

The Future of FPSOs

How can the FPSO Industry Contribute with Climate Actions in the Energy Transition

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09 November 2022

An independent assurance and risk management company

158

years

~12,000

employees

100,000

customers

100+

countries

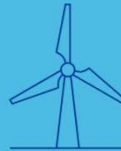
5% R&D

of annual revenue

**Ship and offshore
classification and advisory**



**Energy advisory, certification,
verification and monitoring**



**Management system
certification, supply chain and
product assurance**



Software, platforms and digital solutions



The world's leading ship and offshore classification society

Global reach

Survey stations in 67 countries and expertise in all ship and offshore segments

~11,000

ships and mobile offshore units in DNV Class

~20%

market share in Gross Tonnes of the world's classed ships and mobile offshore units

Quality

Consistently among the top ranking societies in Port State Control performance



Agenda

Background

What can be done to decarbonize FPSOs

Future use of floating production systems

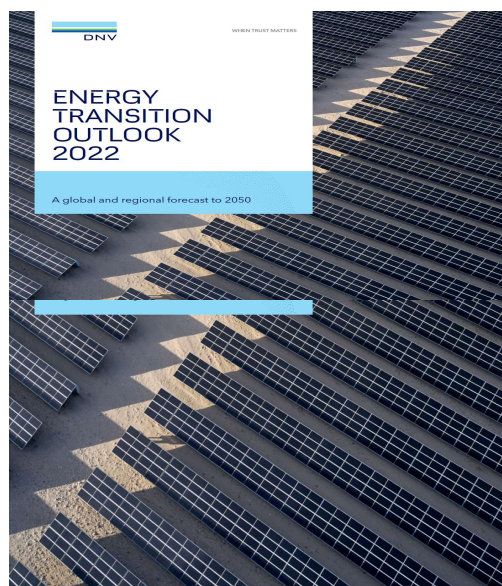
How can class societies contribute?

IPCC report: Code RED



“We need decarbonization now, across every sector in every country”

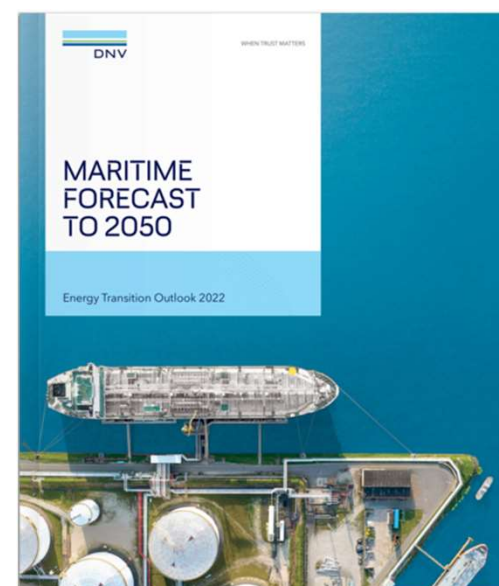
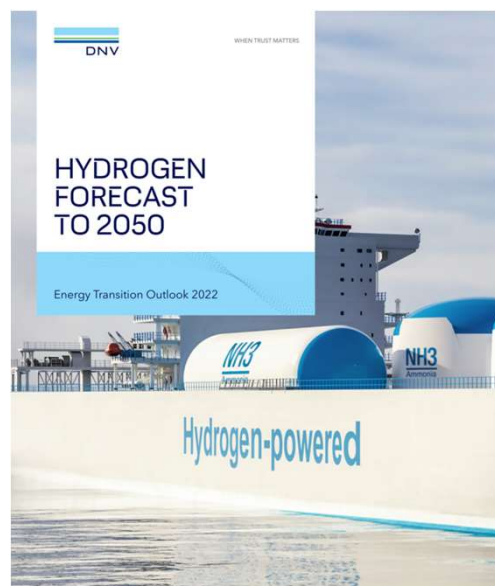
Suite of publications available on eto.dnv.com



8

PATHWAY TO NET ZERO EMISSIONS (PNZ)

8.1	Pathway to net zero emissions (PNZ)	176
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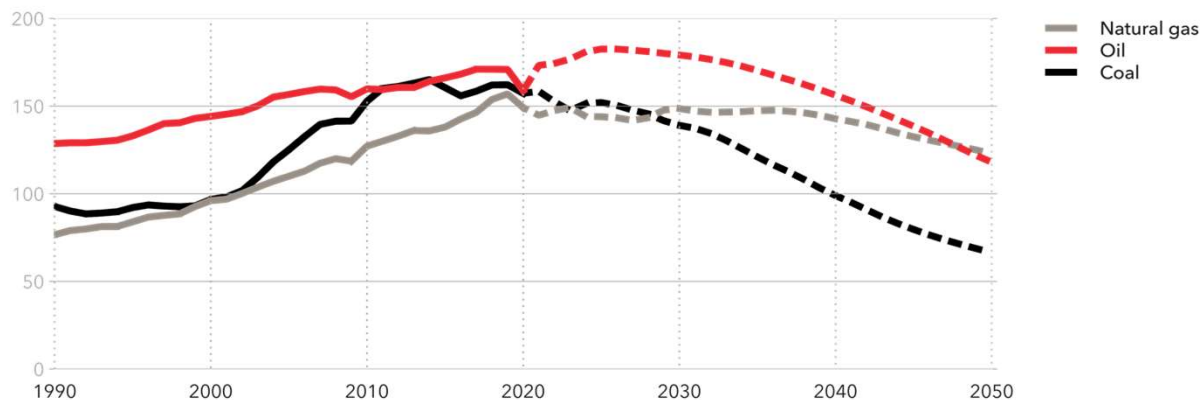


O&G in the energy mix in 2050

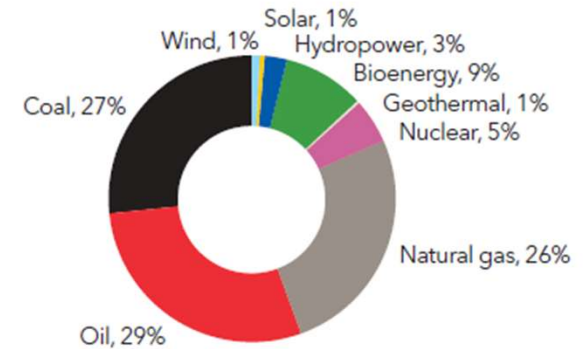
- DNV predicts that oil and gas will still play key roles in the energy mix in 2050 when their value chains will account for most energy-related emissions

World primary fossil fuel supply by source

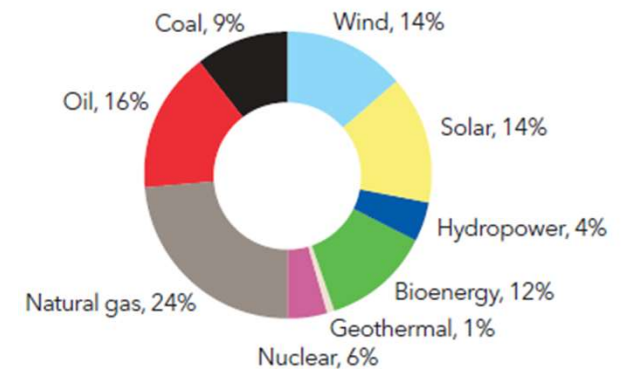
Units: EJ/yr



2019



2050





Enabling a faster transition

- The world needs to transition faster to a deeply decarbonized energy system in order to meet the Paris Agreement goals
- This requires technology and behavioural revolutions, huge innovation and investment, and advances and scaling of technology and infrastructure
- Governments and energy industries need to extend renewables to new sectors and work together to scale CCS and hydrogen
- This complexity requires understanding and expertise across the energy value chain

Why is it important to O&G upstream and FPSO industry?

- Clients/Investors are increasing ESG awareness
 - Meet expectation on climate actions and energy transition from community, customers and shareholders
- Competence and ability to attract and retain people
- Remain relevant as an industry and ensure economical feasibility of projects
 - Securing access to finance as capital markets favor lower emission projects.

The industry needs to prepare for an energy system that does not accept the release of carbon emissions



The Oil Majors: Energy Companies and the Transition to Decarbonization



The Oil and Gas Climate Initiative (OGCI), is an international industry-led organization which includes 12 member companies from the oil and gas industry: BP, Chevron, CNPC, Eni, Equinor, ExxonMobil, Occidental, Petrobras, Repsol, Saudi Aramco, Shell and Total represent over "30% of global operated oil and gas production." It was established in 2014 and has a mandate to work together to "accelerate the reduction of greenhouse gas emissions" in full support of the Paris Agreement and its aims."

Taking Some of Those in Brasil...

From PBR's Climate Change Supplement



1. Zero growth of absolute operational emissions until 2025.



2. Zero routine flaring by 2030, according to initiative *Zero Routine Flaring* of the World Bank.



3. Reinjection of ~40 MM ton CO₂ by 2025 in CCUS projects (*Carbon Capture, Use and Storage*).



4. 32% reduction in carbon intensity in the E&P segment by 2025, reaching 15 kgCO₂e/boe.



5. 30%-50% reduction in methane emission intensity in the E&P segment by 2025.



6. 16% reduction in carbon intensity in the refining segment by 2025, reaching 36 kgCO₂e/boe.

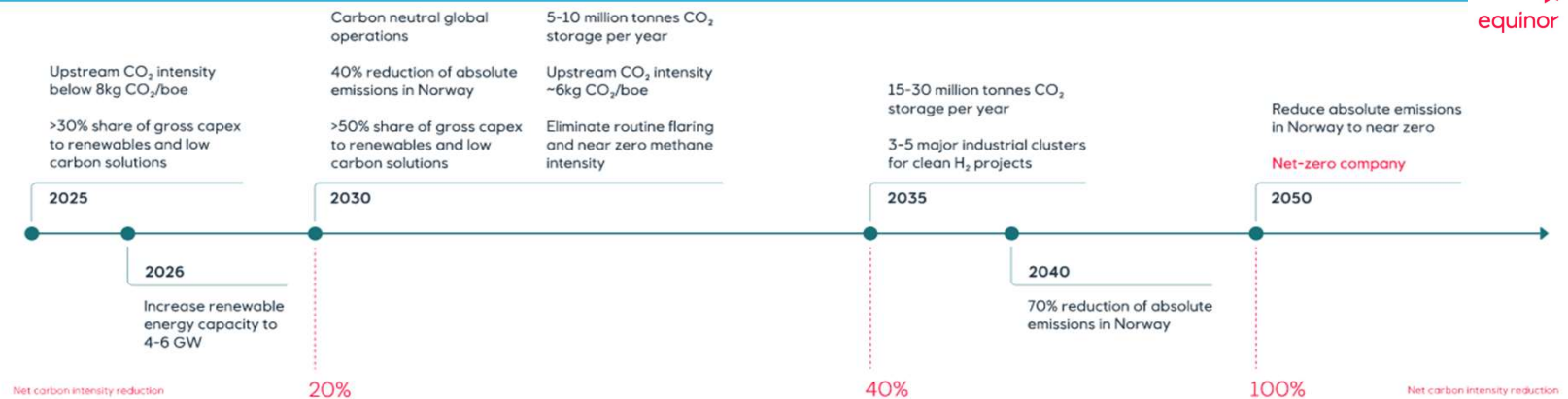
Shell's Climate Target



Shell's target is to become a net-zero emissions energy business by 2050, in step with society's progress in achieving the goal of the UN Paris Agreement on climate change.

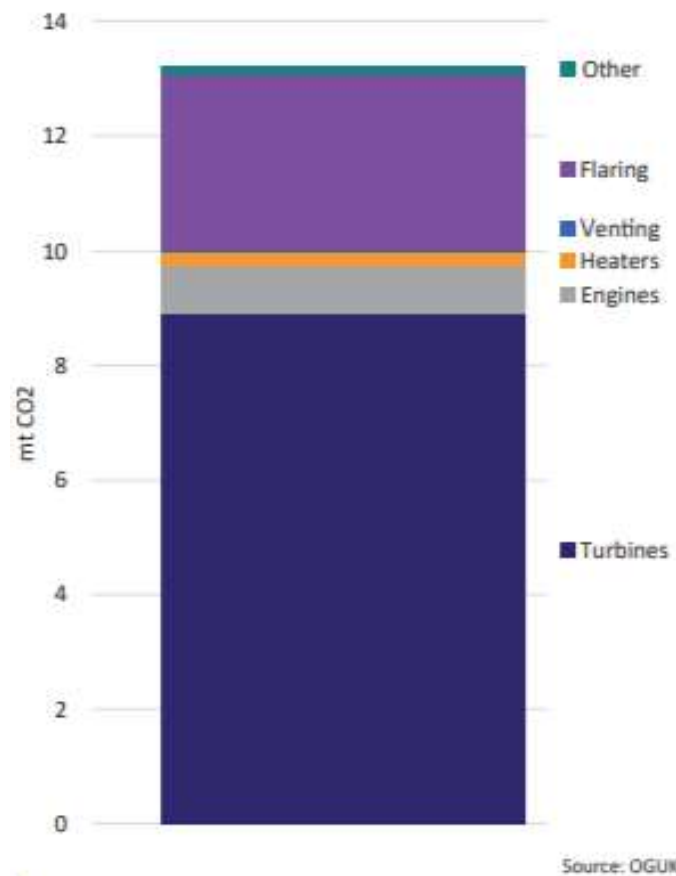
set a target to reduce absolute emissions by 50% by 2030, compared to 2016 levels¹. This covers all emissions in Scope 1, which come directly from our operations, and in Scope 2, from the energy we buy to run our operations.²

EQUINOR's Climate Ambitions



Decarbonizing FPSOs

GHG emissions from FPSOs - overview



CO₂ from power generation and flaring

Power or heat generation from turbines, engines and heaters

Methane emissions from process

Leaks and venting from the process plant

VOC – Methane and Non methane volatile organic compounds

Organic compounds from tanks and vents

Potential Abatement Measures

Reduction of CO₂ emissions

- Reduce energy demand
- Increase energy efficiency (combined cycle)
- Reduce emissions from power/heat production (hybrid/alternative fuels)
- Reduce flaring scenarios
- Reduce flare gas volumes

Do not Emit CO₂ produced

- Capture any CO₂ produced
- Store/dispose of captured CO₂
 - Inject
 - Pipeline
 - Offload

Reduction of Methane emissions

- Minimise process venting
- Selection of equipment to minimize leaks
- Improve leak detection
- Apply preventive maintenance
- Minimize methane slip in flaring

Reduction of Storage Tank emissions

- VOC recovery systems
- Increase reliability to avoid shutdowns
- Optimize tank inspection regime to reduce tanks inspection activities

DNV A

Contributing

Benefit for Own

- Reduced env
- Provides rec
- Provides sup
- Provides inp
- Reduce out-c

Cost saving:

- Reduced fue
- Increased ga
- Dependent o

DNV

Maritime


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MARITIME / NEWS

DNV and Altera Infrastructure pilot new Abate notation to reduce GHG emissions on offshore installations



The Petrojarl Knarr FPSO (Image care of Altera Infrastructure).

Classification society DNV has introduced the new Abate class notation, designed to assist the owners and operators of offshore floating installations to identify and implement measures to reduce greenhouse gas (GHG) emissions. Altera Infrastructure is the first FPSO owner to pilot the DNV notation on the Petrojarl Knarr FPSO, with successful results so far.

Published:
27 September 2021

Contact:
[Tomas Barrett](#)

Qualifiers(s)

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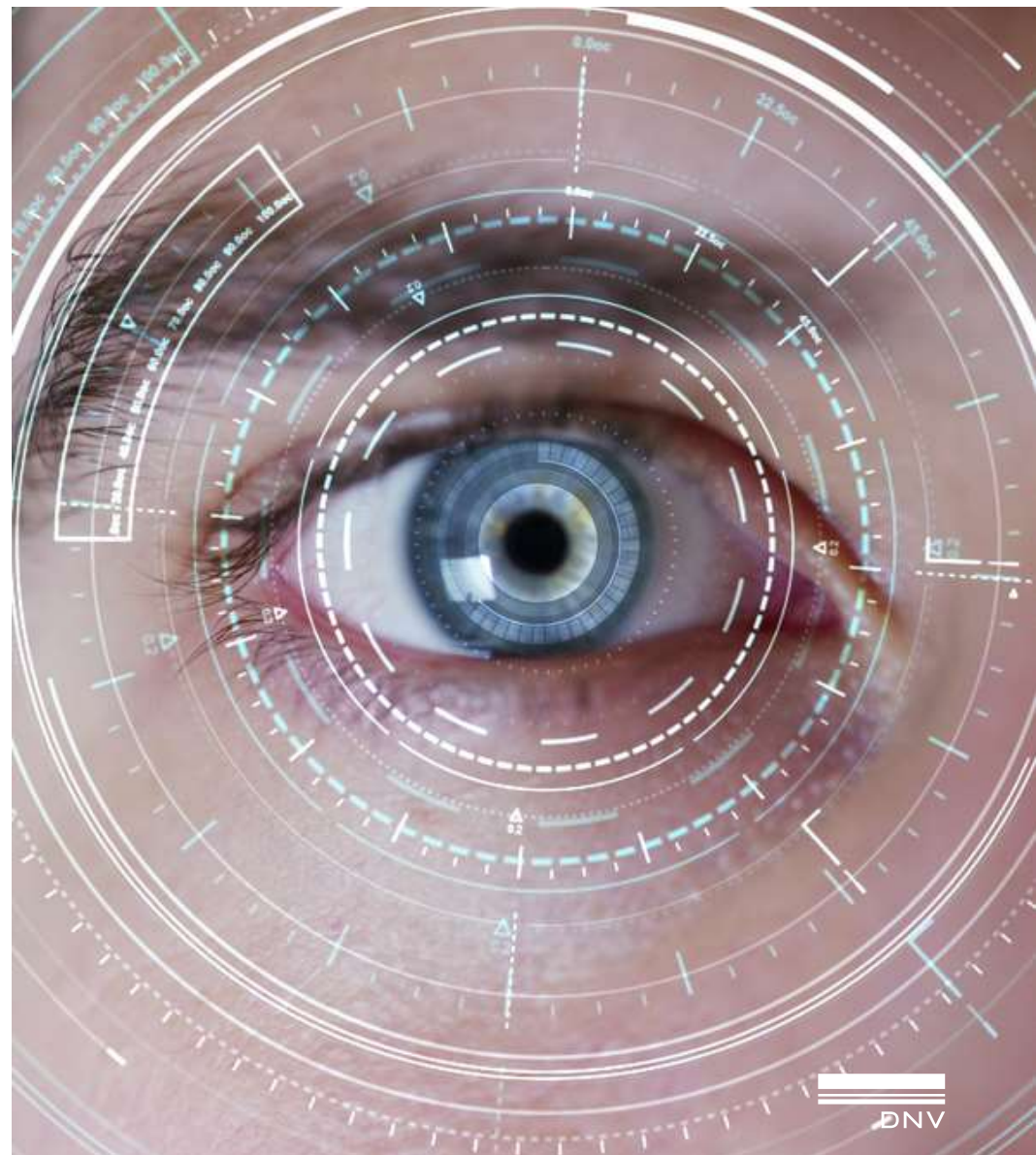
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Future technologies

- CCS of emissions from fuel used onboard offshore installations
- Electrification
 - From shore
 - From nearby renewable sources
 - Alternative fuels
 - Fuel cells
- Implement future technology
 - Prepare for implementation
 - FPSOs installed today will be around in 2050



Future use of floating production systems

Floating ammonia plant



Illustration courtesy of H2carrier

Floating ammonia plant


- DNV AiP for P2XFloater concept (H2 Carrier)
- Production of environmentally friendly ammonia, supplied by renewable energy (wind farm and/or other)



Contributions from class societies

How can class contribute?

- Develop standards
- Assurance of technologies
- Assurance of data/reported reductions



DNV

RECOMMENDED PRACTICE

DNV-RP-F302

Edition September 2019
Amended October 2021

Offshore leak detection

DNV-RP-J201
Qualification procedures for carbon dioxide capture technology

DNV-RP-F104
Design and operation of carbon dioxide pipelines

DNV-RP-J203
Geological storage of carbon dioxide

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DNV AS

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DNV Can Support on...

Strategy	Newbuilding	Operations
Establish GHG performance targets	Select Abatement Technologies	Monitor, visualize and report GHG ratings
Map and improve GHG performance – develop FPSO specific roadmaps	Select Fuel and optimize Power and Heat generation	Energy Management
FPSO specific GHG dashboard	Electrification /Hybrid Solutions: LNG + Offshore Wind / Offshore Solar	Retrofit Options

Summing up



Oil and gas still needed, but sector needs to prepare for energy system without carbon emissions

<1% capex invested in low-carbon businesses

Our ETO results can help guide investment strategies

Delivering decarbonization

Oil and gas companies will need to adapt to play their role in delivering the decarbonized energy systems of the future

Hydrogen & CCS catalysts after 2035

Potential to transform the oil and gas industry into the decarbonizer of hydrocarbons

Conclusive remarks

O&G will play a key role also in 2050

- Addressing CO2 emissions is key
- Every tonne counts

Technology

- Some technology does exist today
- Prepare for implementation of future technology

Competence

- FPSO industry competence will be needed

Complex problems

- The entire FPSO industry need to join forces

Collaboration is the fuel of the future!

WHEN TRUST MATTERS

Thank you

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