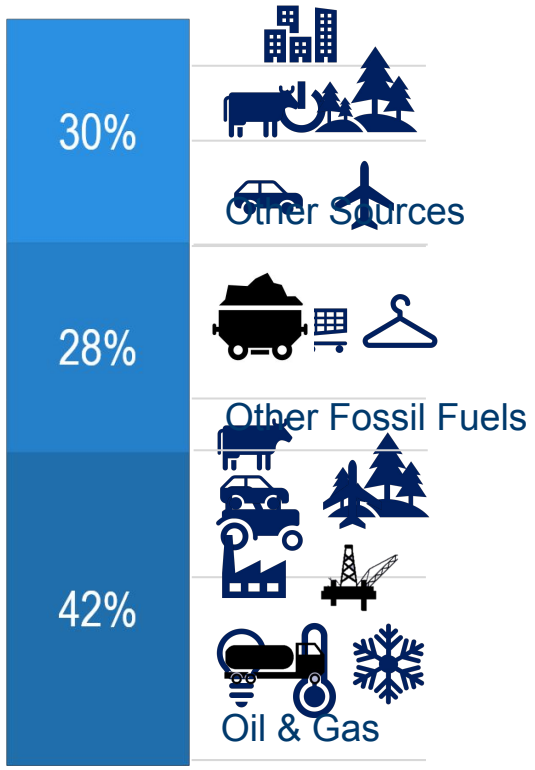
EARNINGS GROWTH
Cost Efficiency & Consistency

Source: International Energy Agency (2021), Net Zero by 2050, IEA, Paris
Image source: UN.org

The Climate Challenge

Green House Gas Emissions – Total 55 $GtCO_2e$ in 2019





Total from Fossil Fuels ~ 70%
Total from Oil & Gas ~ 42%

Source: IPCC (2014), CDIAC, UNFCC, BP, USGS, IEA WEO (2020), McKinsey 2020

Dual challenge

↑ 40% Growth in World Economy by 2030

+

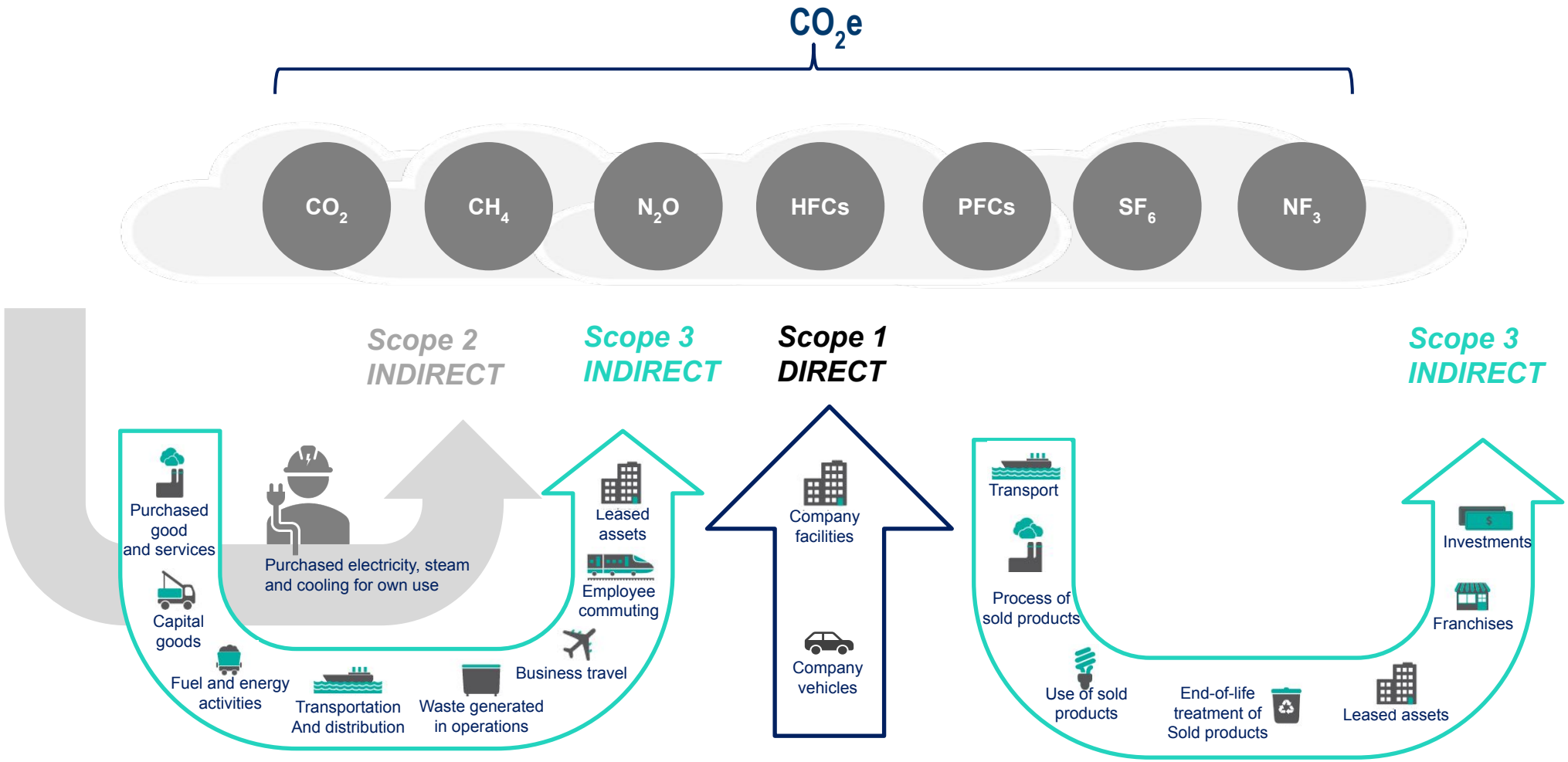
↓40% in greenhouse gas emissions by 2030 for 1.5 degC

UNITED NATIONS PARIS CLIMATE AGREEMENT SIGNING CEREMONY 22 APRIL 2016

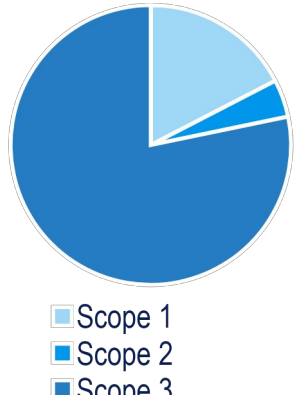
Source: IEA WEO (2020), IPCC (2019)

Greenhouse Gas Emission Scopes

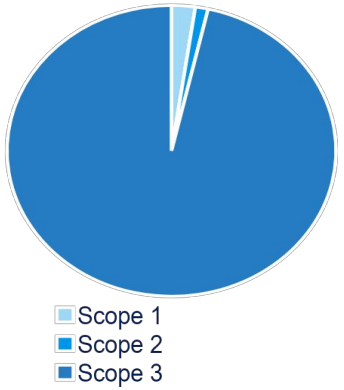
Source: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf



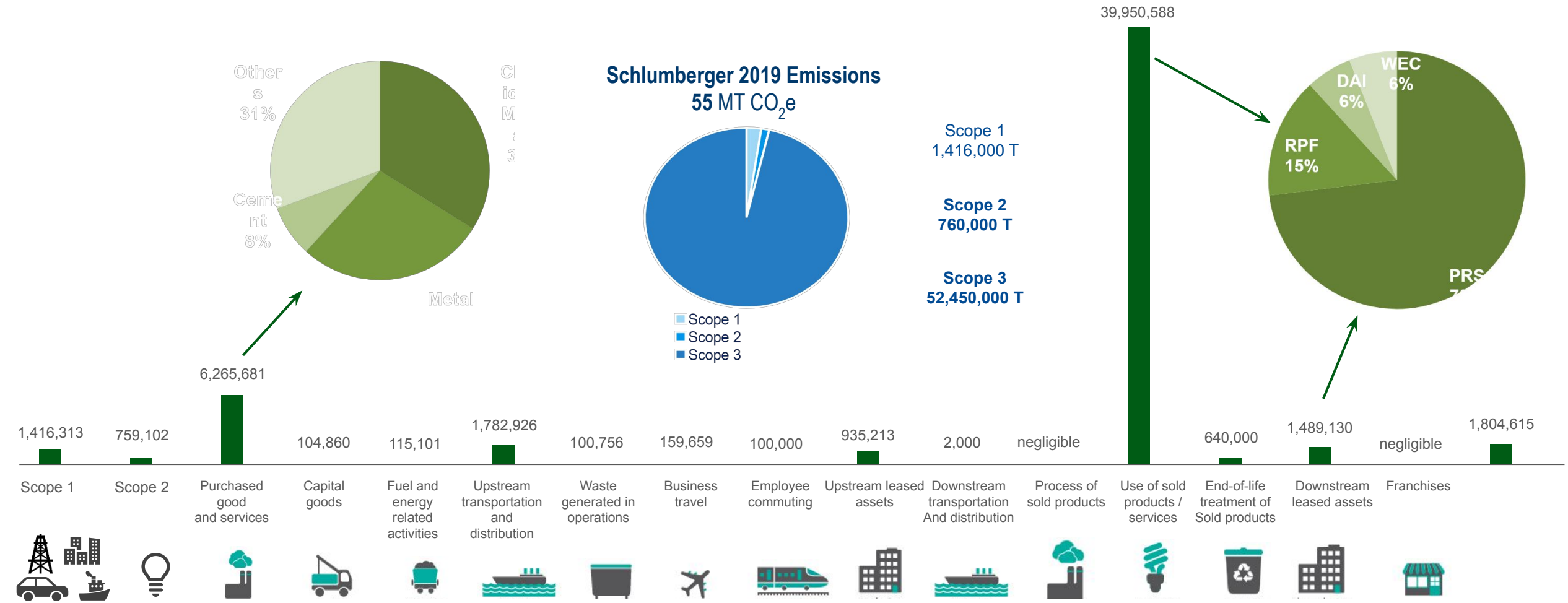
Oil and Gas 2019 Emissions
23 GT CO_2e



Schlumberger 2019 Emissions
0.055 GT CO_2e



Schlumberger Emissions 2019 – CO_2e Tonnes



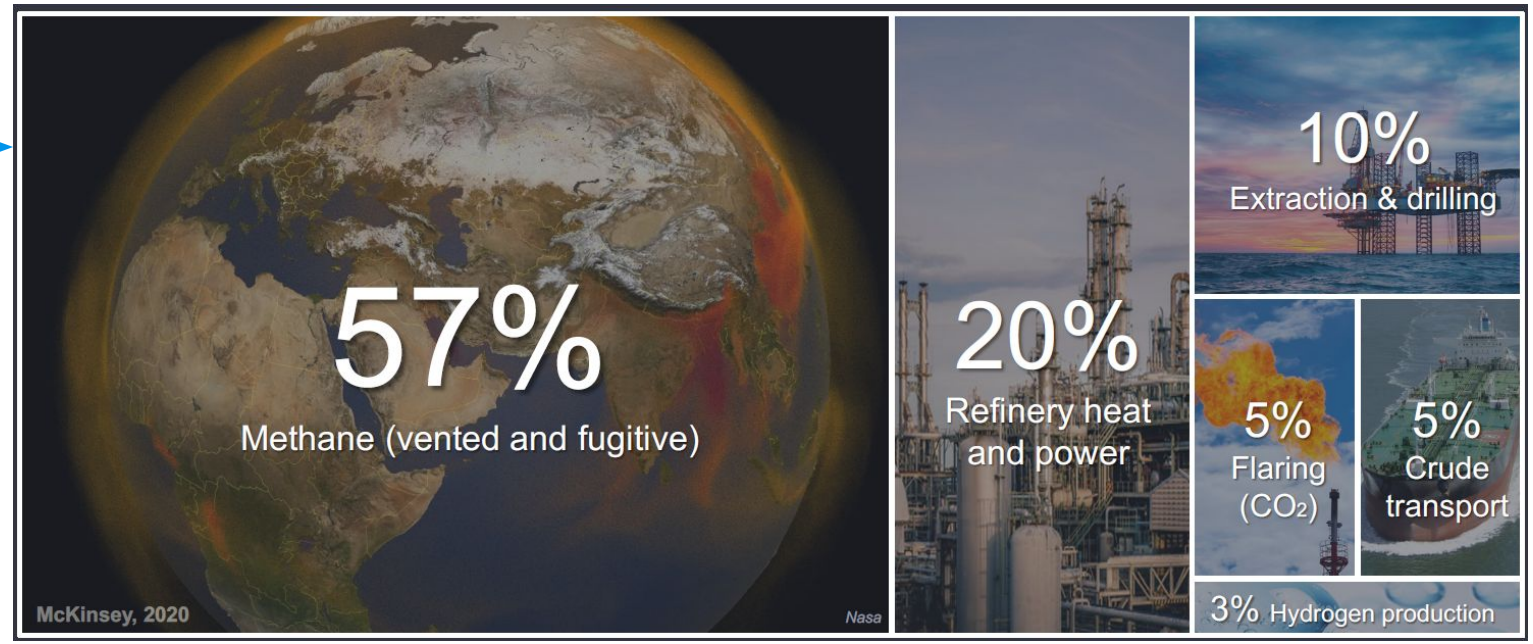
Oil & Gas Emissions

2019 Estimates

23GT CO2E – Oil & Gas related

The oil & gas industry = 5 GT

Using the refined products = 18 GT



32GT CO2E – outside Oil & Gas

Source: IEA, McKinsey 2020

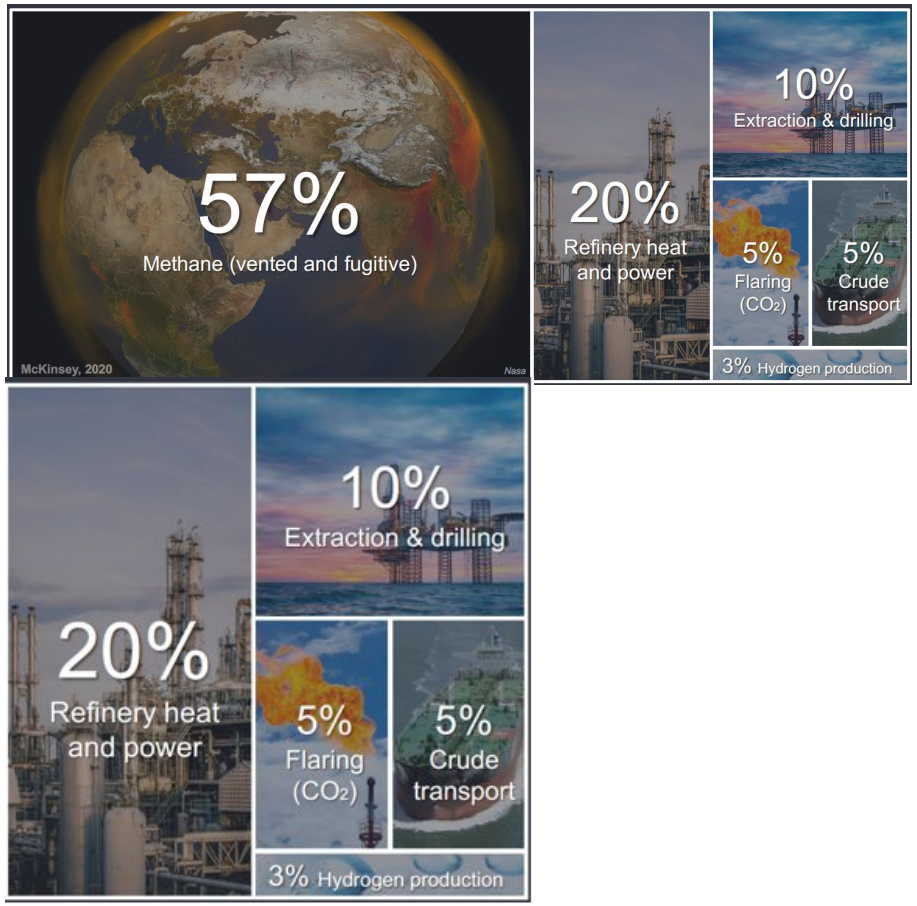
Oil & Gas Emissions

2019 Estimates

23GT CO2E – Oil & Gas related

The oil & gas industry = 5 GT

Using the refined products = 18 GT



32GT CO2E – outside Oil & Gas

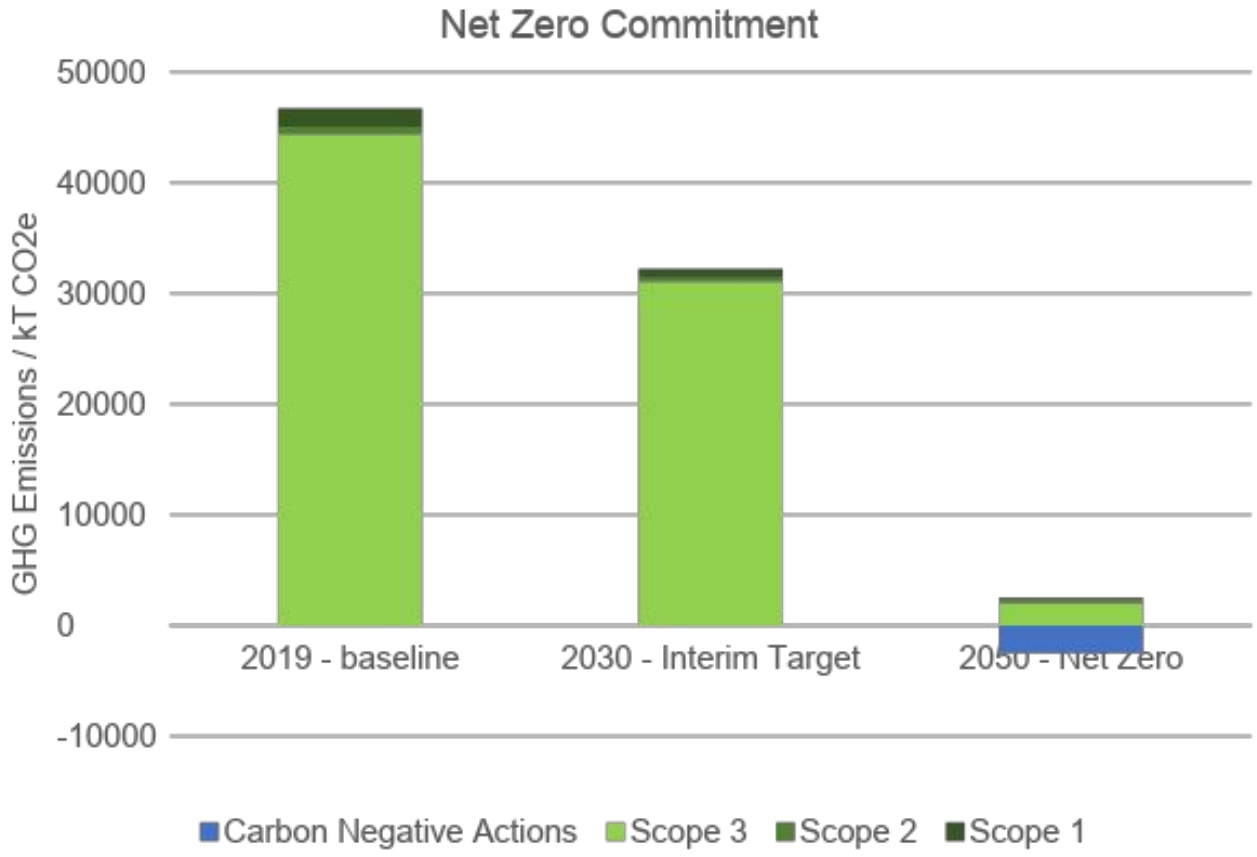
Source: IEA, McKinsey 2020

UN Sustainable Development Goals

Related to Oil & Gas technology solutions

Built on decades of work by countries and the UN, based upon multiple summits, conferences, forums and agreements, starting in 1992

Our Science-Based Commitment to Net Zero

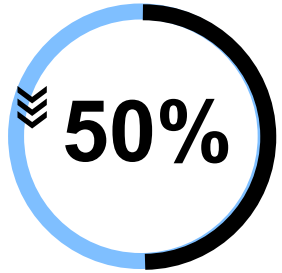


Industry leading Scope 3 inclusive target to get to
NET ZERO BY 2050

Ambition to achieve **NET ZERO** with
carbon-negative solutions

Comprehensive near-term roadmap with **INTERIM TARGETS**

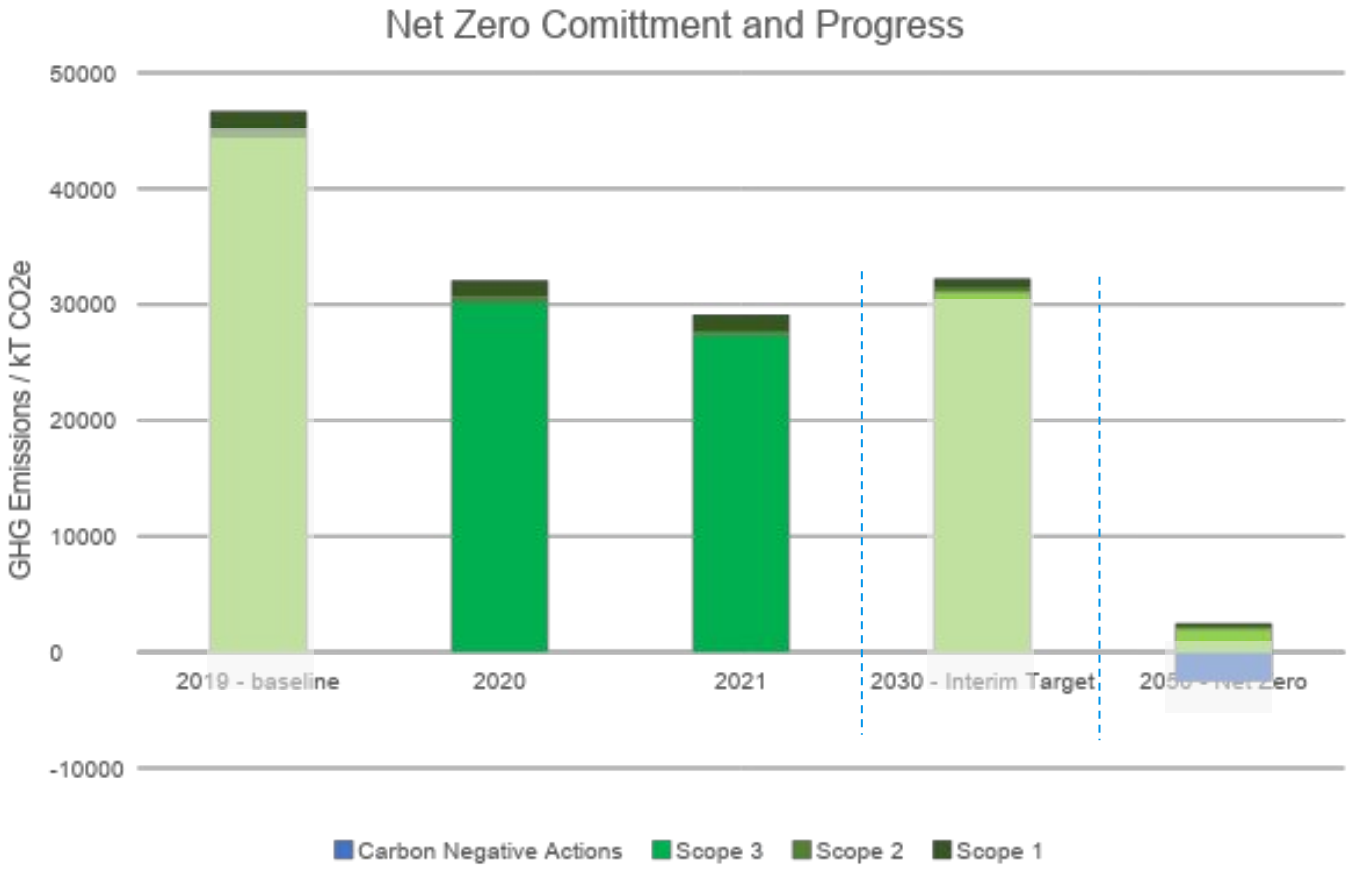
2025
Scopes 1 and 2



2030
Scopes 1 and 2

2030
Scope 3

Our Science-Based Commitment to Net Zero



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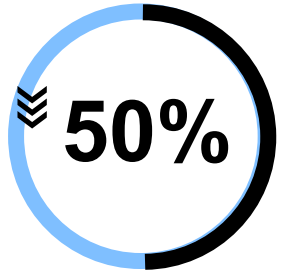


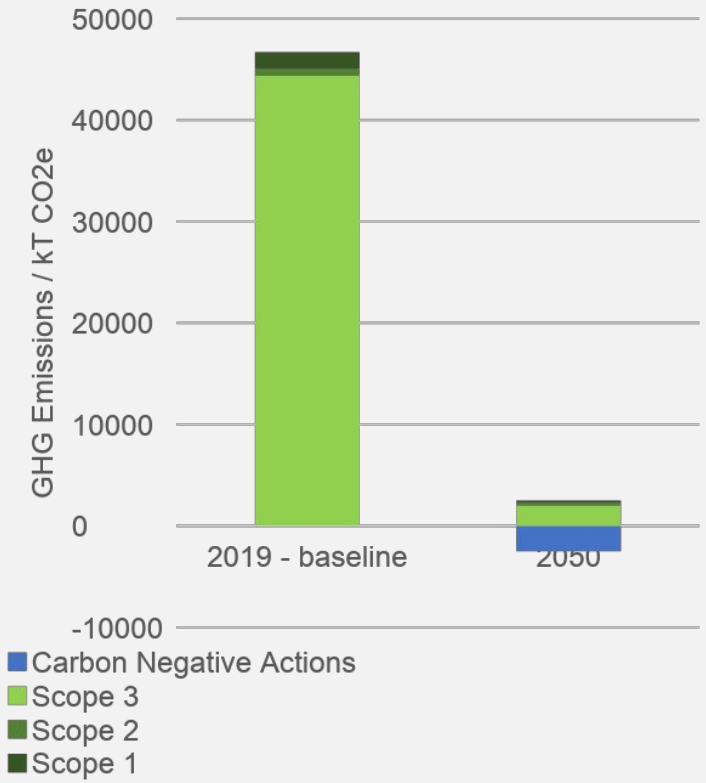
2030
Scopes 1 and 2

2030
Scope 3

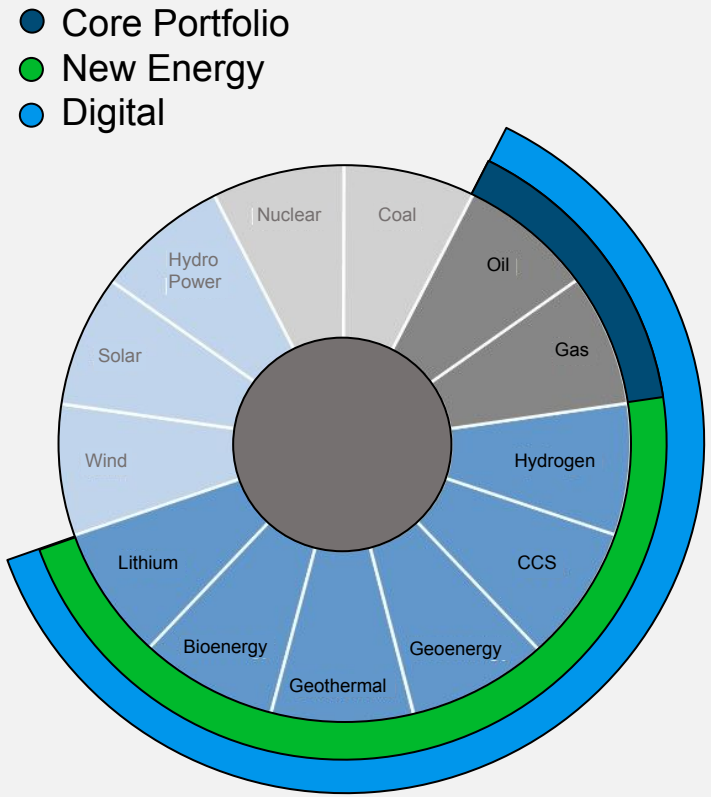
Scorecard	2021 emissions = 29.2 million tonnes	Scope 1 and 2 ↓ 25%	Scope 3 ↓ 38%

Taking Climate Action

Getting to Net Zero by 2050



Investing in the Energy Transition



Oil & Gas Decarbonization

Transition Technologies

Schlumberger End-to-end Emissions Solutions

Drilling Emissions Management

Carbon Services for CO_2 Storage

Solutions to Reduce Emissions in Customer Operations

Transition Technologies

Schlumberger End-to-end Emissions Solutions

Drilling Emissions Management

Carbon Services for CO_2 Storage

Portfolio Vision: Transition Technologies

Driving Superior Business Outcomes with More Energy, Less Carbon

Less NPT
Less Waste
Less Driving
Less Resources
Less Emissions
Less Carbon
Less Cost

More

RETURNS
Capital Efficiency

+

SUSTAINABILITY
More Energy, less Carbon

+

EARNINGS GROWTH
Cost Efficiency & Consistency

Our Approach: Sustainability through Technology

Environmental Focus

Our United Nations
SUSTAINABLE DEVELOPMENT GOALS

Solution Attributes

- **Emissions Reduction**
- Energy Consumption Reduction
- Renewable Energy / Electrification
- Surveillance & Assessment
- HazMat / HazChem Reduction
- Water Stewardship
- Waste Reduction
- Size Reduction

Transition Technologies

Image source: UN.org

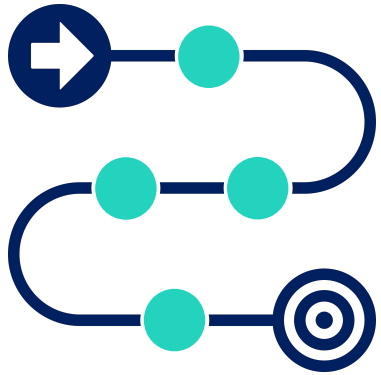
Transition Technologies: Progress & Outlook

Portfolio review: 100+ impact-reducing technologies; Mapped to SDGs.

100+
Technologies

H1 2020

Impact quantification framework using 8 technology attributes.



H2 2020

Framework piloted. Sustainability embedded in R&D process

Transition Technologies

H1 2021

Rapid expansion of portfolio and external accreditation of framework.

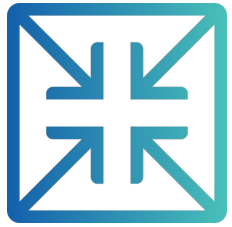
Ongoing

Transition Technology Portfolio

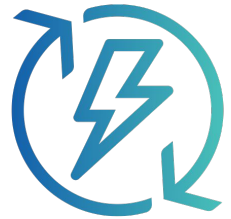
Address Methane Emissions

Reduce or Eliminate Flaring

Minimize Well Construction CO_2 Footprint



Full Field Development Solutions



Electrification of Infrastructure

Transition Technology Portfolio

Address Methane Emissions	Reduce or Eliminate Flaring	Minimize Well Construction CO_2 Footprint	Full Field Development Solutions	Electrification of Infrastructure
▪ Cameron low-emission valves ▪ Symmetry process software platform ▪ Vx Spectra surface multiphase flowmeter	**Nonroutine Flaring** ▪ Ora deep transient testing ▪ EverGreen minimal environmental impact well effluent burner ▪ Zero flaring well test and cleanup ▪ Flaring emissions prediction **Routine Flaring** ▪ Symmetry platform	▪ ATC automatic tank cleaning technology ▪ CemFIT Heal flexible self-healing cement system ▪ ENVIROUNIT offshore slop water treatment ▪ EverCRETE CO_2-resistant cement systems ▪ GeoSphere 360 3D reservoir mapping-while-drilling Service ▪ Intelligent Power Management ▪ NeoSteer at-bit steerable system ▪ Ora platform fluid sampling and scanning ▪ Optiq Seismic fiber-optic borehole seismic solution ▪ Performance Live digitally connected service ▪ PowerDrive Orbit G2 rotary steerable system ▪ TruLink definitive dynamic survey-while-drilling service	▪ Apura composite membrane ▪ CYNARA acid has removal membrane systems ▪ HiWAY flow-channel fracturing technique ▪ NATCO DUAL FREQUENCY electrostatic treaters, coalescers, and deslaters ▪ Rapid multilateral systems ▪ ReacXion fully dissolvable frac plug ▪ REDA Maximus Eon extended-life, install-ready ESP motor ▪ Saltel Xpandable expandable steel technology ▪ Subsea boosting systems ▪ Subsea multiphase compression system ▪ PureMEG MEG mechanical vapour recompression ▪ PMM ESP Motor ▪ HPS Multiphase Horizontal Pump ▪ Select S and SulfaTREAT H2S Adsorbents ▪ THIOPAQ O&G Biodesulfurization System ▪ OCS-V and OCS-H Clamp Connection Systems	▪ All-electric subsea actuator ▪ All-electric surface actuator

Qualification

Reduce or Eliminate Flaring

Zero-Flaring Well Testing and Cleanup

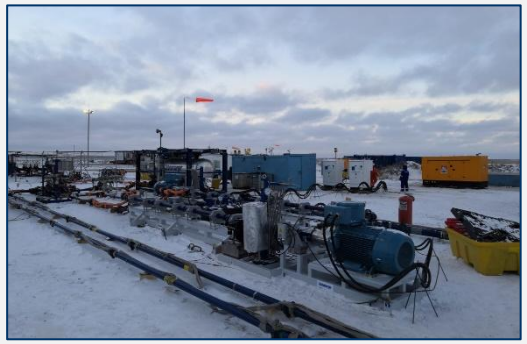
Technology-driven approach to reduce industry emissions

5% of oil and gas emissions are related to flaring activities

Our approach reduces emissions by eliminating flaring

Central Asia

Improving production while eliminating all flaring-related emissions



Track record:

- 500+ days in operation

Emissions reduction:

- >240,000 metric tons from well cleanup and production boosting

BP Oman

Zero-flaring completions technique sets a new bar for delivery and efficiency

Track record:

- 10 wells per year

Emissions reduction:

- 80,000 metric tons CO_2e elimination

Qualification

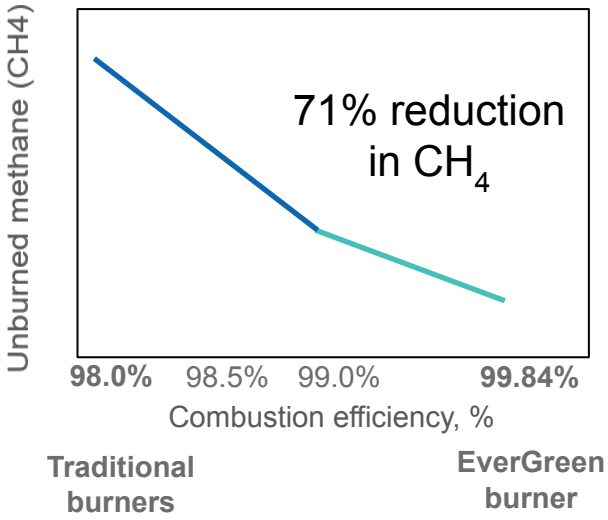
Reduce or Eliminate Flaring

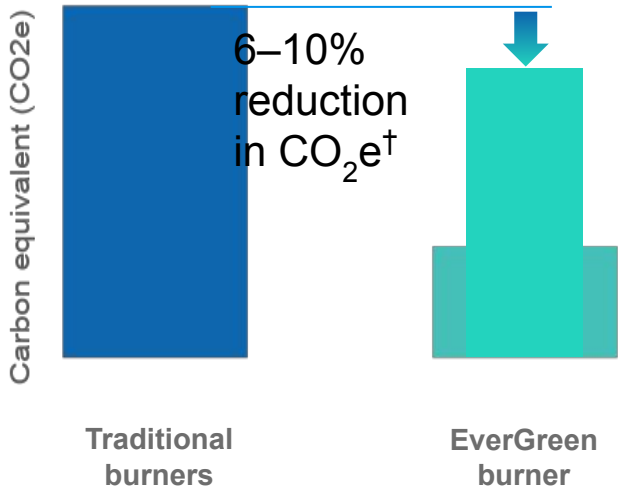
13 CLIMATE ACTION

EverGreen

Minimal environmental impact well effluent burner

Emissions reduction compared with traditional burners





Total reduction in emissions
324 metric tons of CO_2e

Result	Peak Combustion Efficiency	Peak Destruction Efficiency	Fallout Efficiency, One-Day Cycle
%	99.84	99.93	99.999995

†3 days flaring at 4,000 bbl/d using the Evergreen burner at 99.84% combustion efficiency compared with a traditional burner at 98% combustion efficiency

Qualification

Address Methane Emissions

Low-Emission Valves

API- and ISO-certified valves to mitigate fugitive emissions

- Proven reduction in emissions
- Certified to industry fugitive emissions design standards API 624 and 621 and ISO 15848-1
- Traditional, well-known ball valve types—trunnion-mounted, floating, and rising stem ball valves—together with new technology, such as integrated-seat ball valves and gate, globe, butterfly, and plug valves
- Aftermarket services to ensure that the valves maintain their fugitive emissions certifications

596

million metric tons of methane emitted to the atmosphere annually

84×

stronger global warming potential of methane compared with CO_2 over a 20-y period

57%

CO_2e emissions from oil and gas operations caused by vented and fugitive methane

96%

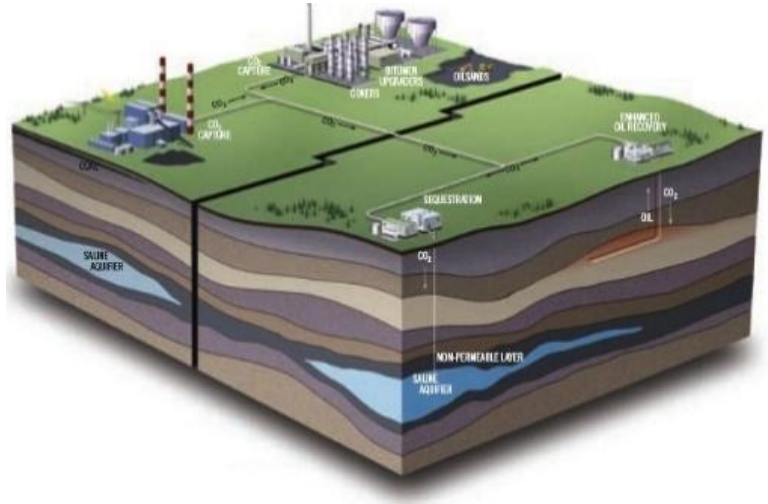
Reduction in emissions possible from ISO and API certified Low-E valves

Case Study

Reduce or Eliminate Flaring

Symmetry

Advanced simulation technology improves product quality while reducing flaring for a major shale producer in Canada



- Ensuring product consistency in a challenging environment
- Advanced modeling for operational decision support
- Allowed the customer to assess the impact of composition and rate for each new well brought into production.
- Enable the customer to shift these wells to the primary production system an average of five days sooner than was previously the case
- Shifting the wells to production earlier in their clean-up process, allowed the operator to eliminate 0.25 MMscf of routine flaring per well.

Elimination of 5 days of gas flaring on each well

Emissions Reduction

Eliminated flaring 250 Mscf of gas for each new well brought into production

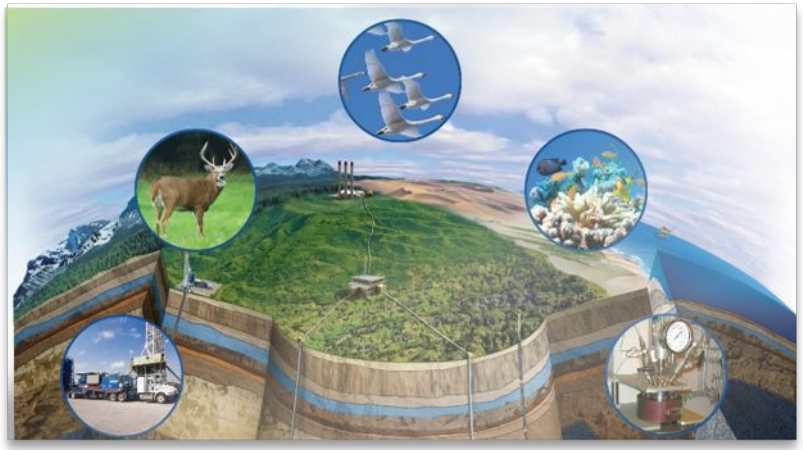
18 T CO_2e eliminated per well in a field with 50 to 100 wells drilled per year

Qualification

Minimize Well Construction CO_2 Footprint

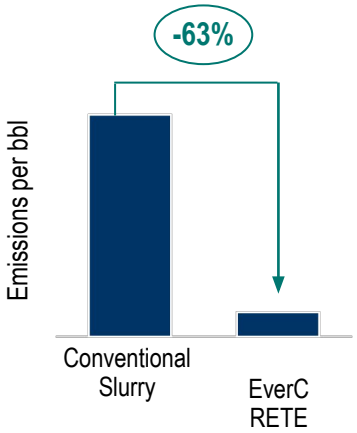
EverCRETE

CO_2-resistant cement system



- Creates robust barrier
- Extends longevity through self-healing
- Significant reduction in CO2 during manufacturing
- Primary application: CCUS and CO2 injection for EOR

COMPARISON



Typical section – injection well

Average 200 bbl fluid pumped

- 63% reduction in CO_2 emissions

63%
reduction in CO_2 emissions

34
metric tons CO_2 reduced

Typical section – injection well
Average 200 bbl fluid pumped

Qualification

Minimize Well Construction CO_2 Footprint

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

CemFIT Heal

Flexible self-healing cement system

- Provides competent annular pressure seal thus assuring long-term well integrity
- Delivers superior mechanical properties to withstand downhole stresses preventing cracks and micro-annuli
- Auto-repairs recurrently should any cement defects appear, thus extending the longevity of the wells
- Significant reduction in CO2 during manufacturing

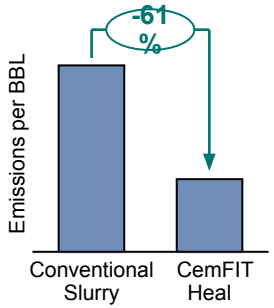
Case Study: Sustained Casing Pressure (SCP) Eliminated

Challenge:

45% of the wells in an offshore field had SCP. A liner, followed by tie-back was being used to cement the section without any success.

Result:

- >1,000 bbl of customized light weight CemFIT Heal system placed with minimal losses in highly deviated section
- Effectively resolved SCP, and in-turn any remedial treatment related emissions (> 165 CO2eq Tonnes Scope 1 Emissions per well)
- Enabled modified casing design saving up to 3 rig days per well (> 100 CO2eq Tonnes Scope 1 Emissions per well) & over USD 200,000



CO_2e

265 metric tons CO_2e emissions avoided

Qualification

Minimize Well Construction CO_2 Footprint

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

17 PARTNERSHIPS FOR THE GOALS

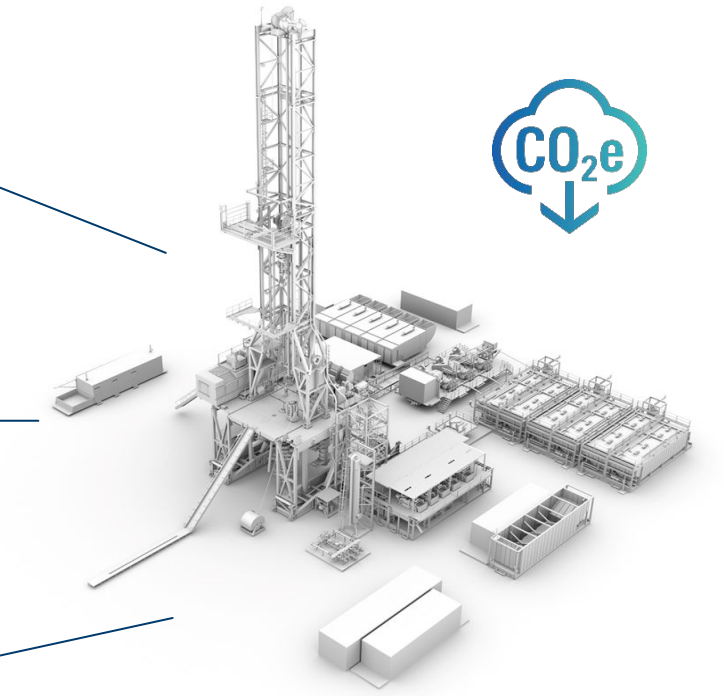
Intelligent Power Management

From reactive to predictive power management

Fully automated smart **engine management software**

Energy storage maximizes engine performance

Zero emissions through use of **hydrogen fuel cells**



Path to ZERO EMISSIONS

Today

12%

reduction in emissions†

1,200 PER YEAR‡

metric tons CO_2 reduced

Results from automated software in US land rigs operating for more than six months

2023 Ambition

100%

reduction in emissions

10,000 PER YEAR

metric tons CO_2 reduced

Emissions reduction based on power produced at the wellsite with green hydrogen fuel cells

- Delivering consistent, sustainable, and efficient power
- Integrating advanced technologies into one solution
- Reducing maintenance, emissions, and fuel costs

†Results may vary by well type, engine type, crew, etc. ‡ Based on USL a rig with automated software

Qualification

Minimize Well Construction CO_2 Footprint

Performance Live

Digitally connected service

- Safety and Sustainability
  - **Remove** people from the red zones
  - **Reduce** carbon footprint by leveraging digital tools
- Improved Service Delivery and Efficiency
  - **Streamline** operations and logistics
  - **Minimize** manual work and siloed operations
- Enhanced Customer Performance
  - **Live control** of wellsite operations
  - **Faster** and more informed decisions

21%
increased ROP

CO_2e

45
metric tons CO_2 reduced

United States – Permian Basin
Improved ROP and reduced footprint per well basis

DRILLING EFFICIENCY AND PRODUCTION OPTIMIZATION

Performance Live

Digitally connected service

Minimize Well Construction CO_2 Footprint

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

Mario Bonvini • 1st
Performance Engineer, Drilling at YPF SA
5d •

Dando el presente en la #AOG2022 con Gabriel Berkovic. Presentamos evolución y resultados del sector Ingeniería de Performance Pad en Perforación No Convencional en YPF. En esta presentación mostramos cómo, en colaboración con Perforación, las contratistas, y sectores transversales, se logró un 60% de reducción en tiempos planos en la perforación de pozos horizontales.

Agradecemos a YPF SA y al Instituto Argentino del Petróleo y del Gas por brindarnos esa oportunidad.

#perforación #estandarización #tiemposplanos #trabajoenequipo #optimización #LEAN

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Giving the present in the #AOG2022 with Gabriel Berkovic. We present evolution and results of the Performance Pad Engineering sector in Unconventional Drilling in YPF. In this presentation we show how, in collaboration with Perforación, the contractors, and transversal sectors, a 60% reduction in flat times was achieved in the drilling of horizontal wells.

We thank YPF SA and the Instituto Argentino del Petróleo y del Gas for giving us that opportunity.

#perforación #estandarización #tiemposplanos #trabajoenequipo #optimización #LEAN

You and 55 others 9 comments

Thank You + Questions