

The Energy Transition and Sustainability Pathways to Net Zero



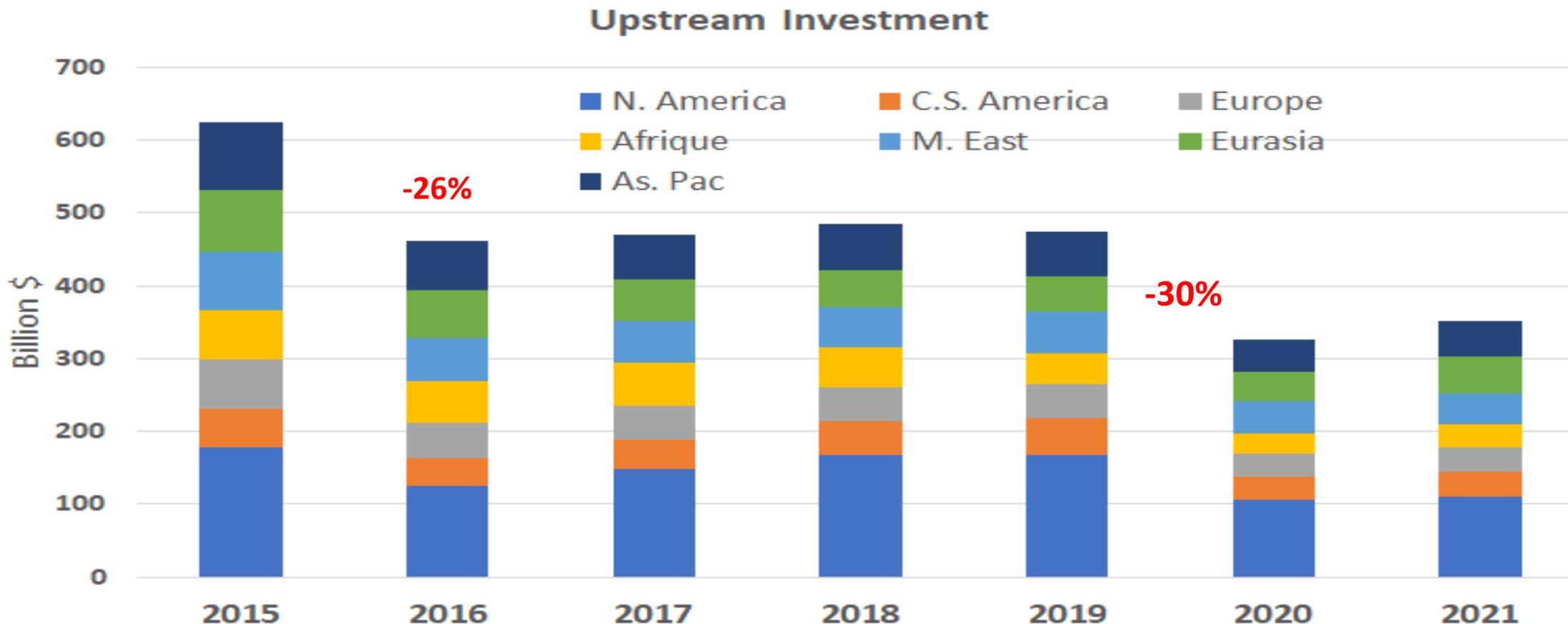
**SPE Gulf Coast Section
September 8th, 2022
Kamel Ben Naceur
2022 SPE President**



Sustainability and Energy Transition in 5 Episodes

**Episode 1: Two consecutive major disruptions
for oil and gas markets**

Evolution of Upstream Oil & Gas Investments

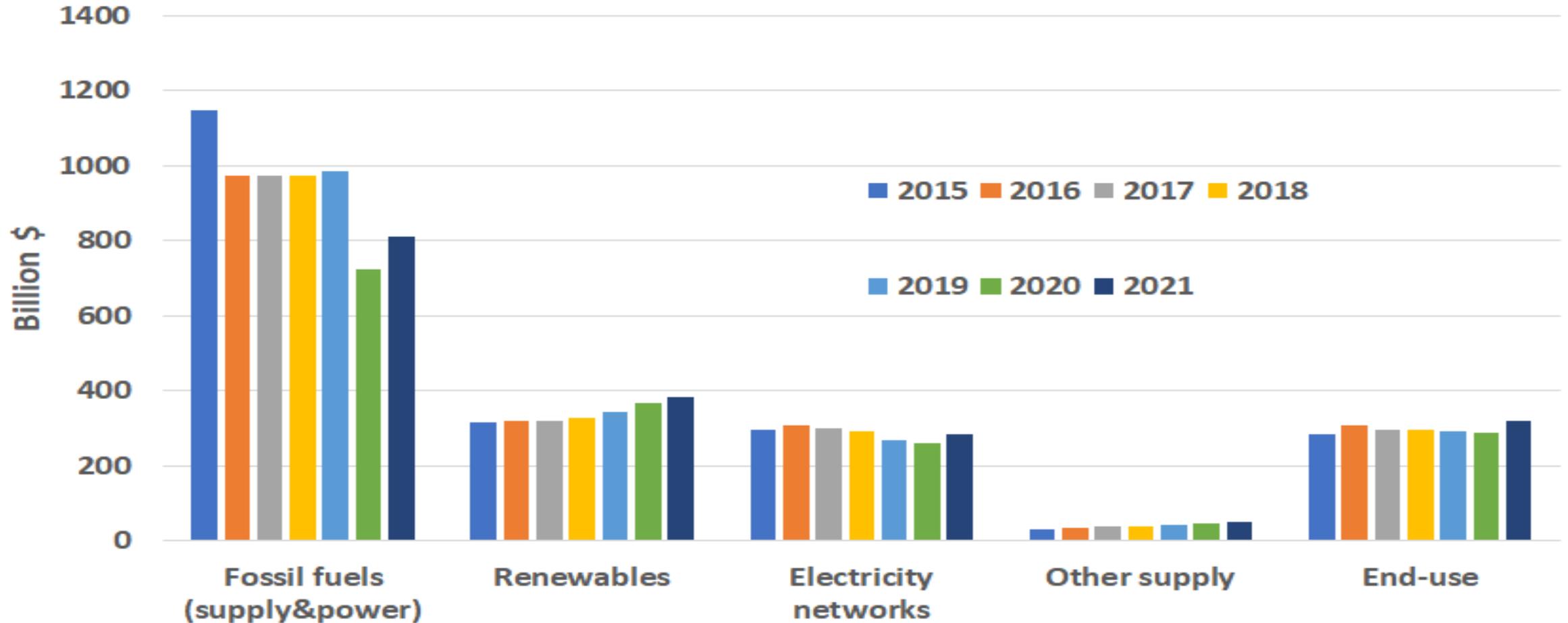


Investments had a major decline in 2016, related to North America, followed by a slight recovery, and then a 30% drop in 2020

Global Energy Investments



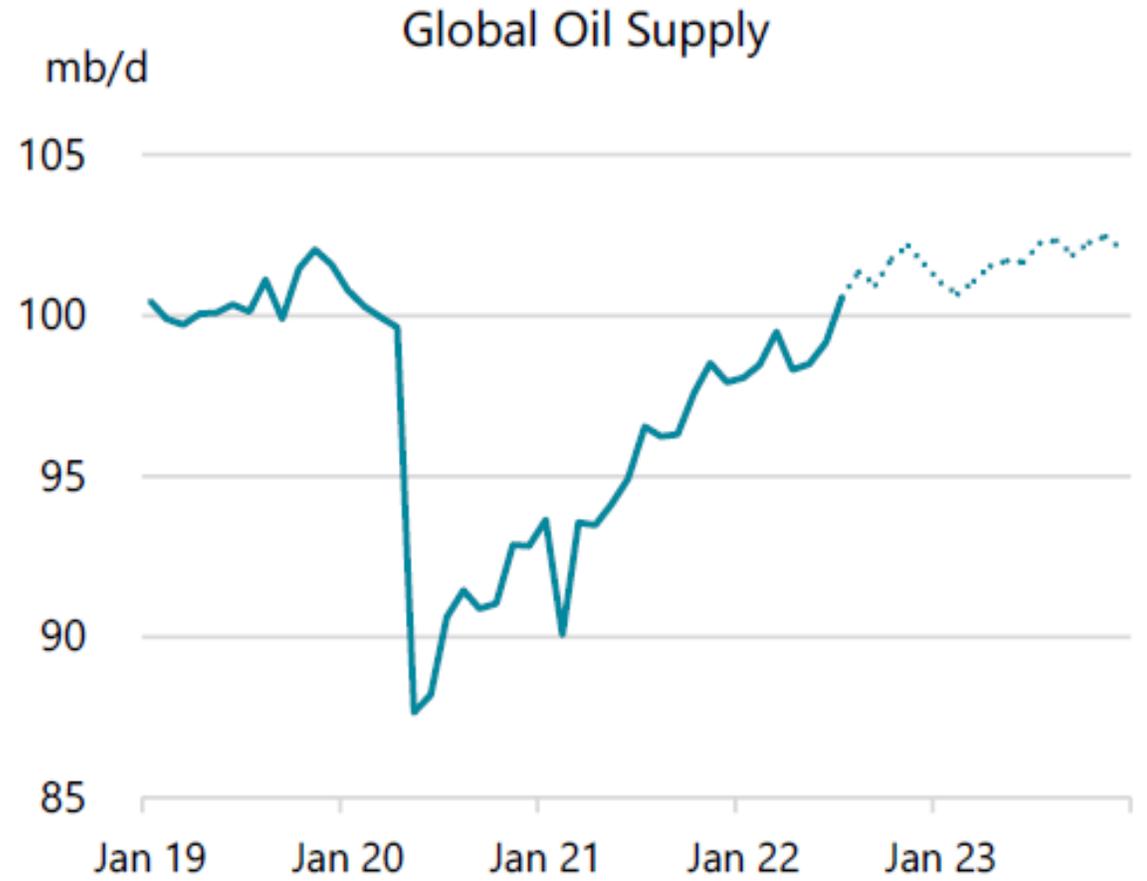
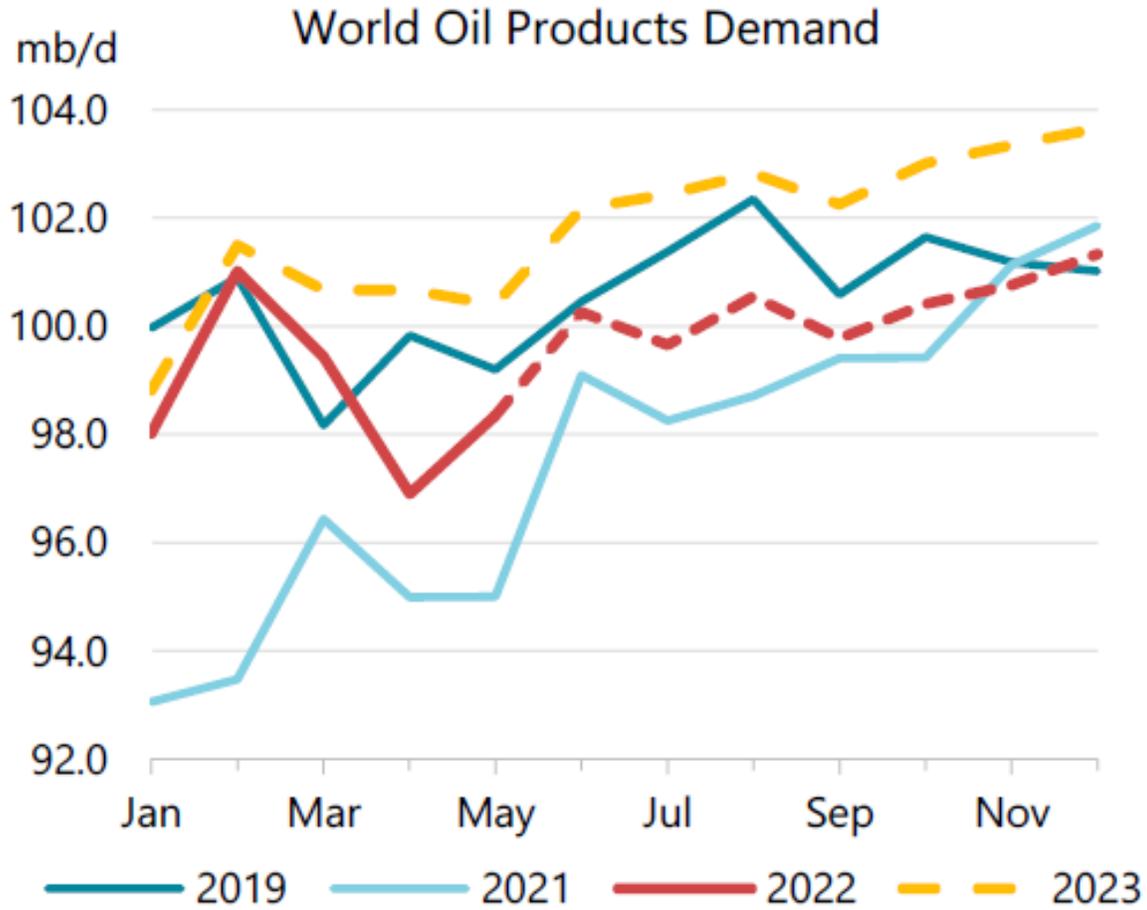
Energy Investments (2015-2021)



Sustainability and Energy Transition in 5 Episodes

Episode 2: Energy Markets after Feb. 24, 2022

Oil Demand Above Pre-COVID Levels While Increase in Supply is Limited



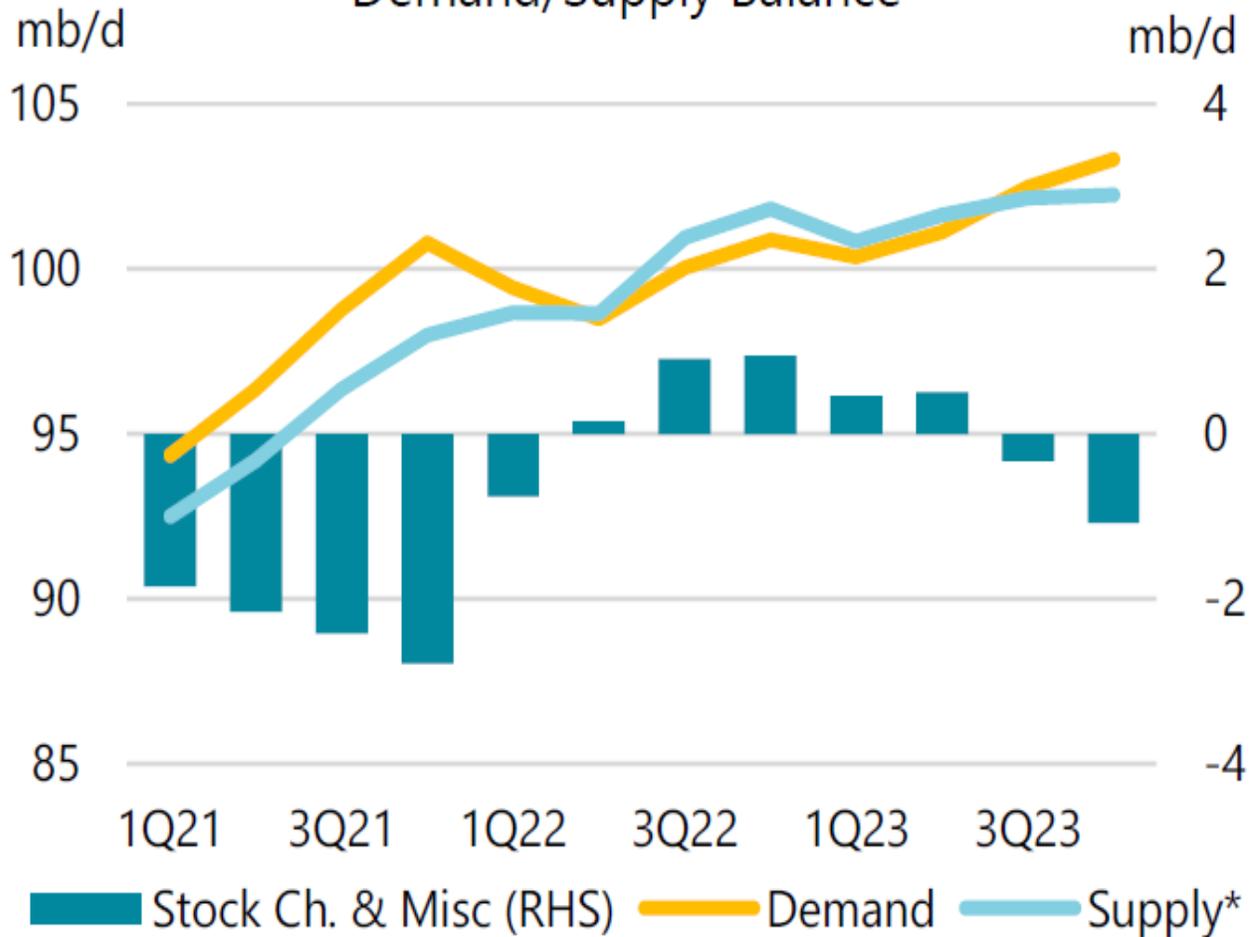
Source: IEA-OMR

Demand Expected to Exceed Supply in 2023

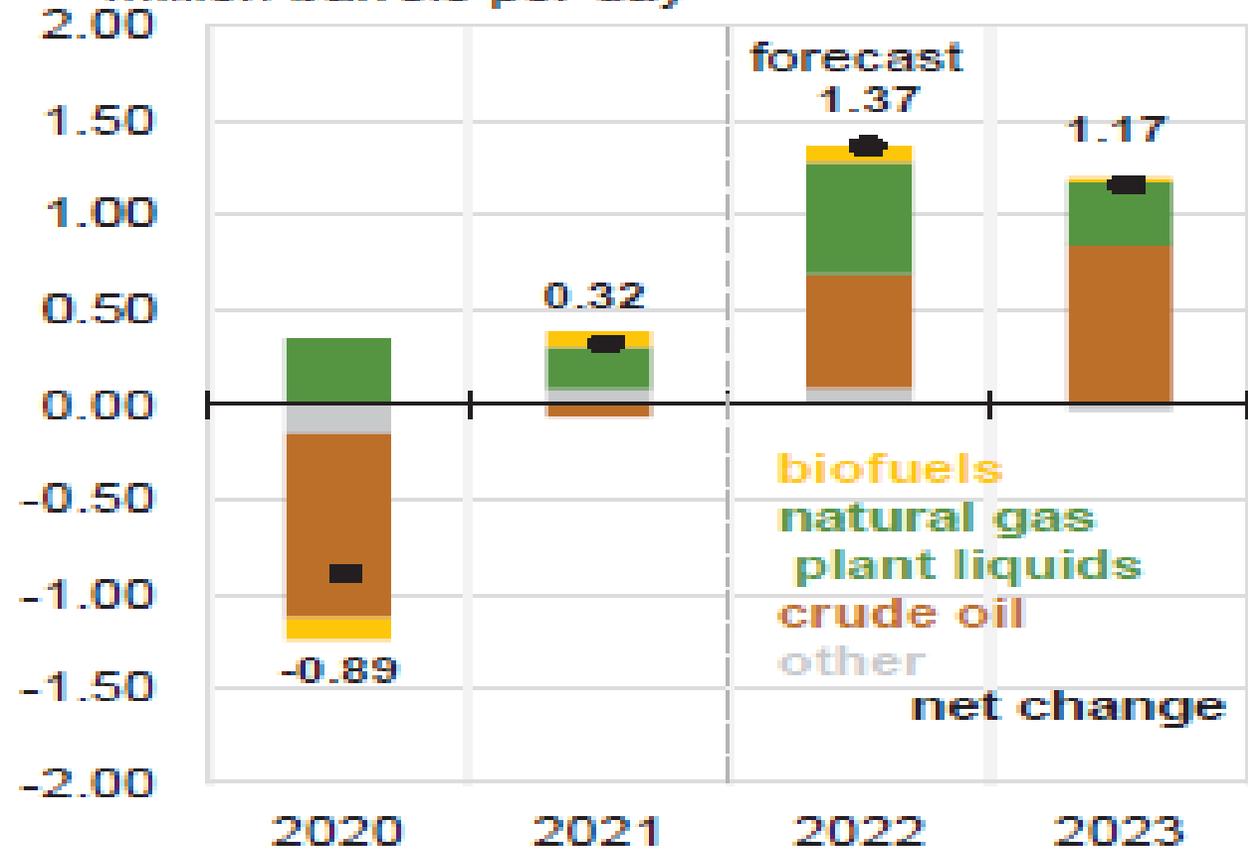
Limited Contribution from Short-Cycle Barrels



Demand/Supply Balance



Components of annual change
million barrels per day

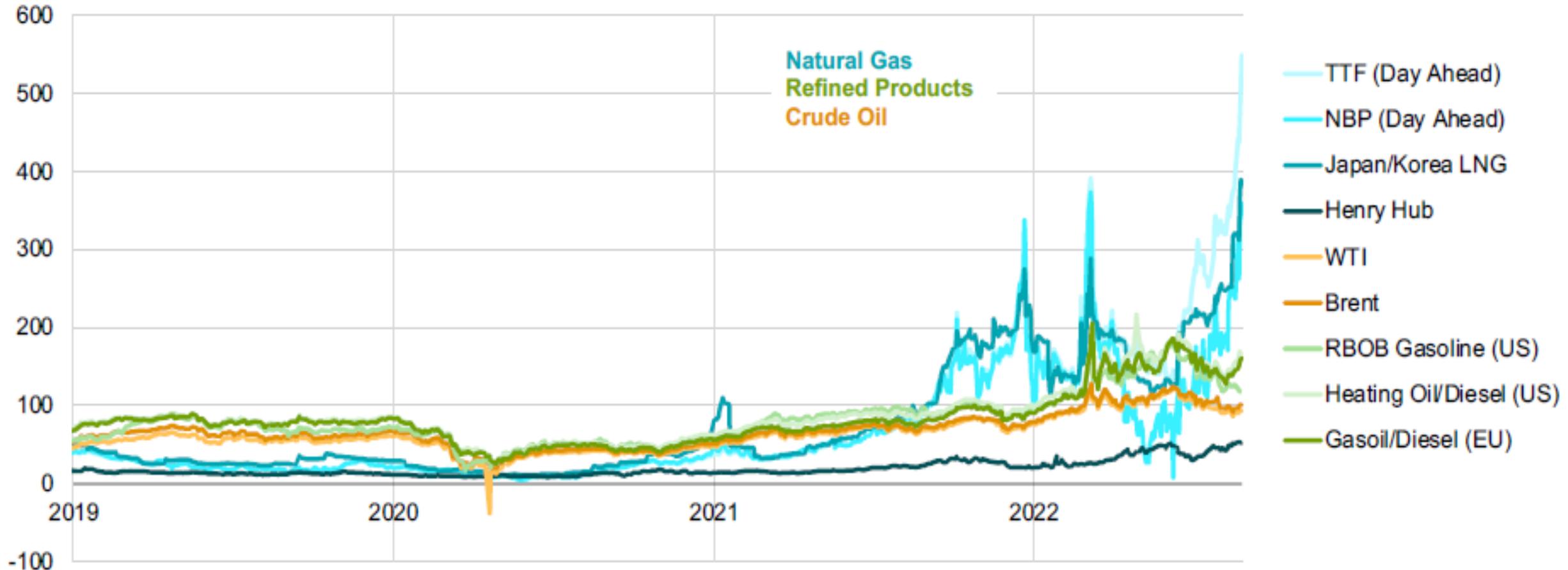


Energy prices at their highest level of volatility



Global Energy Futures Prices

USD per barrel of oil equivalent

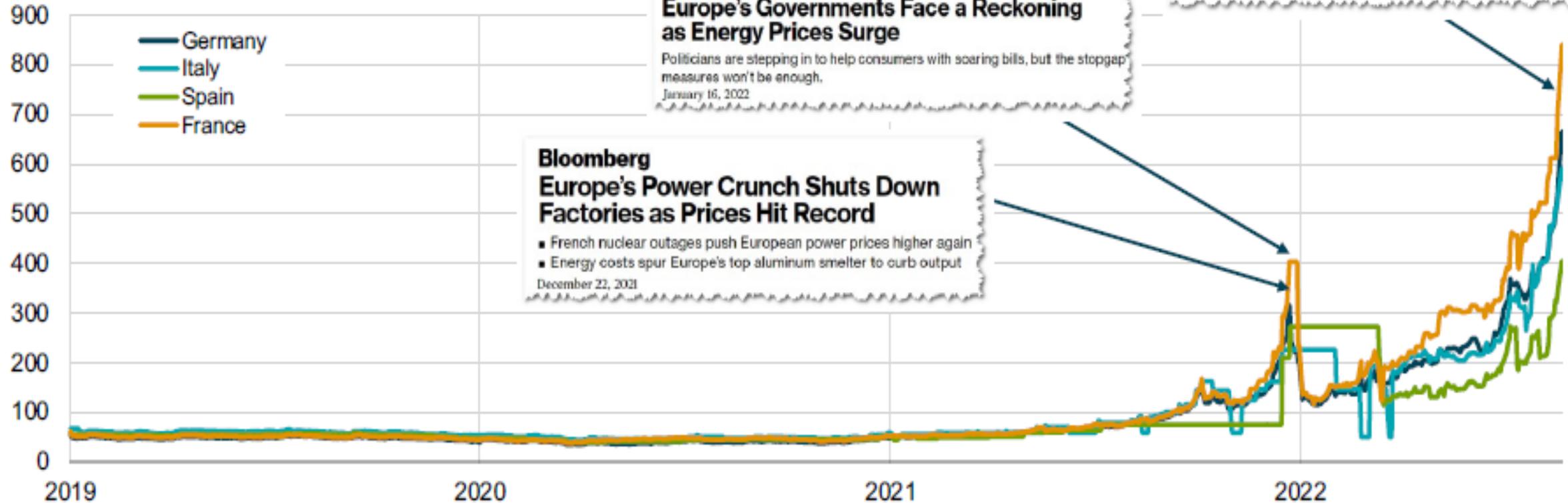


Source: IEF, Bloomberg

European electricity prices at historical levels



Europe Baseload Power Prices - Forward 1 Year
Eur/Mwh

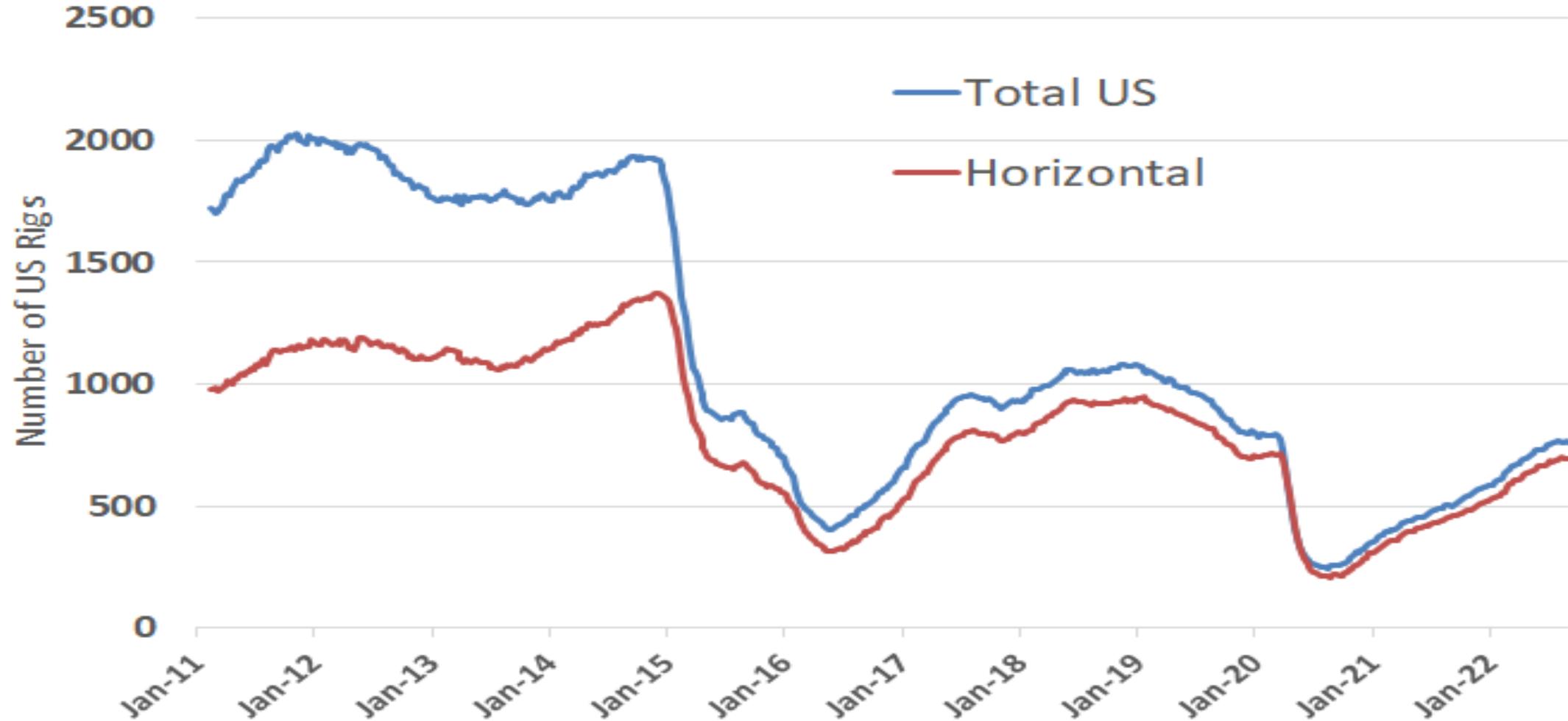


Source: IEF, Bloomberg

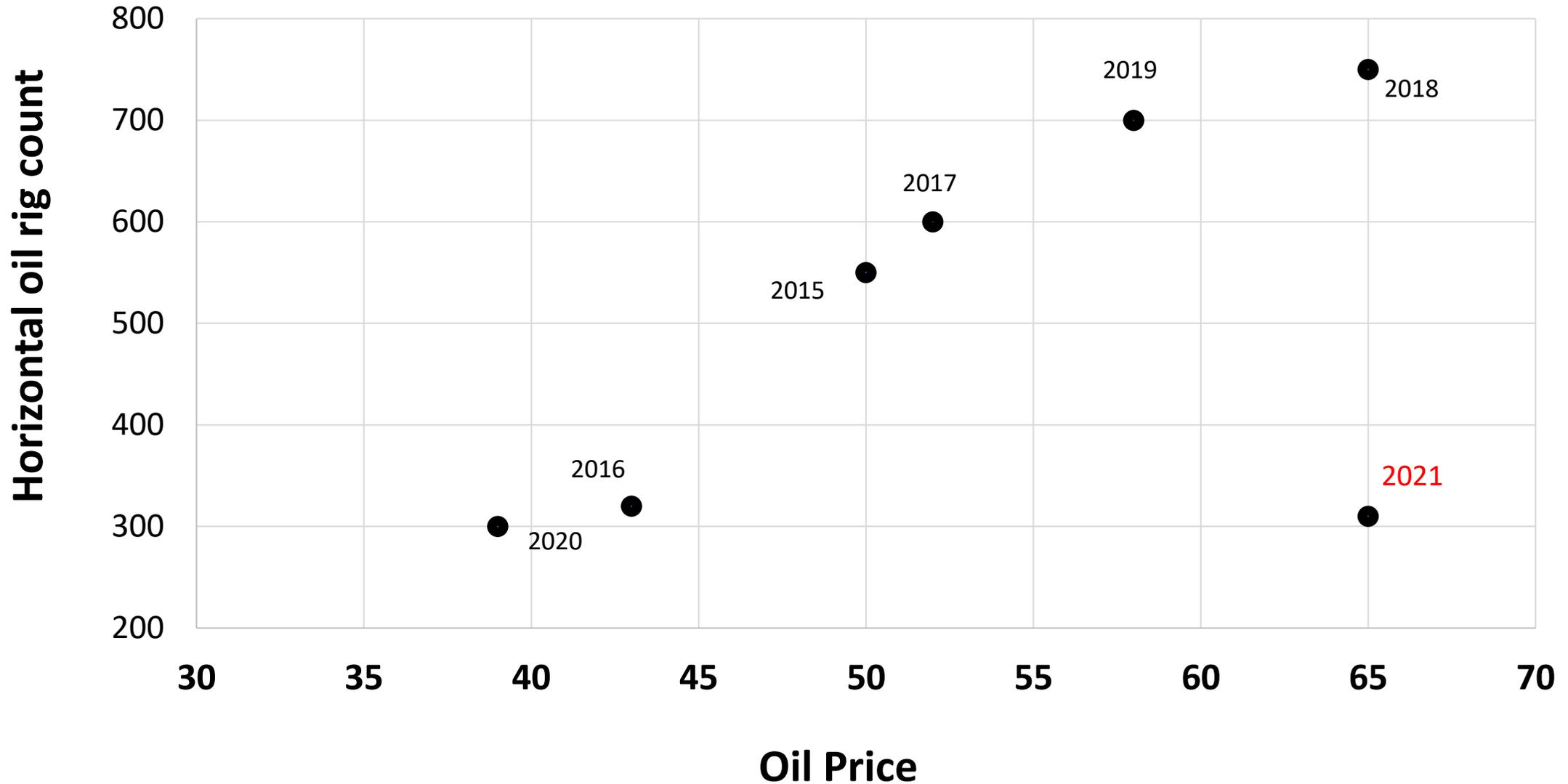
US Oil & Gas Rig Count - Not Recovered



A Decade of US Drilling Activity



Response of Shale Producers to Higher Oil Prices



Response of Shale Producers to Higher Oil Prices



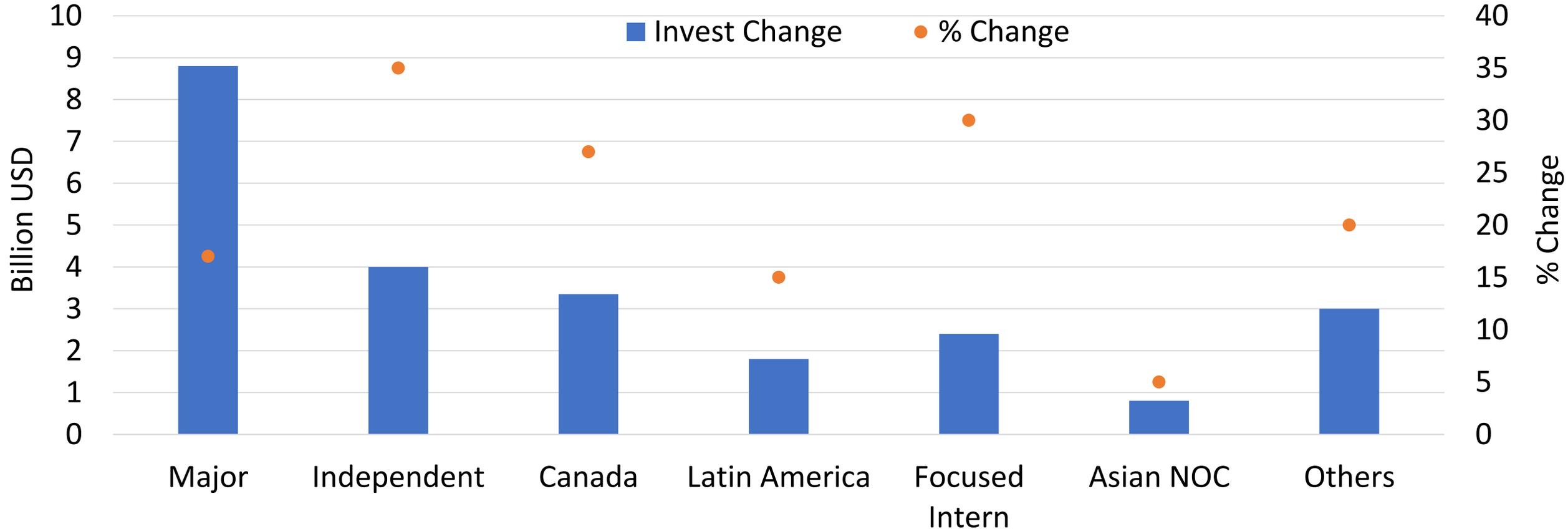
- Uncertainty to industry response to several more quarters of high oil prices
 - High prices generate more cash for investment while staying below a 70% reinvestment rate level
 - High prices reduce gearing levels more quickly, giving more flexibility to reduce discipline
- New balance emerge between investment levels and shareholder returns
- Ukraine has a limited impact on their reinvestment strategy

Good News for our New Graduates



Significant Increase in Upstream Investment in 2022 (+20%)

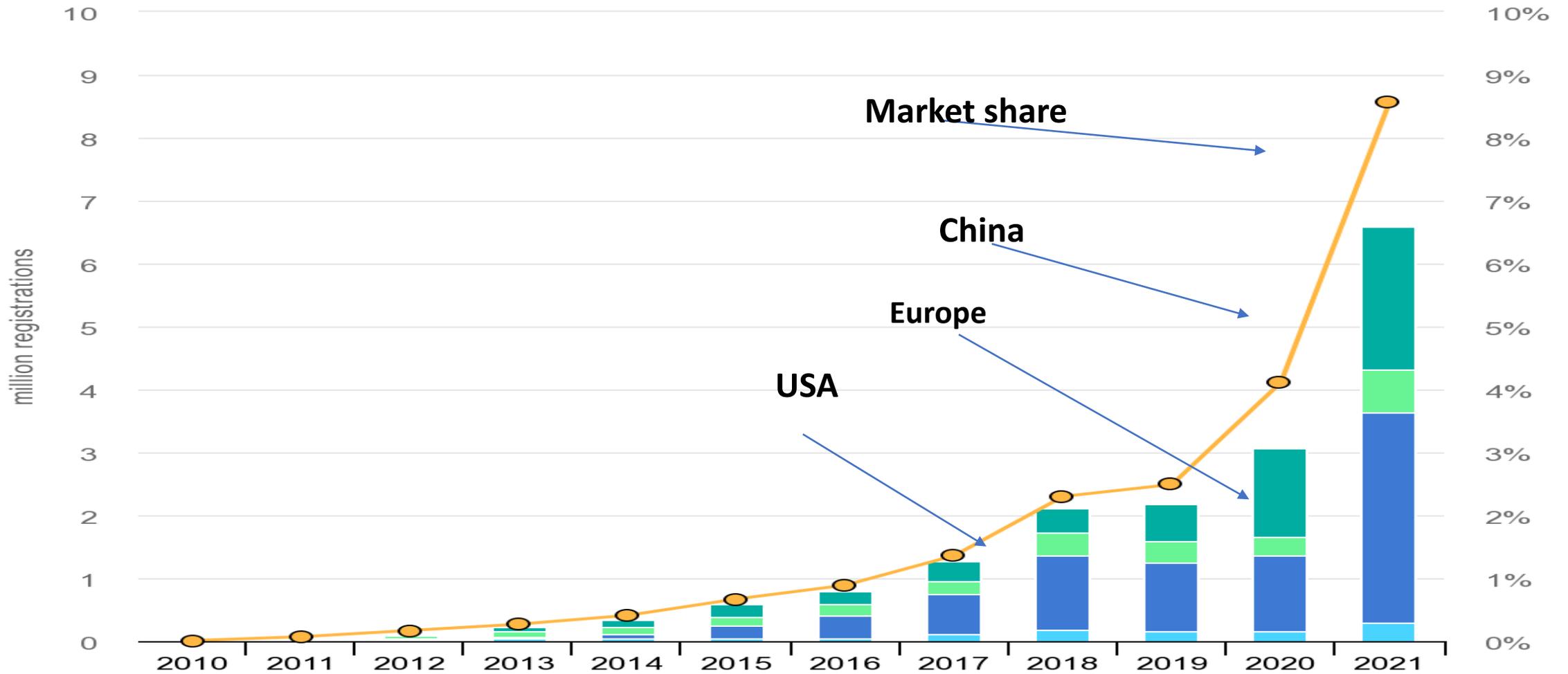
Change in Investment: 2022 vs 2021



Aug. '2022: US-OFS employment (648 K) the highest since the COVID-19 pandemic began, but still off the pre-pandemic mark in Feb. 2020 of 706k.

Energy Transition: A Reality ?

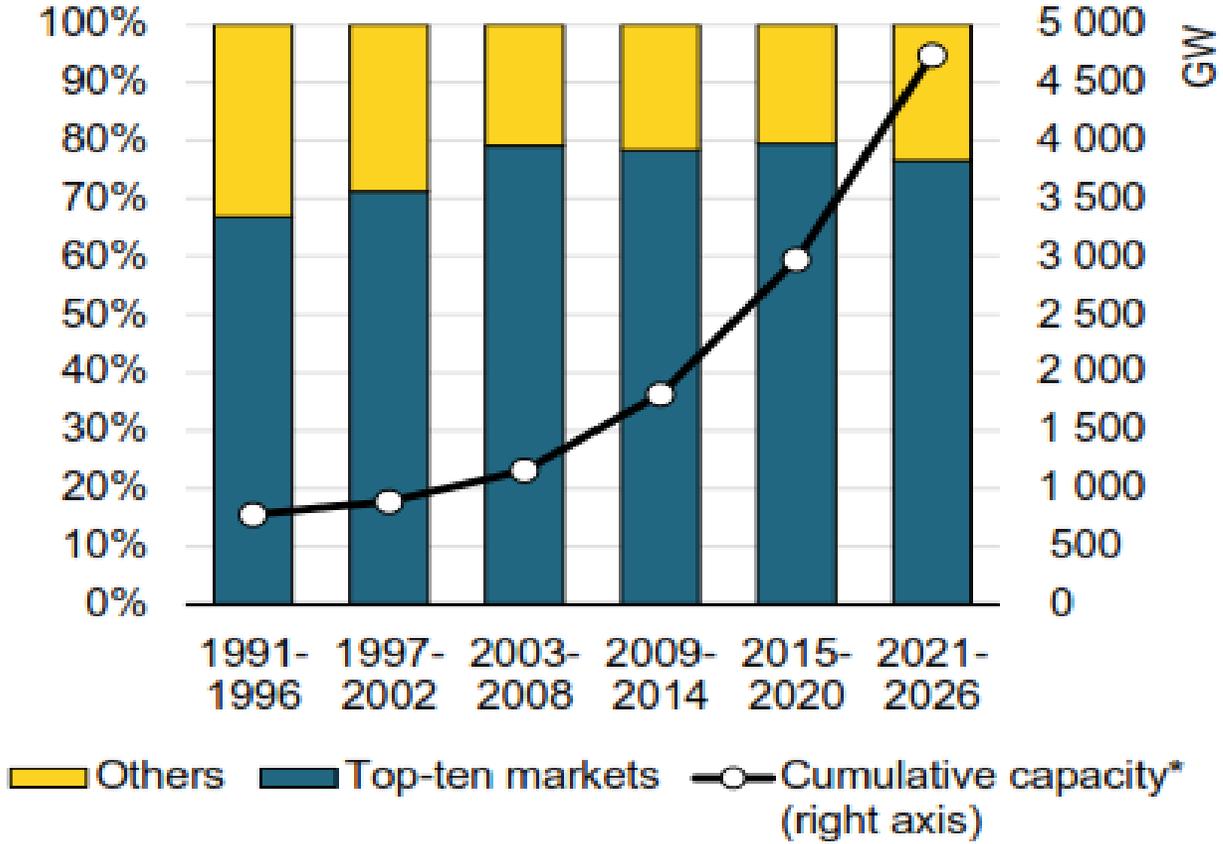
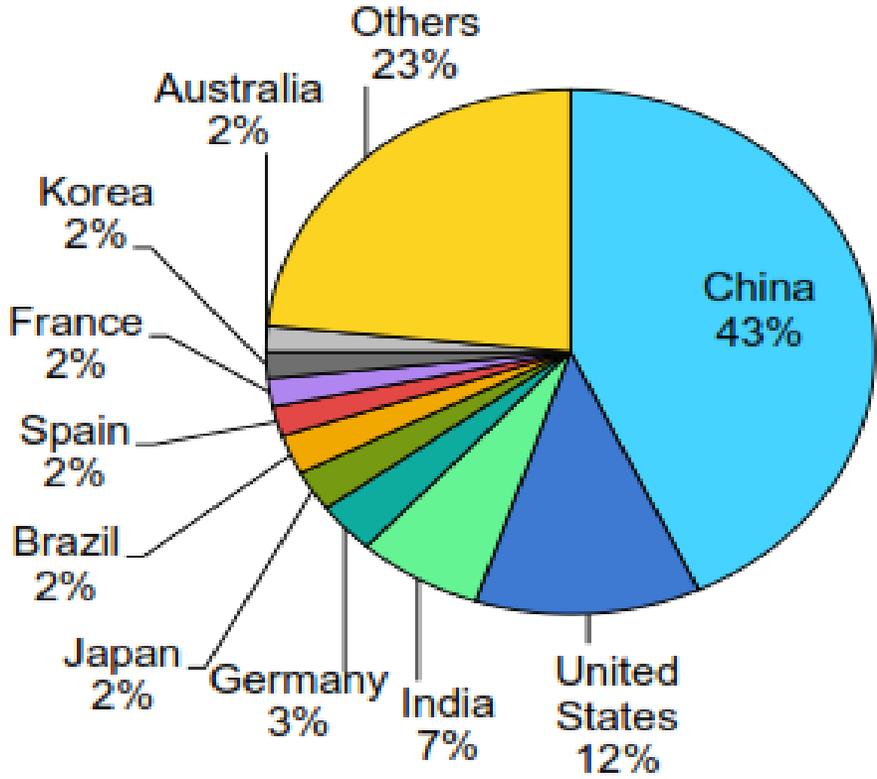
Annual Sales of Electric Cars



Source: IEA, Nomadia

Energy Transition: A Reality?

Renewable Power Capacity Additions

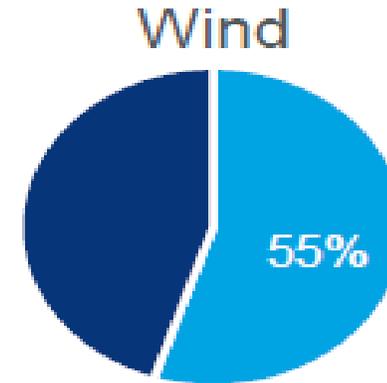
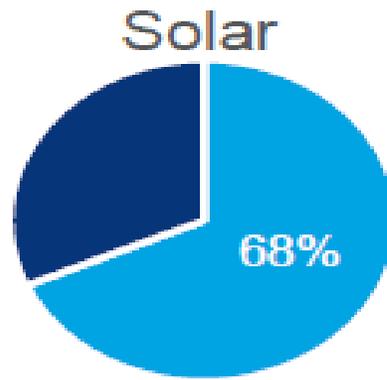


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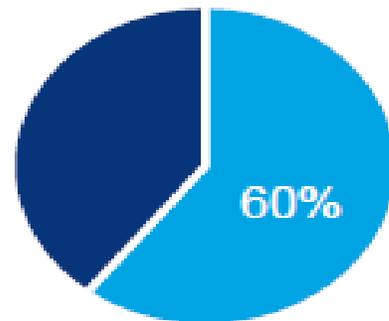
China and the Energy Transition



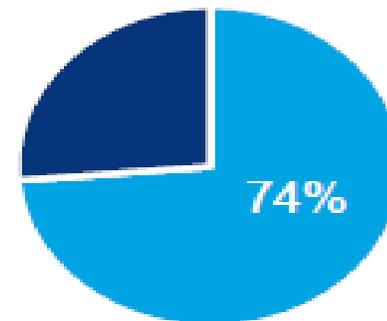
China dominant in transition equipment



Electric vehicles



Lithium-ion battery

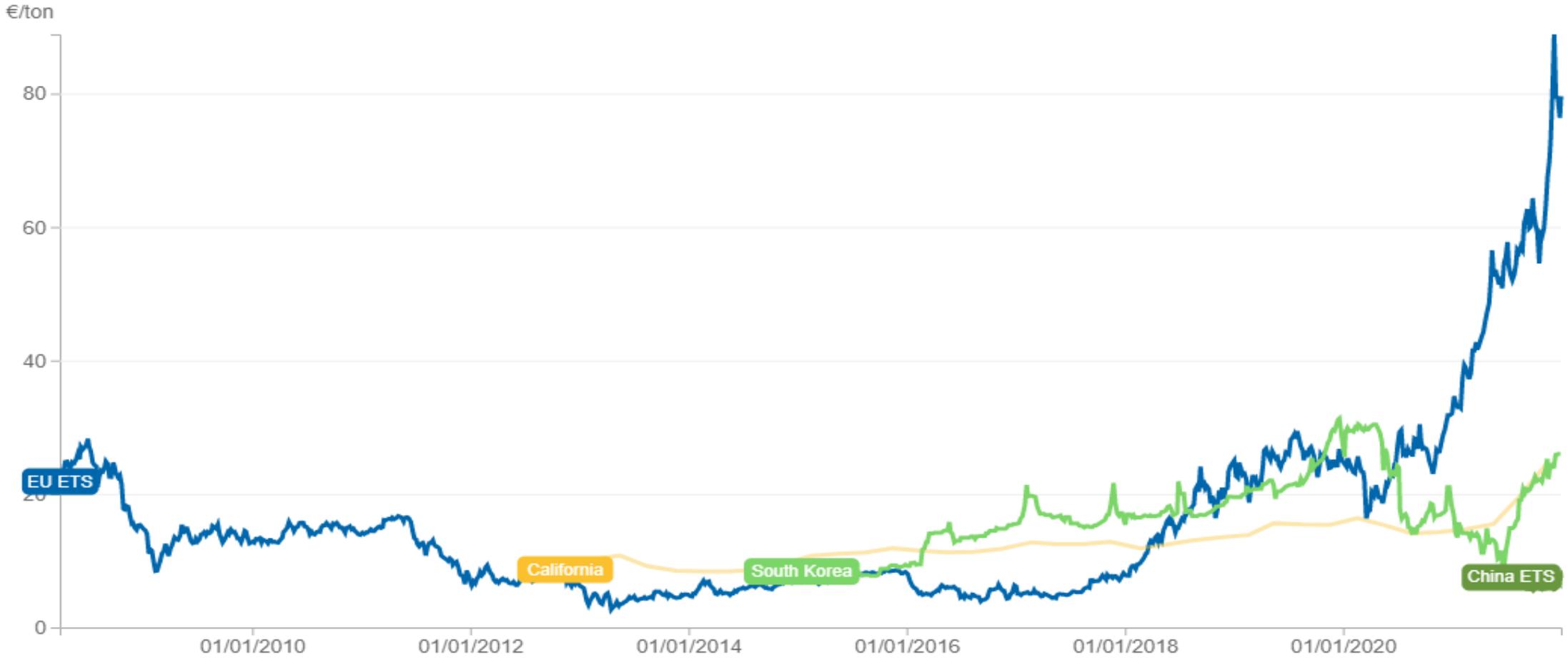


China is world's largest carbon emitter but also a centre for manufacturing renewable technologies and equipment. This dominance will partially hedge the cost of decarbonising the economy

CO₂ Prices a Record 100 Euros/ton in the EU-ETS



 ICAP Allowance Price Explorer



Sustainability and Energy Transition in 5 Episodes

**Episode 3: Mid and Long-Term Energy
Perspectives**

The IEA's World Energy Outlook Scenarios



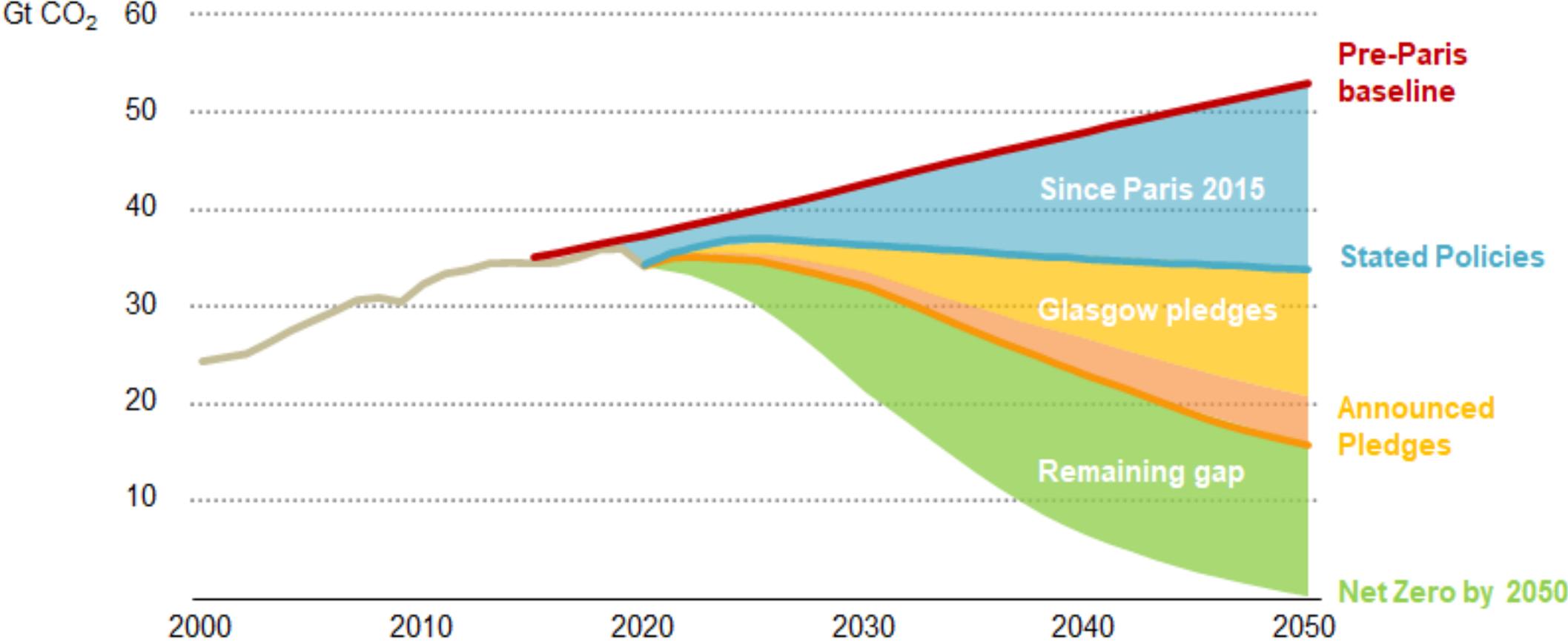
The **Stated Policies Scenario, or STEPS**: considers only specific policy initiatives that have already been announced.

The **Announced Pledges Scenario (APS)** takes account of all of the climate commitments made by governments around the world, including Nationally Determined Contributions

The **Sustainable Development Scenario (SDS)** charts a path fully aligned with the Paris Agreement by holding the rise in global temperatures to “well below 2°C ... and pursuing efforts to limit [it] to 1.5°C”, and meets objectives related to universal energy access and cleaner air.

The **Net Zero Emissions by 2050** is in line with the pathways used by the Intergovernmental Panel on Climate Change for the Special Report on Global Warming of 1.5 °C (IPCC SR1.5)

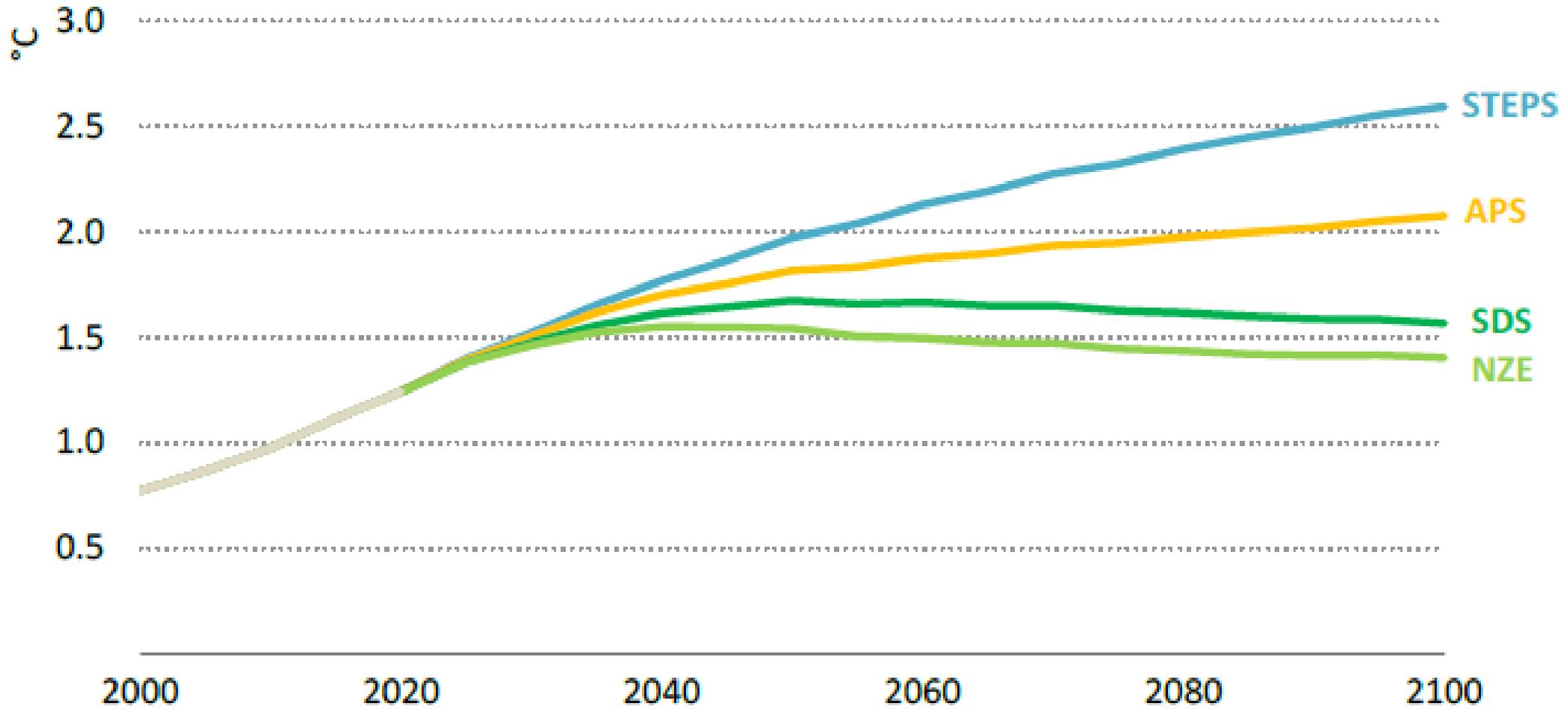
CO2 Emissions Trajectories for Different IEA Scenarios



For the first time, today's pledges – if implemented on time and in full – would keep the rise in global average temperatures in 2100 to below 2°C, but there's still a large gap to 1.5°C

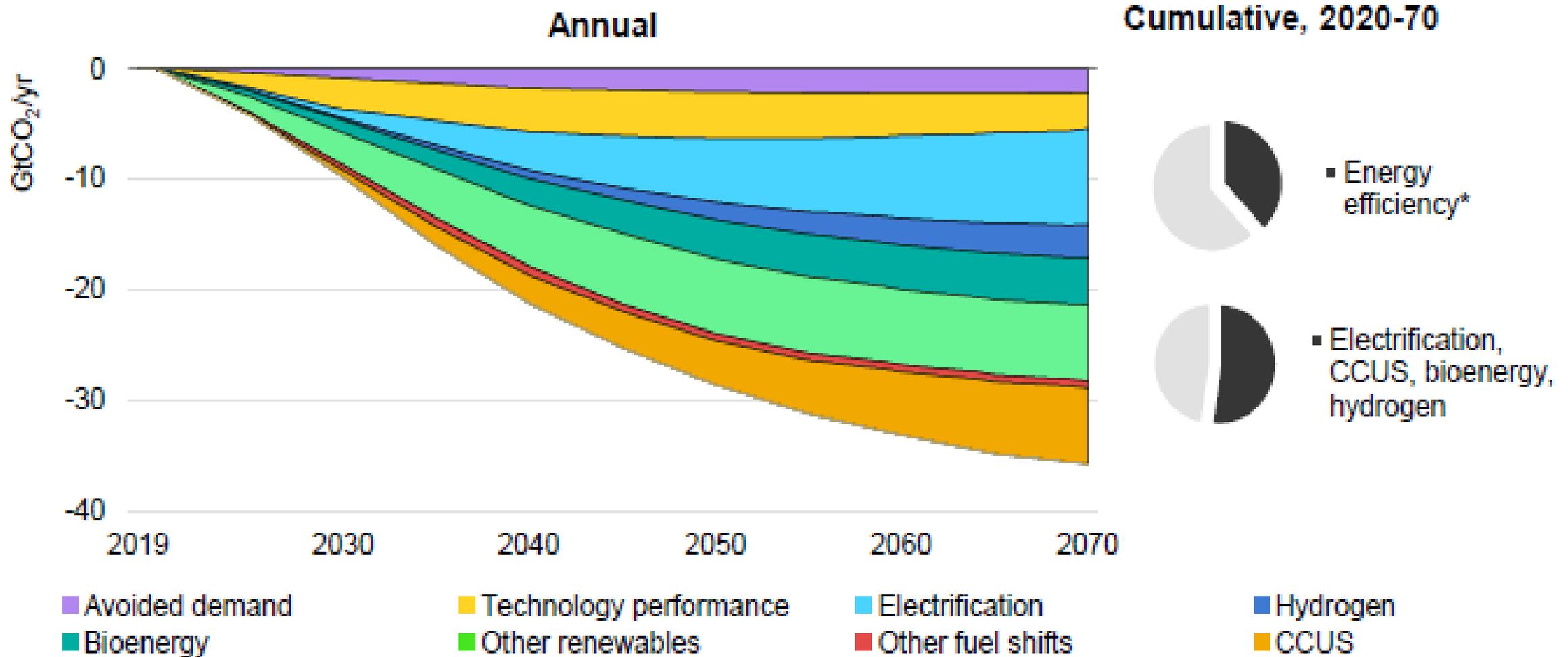
Source: T. Gould (2022)

Projected Impact on Temperature Rise

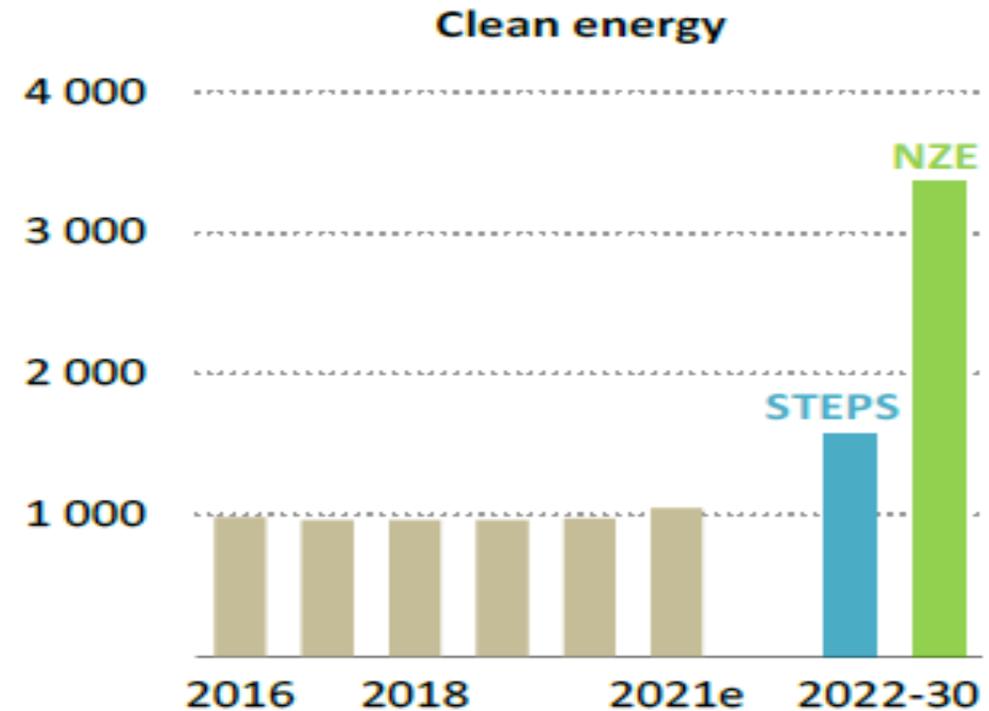
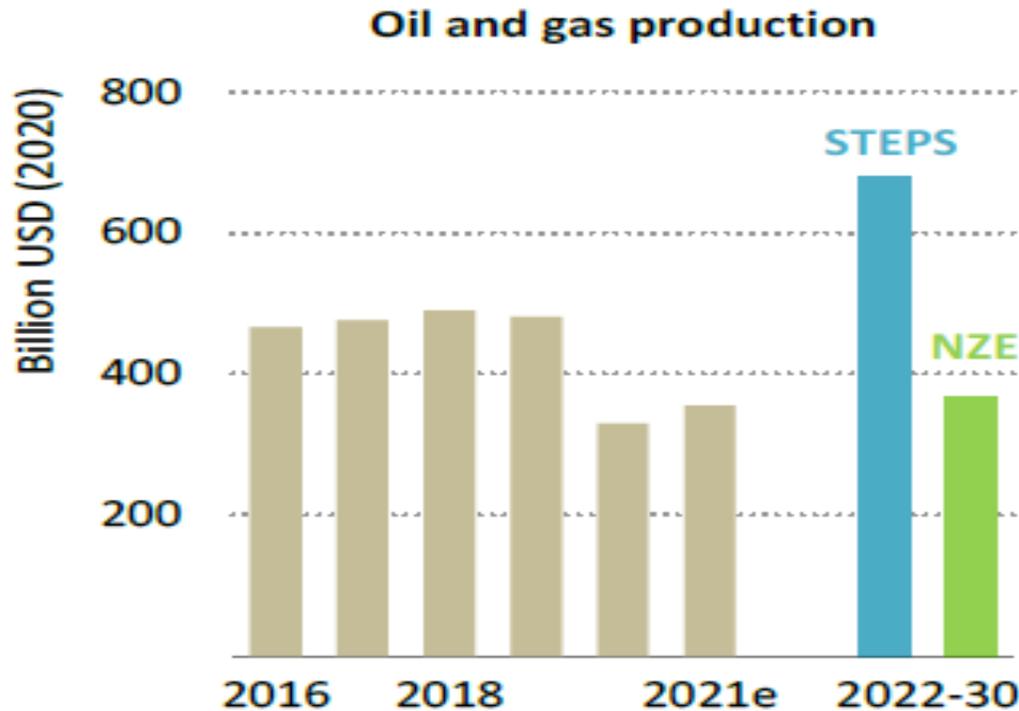


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Decarbonization Requires CO₂ Capture & Storage, Hydrogen, Geothermal - Oil and Gas Skills



Does Net Zero Emissions Imply Lower Investments ?



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Mike Wirth (Chevron CEO): Looking out for a few years if the global economy continues to grow and recover post COVID, is there sufficient reinvestment in the energy that runs the world today? Or are we turning so quickly to the energy that runs tomorrow that we created an issue in the short term?

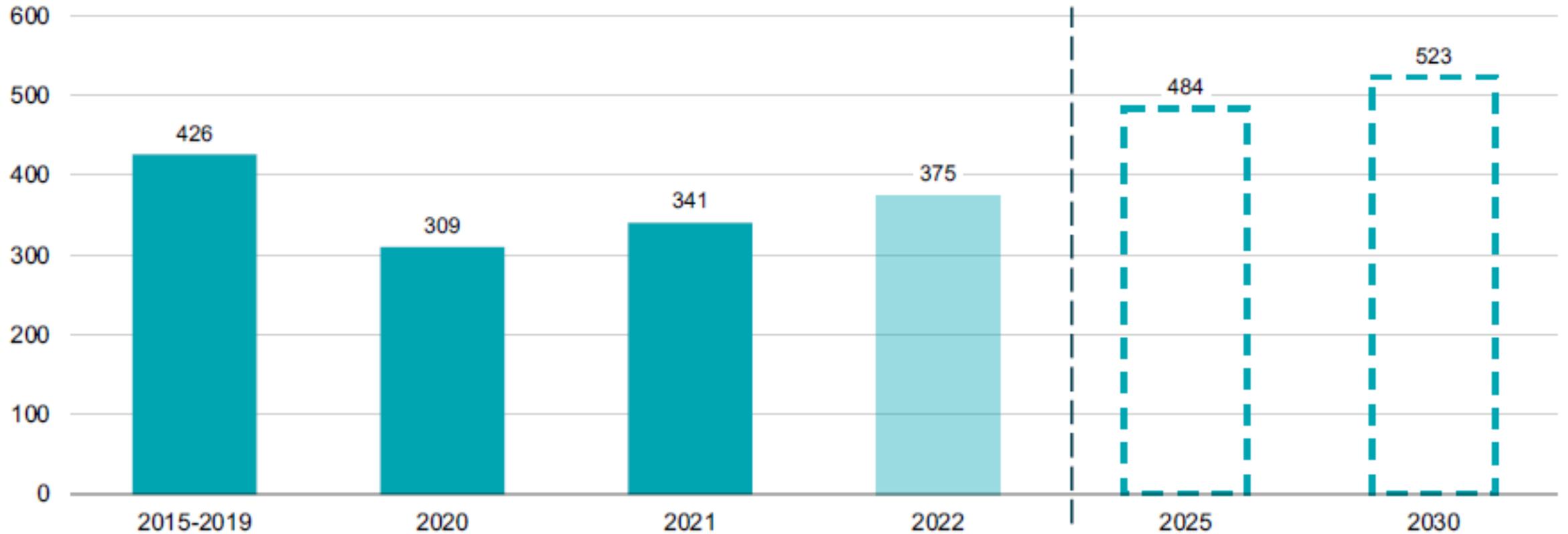
Sustainability and Energy Transition in 5 Episodes

**Episode 4: The Oil & Gas Industry and the
Energy Transition**

Is Investment in Upstream Oil & Gas Sufficient ?



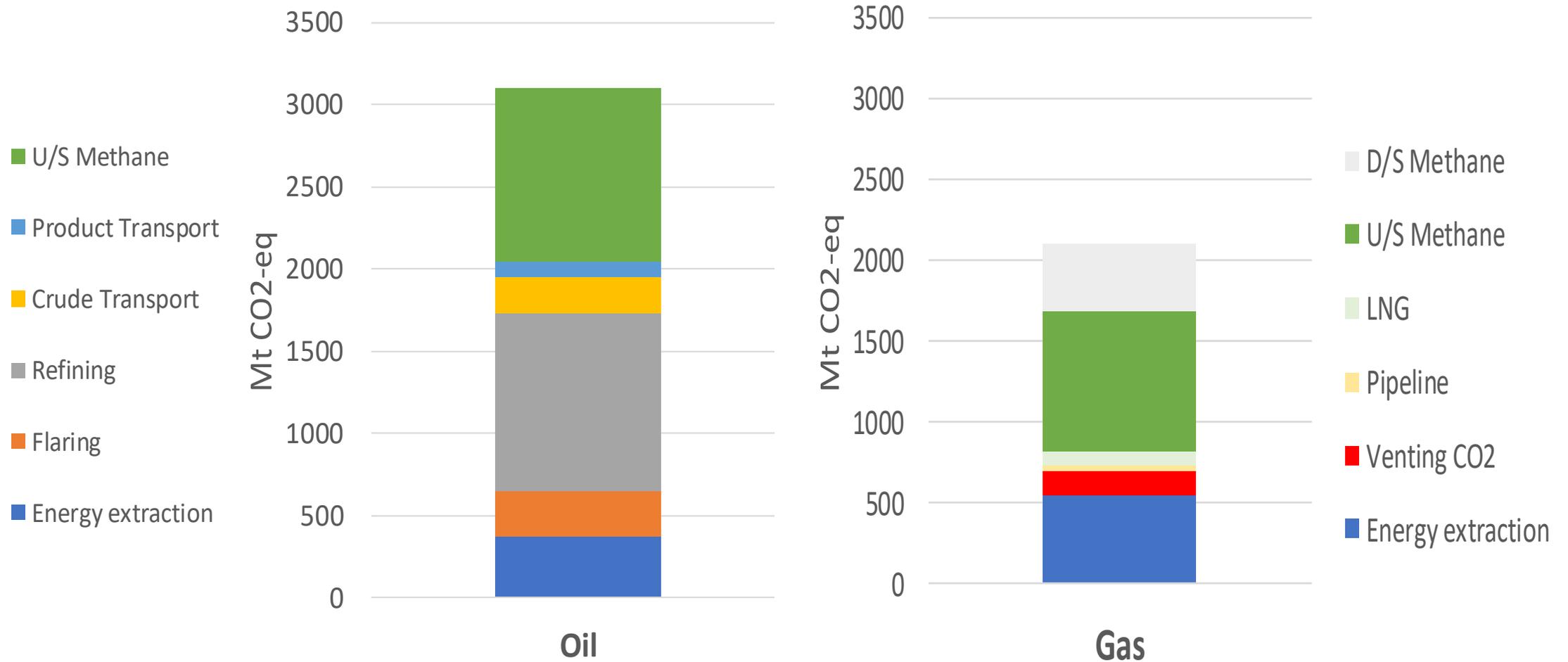
Global Upstream Oil & Gas Investment
Billion USD





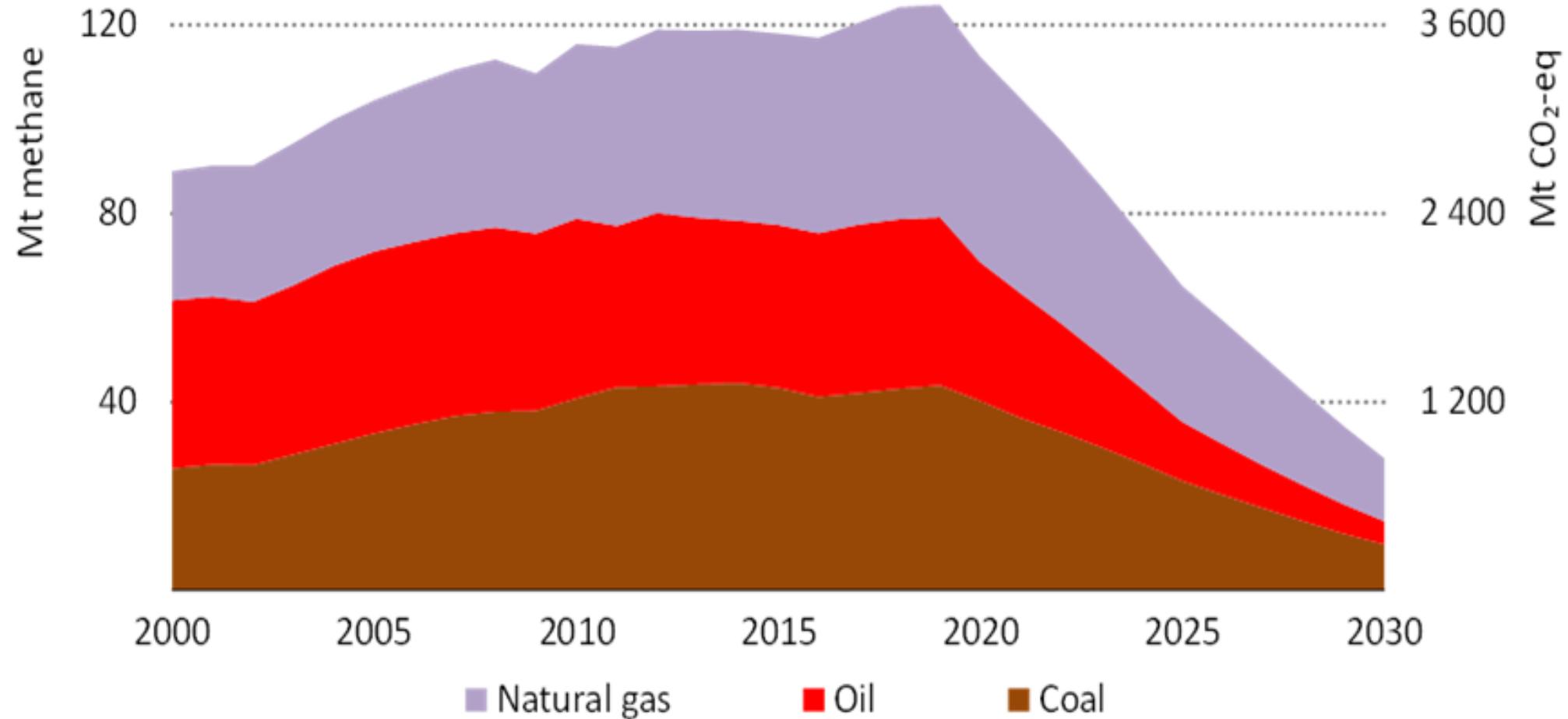
- One of the biggest challenges the world has ever faced is the transition to sustainable energy and to a sustainable economy,” Elon Musk said at ONS 2022. “That will take some decades to complete.”
- **The world must continue to extract oil and gas in order to sustain civilization, while also developing sustainable sources of energy**
- Realistically I think **we need to use oil and gas in the short term, because otherwise civilization will crumble,**”

GHG Emissions for the Oil & Gas Industry



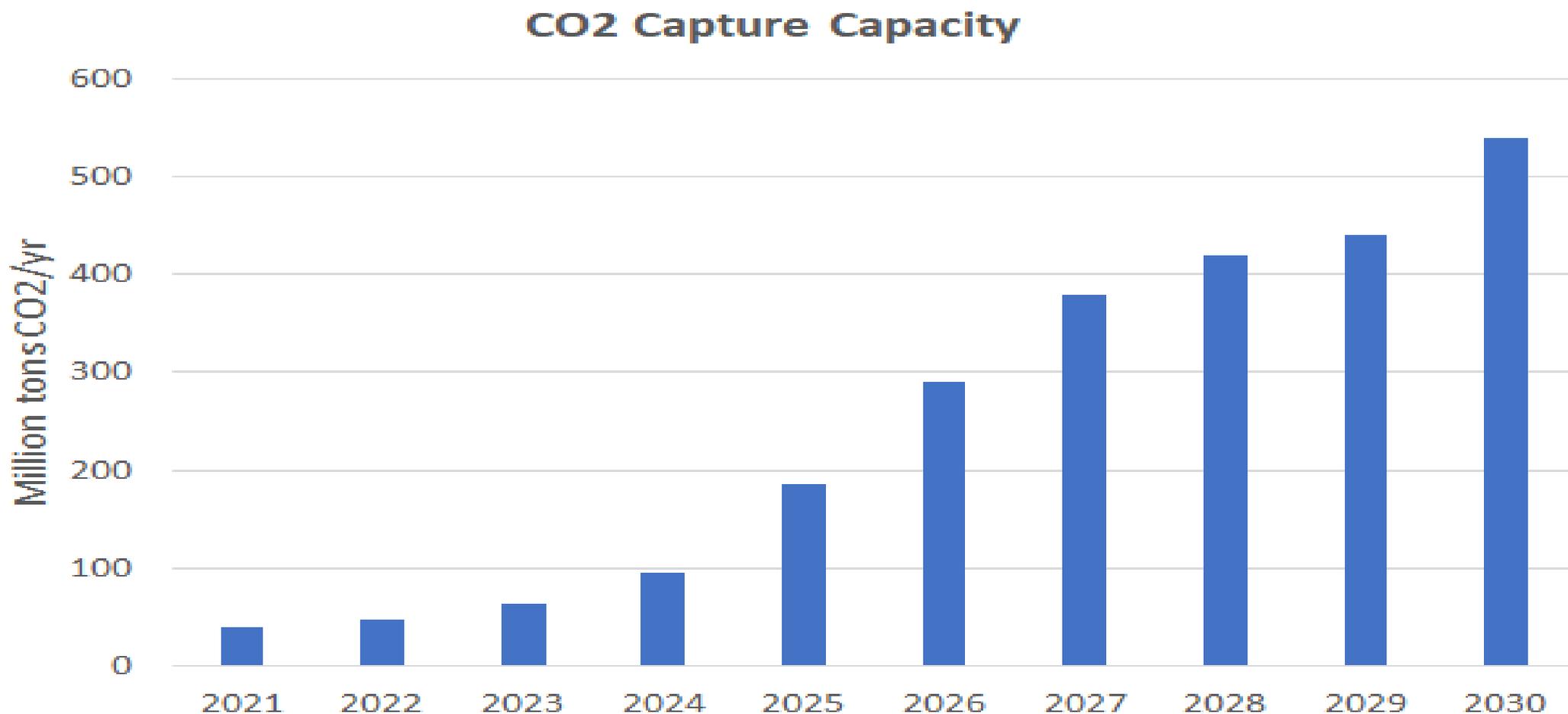
Source: IEA, NOMADIA

Methane Emissions Need to Drop Significantly by 2030



Source: IEA,(2021)

CO2 Capture Significantly Expand by 2030 Driven by US and EU, then Middle East and China



Source: Rystad,(2022)

Sustainability and Energy Transition in 5 Episodes

**Episode 5: You (the Energy Professional) and
the Energy Transition**

Skills for the Future Petrotechnical Careers



PE Core Skills and Knowledge

- STEM
- Geology & Geophysics
- Fluid Mechanics
- Drilling, completions & subsea engineering
- Economics
- Project & Risk management
- Managing complexity
- Health, Safety & Environment

New Skills & Knowledge

- Global energy systems
- CCUS & geosequestration
- Renewable
- Energy efficiency
- Hydrogen (#colors)
- Power cogen & mix
- Electrification, grid mngt
- CSR, ESG
- AI & Data Analytics

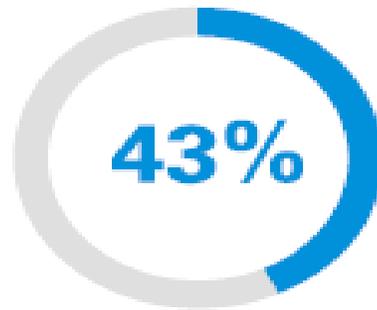
Soft Skills & Knowledge

- Communication
- Multidisciplinary / Remote Teamwork
- Integration of Solutions
- Resilience, adaptability

Source: Hamp, Ben-Naceur

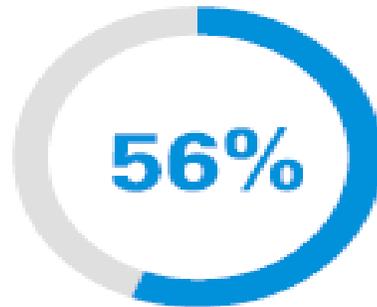
Petroleum Engineering has always been an unusual mix of topics. That mix will continue to change to meet current and future needs (R. Hamp – 2021)

The oil and gas workforce of the future¹



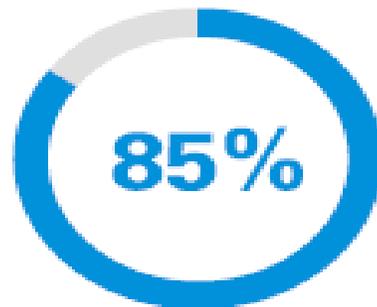
43%

of current energy workers want to leave the industry altogether within the next five years



56%

of those currently working in oil and gas said they'd consider jobs with renewables organizations



85%

of university students considering a career in the oil and gas industry said it is important that their future employer has policies aimed at addressing climate change and environmental factors⁵

¹ Brunei International/Oil and Gas Job Search, Energy outlook Report 2021–2022.



Energy executives have noted that their companies lack employees with skills needed for the successful delivery of their decarbonization strategy, including

technical/engineering



18%

carbon markets expertise



17%

or policy, regulation, or government relations expertise



16%¹

¹ Eversheds Sutherland/KPMG, Climate change and the people factor (2021).

SPE Initiatives Related to New Opportunities



SPE Sustainable Development Tech Section

- Over 1,000 members
- Generate proposals for the Board to direct resources to address identified needs and opportunities
- Fully participate in global sustainability discussions as an enthusiastic participant and contributor

SPE CCUS Tech Section

- Establishment of a Storage Resources Management System
- Carbon Management Project: Joint project with the UEF Societies to bring together their combined engineering expertise to identify practical steps toward managing greenhouse gas emissions

SPE Geothermal Tech Section (2021)

SPE Methane Emissions Tech Section (2022)

SPE Hydrogen Technical Section (2022)

SPE Sustainability Initiatives

SPE Diversity & Inclusion Committee (2020)

- Vision: to advance the society's commitment to **diversity and inclusion** within the oil and gas community through advocacy, collaboration, and education.

SPE BML Committee

- Venues for professional growth in addition to technical development opportunities.
- It is also charged with identifying gaps between the nontechnical skills that members need for their careers

Summary of the 5 Episodes



- Current levels of energy investment have been severely impacted by two consecutive downcycles
- A 20% recovery in oil and gas investment in 2022 is good news, but it is insufficient to balance markets
- The world needs access to secure, affordable, and clean energy
- Reduction of GHG emissions and flaring is critical
- (Accelerating) Energy transition will require a large share of oil and gas in the primary mix for the coming decades
- Petroleum engineering skills will include peripheral areas
- SPE will be there to support you in traditional oil and gas, as well as emerging disciplines

Asking the right questions about Net-Zero

- We need to frame questions in ways that do not separate the technical, causal, and instrumental aspects from values and local environment concerns.
- Instead of asking “How do we get to Net Zero by 2050”, we should ask “how should we get to Net-Zero, preserve a healthy environment, and conserve biodiversity, while also ensuring that **our solutions are fair to all affected communities, and that they account for pre-existing patterns of injustice**”

Helene Landemore – Professor of Political Science – Yale University



The Energy Transition and Sustainability Pathways to Net Zero



**SPE Gulf Coast Section
September 8th, 2022
Kamel Ben Naceur
2022 SPE President**



SPE Strategic Planning Project



- The SPE Board of Directors and leadership are undertaking the reviewing and updating of the SPE Strategic Plan that was developed in 2017/2018
- Periodical exercise to define goals to better meet member expectations and industry needs over the next 3 to 5 years
- 4 Elements of 2018 Strategic Plan
 - Life-long learning
 - Knowledge transfer
 - Membership
 - Professional pride

www.spe.org/strategicplanning

SPE Strategic Planning Project



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- Periodical exercise to define goals to better meet member expectations and industry needs over the next 3 to 5 years
- There are four stages:
 - data collection and research
 - strategic visioning
 - strategy development
 - implementation and action planning

www.spe.org/strategicplanning



Data Collection and Research

- One-on-one virtual interviews with: SPE Foundation Board of Trustees, SPE Committees members, Industry members/key sponsors, academia or higher education, and SPE section leaders or members
- Focus groups with members including past presidents, advisory councils, YPs, and academicians
- SPE Connect General Discussion community
- Online survey with mostly open-ended questions
- Panel discussion @ ATCE in Houston **Tuesday, 4 October, 8:30 to 10:00 a.m., in Room 372 C/F at the George R. Brown Convention Center**



Strategic Visioning

The strategic visioning builds on the data obtained from members and includes virtual and in-person sessions with the SPE Board and staff

- Define the current conditions in the energy space and trends
- Identify key drivers for change for both hydrocarbons and other energy sources
- How will those potentially affect SPE and its mission to help our members continue to do their work and continue to advance in their careers?
 - Began in early June: The focus of those discussions were high-level environmental scan of current conditions, trends, assumptions about the future, key drivers of change, and implications of the key drivers.

Strategy Development

- Strategic Planning session at July Board meeting focused on Core Ideology (purpose, mission and values) and the Envisioned Future statement
- Goals, Objectives, Strategies and new Business Models development at September Board meeting

Implementation and Action Planning

- After all stages of the process are completed, a report of action plans and metrics, including performance measurements, will be written late October/early November

Scan to vote!

