

# ABS View: Low Emission FPSOs

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Stergios Stamopoulos | November 9, 2022

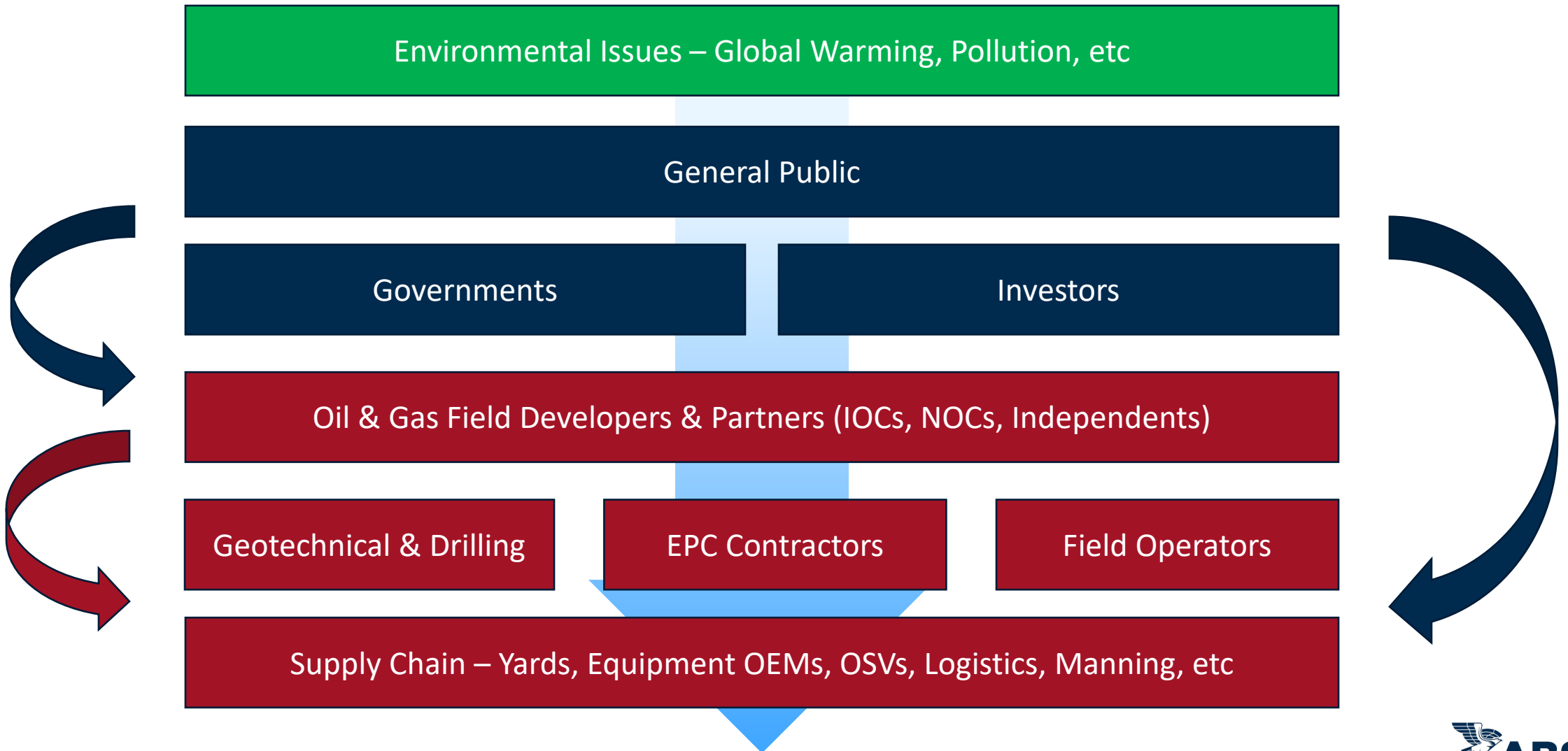


# SUSTAINABILITY CENTERS



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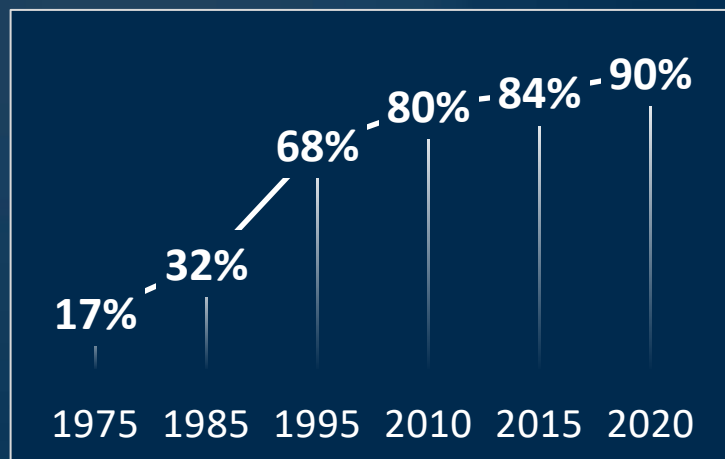
# The Big Picture – Offshore Decarbonization



# The Drivers

- Social Responsibility
- Regulatory Requirements
- Short- & Long-Term Value Creation

## Shift of Market Value towards Intangibles



Source: Ocean Tomo, IAMV Study 2020

- Reputation
- Branding
- Intellectual Property
- Health and Safety
- Social License
- Governance
- Human Factors
- etc.

## Addressing SDGs related to FPSOs



### Environmental Excellence



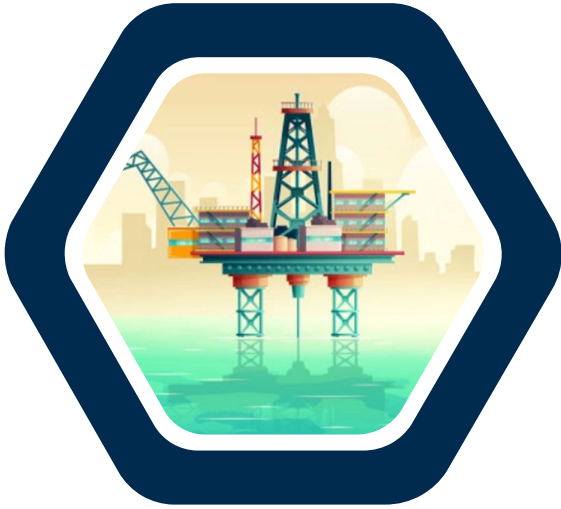
### Social Responsibility



### Governance – Operational Excellence



# Why does it matter to the offshore sector?



## Disclosure requirements

Large integrated oil majors under tremendous pressure to disclose their material ESG topics, including supply chain impacts



## New project-bid requirements

Project tender evaluation criteria now carry additional weightages for ESG performance

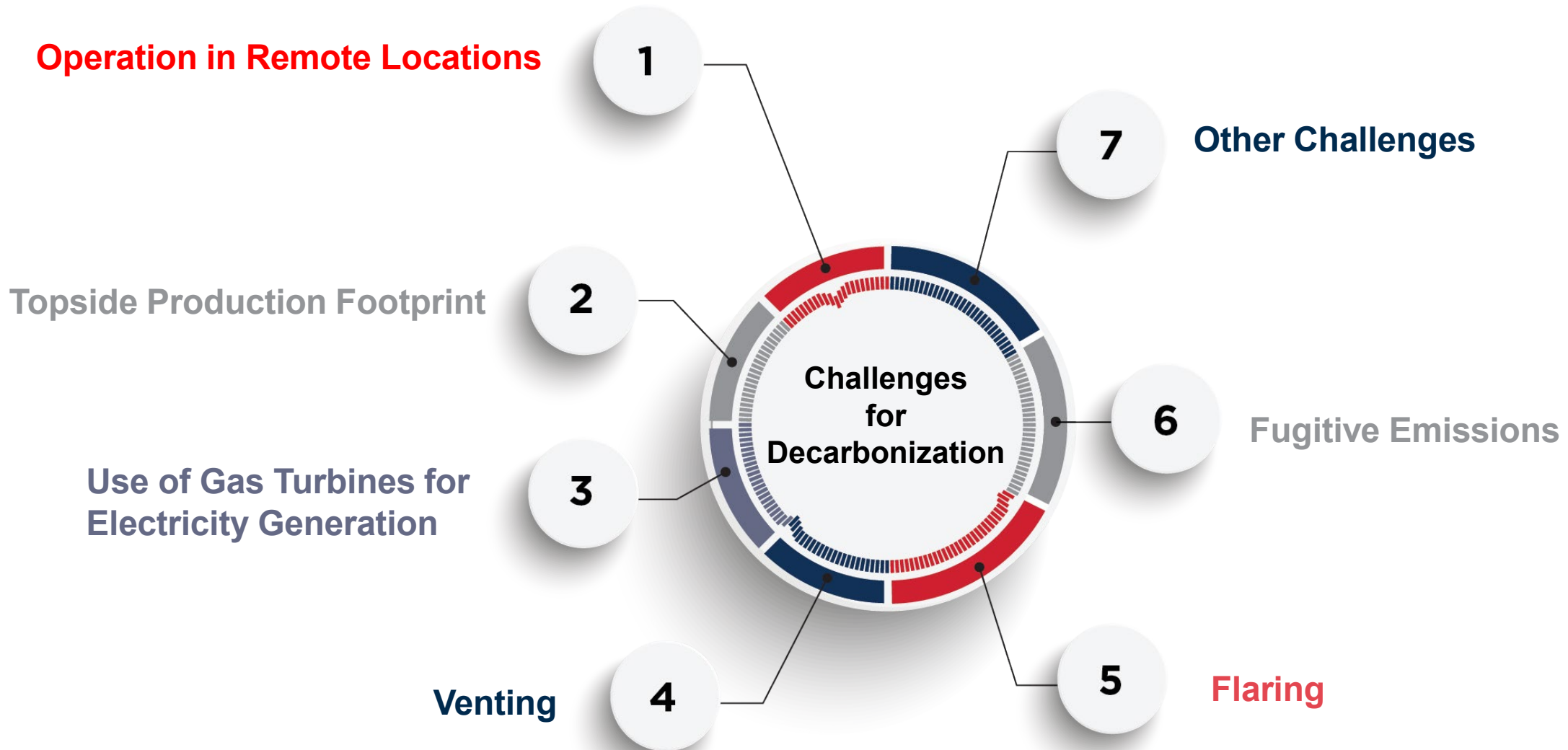


## Changing stakeholder preferences

Stakeholders are more interested in metrics, targets and overall ESG strategy



# Current Challenges



# How do we get to lower emissions?

- Gas turbine replacement
- Venting and fugitive emissions
- Flaring reduction methods
  - Improved maintenance programs
  - Gas reinjection
  - Equipment upgrades
  - Gas capture and export
  - Flare combustion efficiency
  - Gas Lift
- Carbon capture
- Reinjection

Source	Emission Type
Production Storing	Methane, Hydrocarbons
Gas Turbine	CO <sub>2</sub> , Methane NOx, SOx
Internal Combustion Engine	CO <sub>2</sub> , Methane NOx, SOx
Boiler, Water Heater	CO <sub>2</sub> , Methane NOx, SOx
Flare	CO <sub>2</sub> , Methane, Hydrocarbon, NOx, SOx
Chemicals	Volatile Organic Compounds
Fugitive Emissions	Methane, Hydrocarbons

# Gas Turbine Replacement

- Gas turbines have high emissions due to their low energy conversion efficiencies which range between 20-35 %.
- An alternative to gas turbines should be considered to reduce these emissions.
  - Electric motors sourced with renewable energy
  - Alternatively, the facility could convert to full electrification with the use of shore energy.

Though these technologies are at their infant stages of implementation and feasibility, they should be considered as a method of emissions reduction.



# Venting and Fugitive Emissions

- **Venting** can occur intentionally when inert gas that is mixed with VOCs is released, or unintentionally due to leakage.
  - Inert gas, in this context, is any gas that does not support combustion and is used to fill the void in cargo or other tanks.
  - Tank vapor recovery should be considered to minimize the release of GHGs and other pollutants. The latest development is utilizing associated gas (hydrocarbon gas) to fill the cargo tanks.
- From a design standpoint, the following should be considered to minimize unintentional leakages.
  - Improve the type and/or strength of the mooring/station keeping system
  - Improve the strength of the hull to minimize repairs and prevent leaks due to fatigue cracks or deck damage.
- Maintaining the equipment and piping along with these design considerations will also minimize **fugitive emissions** by reducing the potential for leaks and limiting start-up and shut-down operations.

# Flare Reduction Methods

- Improved Maintenance Programs
- Gas Reinjection
- Equipment Upgrades
- Gas Capture and Export
- Flare Combustion Efficiency
- Gas Lift



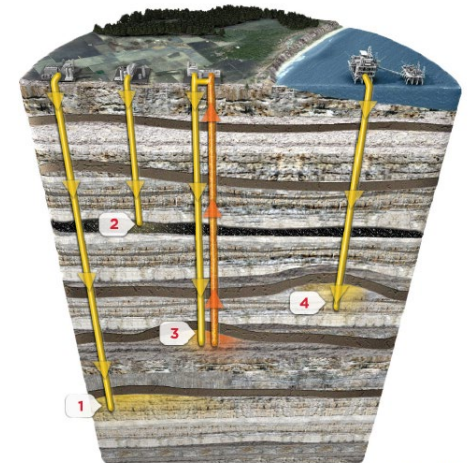
# Carbon Capture / Reinjection

- A post-combustion carbon capture system would be most attractive as it requires minimal retrofitting.
- Proposed concepts use amine-based solvents, such as MEA, of varying concentrations.
- Gas reinjection is accomplished by pumping natural gas or CO<sub>2</sub> into natural porous rock formations such as depleted oil or gas reservoirs, coal beds, or saline aquifers.
- This can be a method for enhanced oil recovery (EOR) to stimulate the reservoir for additional returns or a method of disposal for the natural gas or CO<sub>2</sub>.



## STORAGE OVERVIEW SITE OPTIONS

- 1 Saline formations
- 2 Injection into deep unmineable coal seams or ECBM
- 3 Use of CO<sub>2</sub> in enhanced oil recovery
- 4 Depleted oil and gas reservoirs

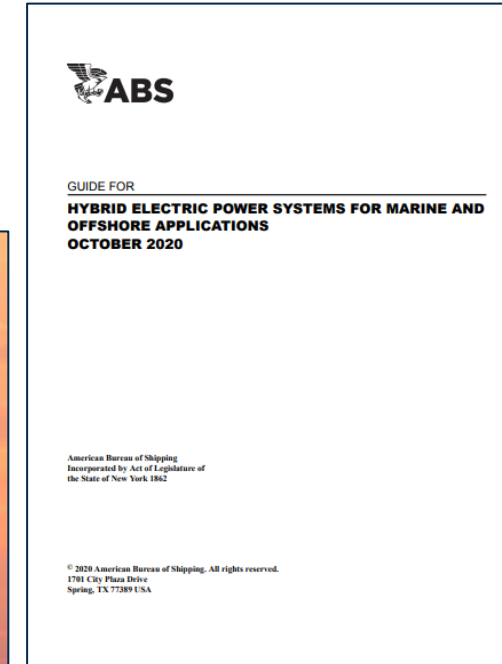
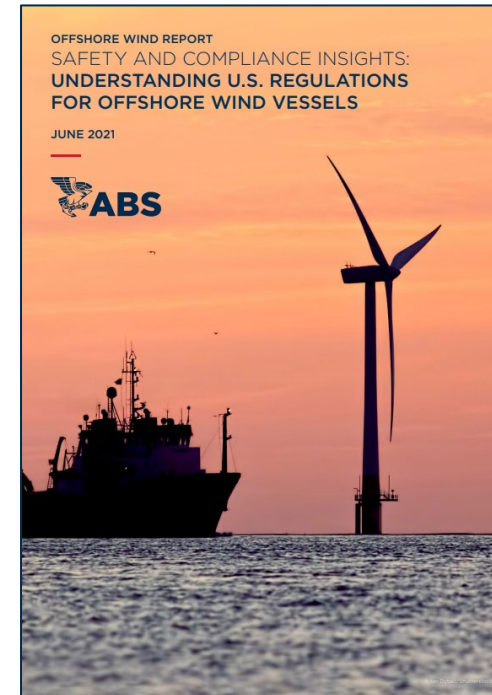
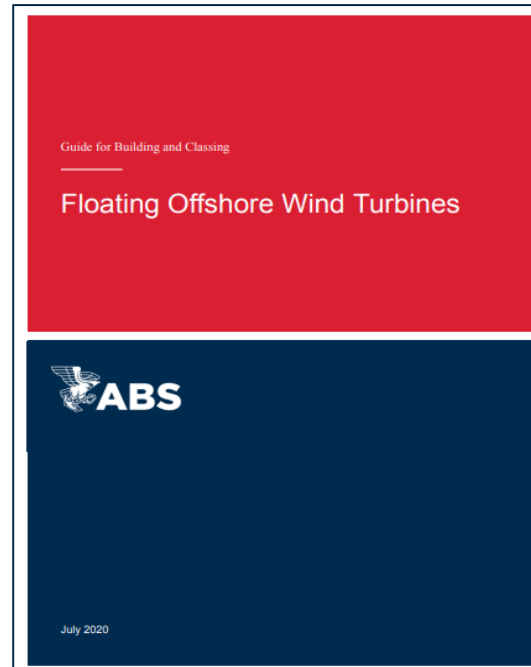


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# Low Carbon Power

- Cogeneration
- Electrification
  - Power from shore
- Alternative energy
  - Offshore wind power
  - Offshore solar energy
  - Hydrokinetics
  - Wave profile devices



# Addressing the SDG Elements

Oil and Chemical  
Pollution

Waste Streams

Effluents  
Discharge



## Considerations

- Oil and chemical pollution affecting marine environment: discharges, spills
- Waste: food, organic waste, heat waste
- Discharge: produced water, oily water, drainage, sewage

## Mitigations

- Pollution Management and Emergency Response
- Design aspects: proper tank arrangement, drainage systems, spill barriers, contingency measures
- Asset Integrity Management and Maintenance procedures, including HVAC
- Circular waste management: from source to recycling
- Process systems design to maximize waste heat recovery from heat sources

# Addressing the SDG Elements

## Air Emissions



### Pathway to Net-Zero

- Industry has been evaluating several mitigation measures
  - New technologies have been developed, or existing technology has been adapted
  - Successful implementation has some dependence on supply chain

### Combined Cycle Power Generation

- Maximizing use of waste heat to generate power, increased use of electric drivers vs. fueled drivers
- Challenges: CAPEX, footprint, weight

### Carbon Capture

- Capturing and reinjecting carbon from wellstream = known technology
- Direct source capture (post combustion): exhaust, flare
- Challenges: onboard storage, disposition other than reinjection

### Low-Carbon Fuels

- Already practiced by the industry at large
- Potential use of hydrogen or ammonia to further reduce emissions



# Addressing the SDG Elements

## Air Emissions

3 GOOD HEALTH  
AND WELL-BEING



7 AFFORDABLE AND  
CLEAN ENERGY



9 INDUSTRY, INNOVATION  
AND INFRASTRUCTURE



13 CLIMATE  
ACTION



### Electrification

Use of energy from external sources, replacing combustion engines/turbines with electric motors

- Power grid
  - Challenge: distance from shore, local infrastructure
- Field supply
  - Centralized power generation system for an oilfield, emission reduction by optimized performance
- Facilities nearby
  - Good option for smaller brownfield units. Use of surplus power generation capacity of larger facilities in the field
- Renewables – Wind power
  - Wind units supplying power to oilfield facilities
  - Total or partial electrification
  - Challenge: amount, size and location of wind turbines

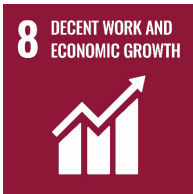
# Addressing the SDG Elements



## Human Factors

### Considerations

- Noise
- Vibration
- Ambient temperature
- Lighting
- Comfort
- Wellbeing: rest and recreation



## Ship Recycling

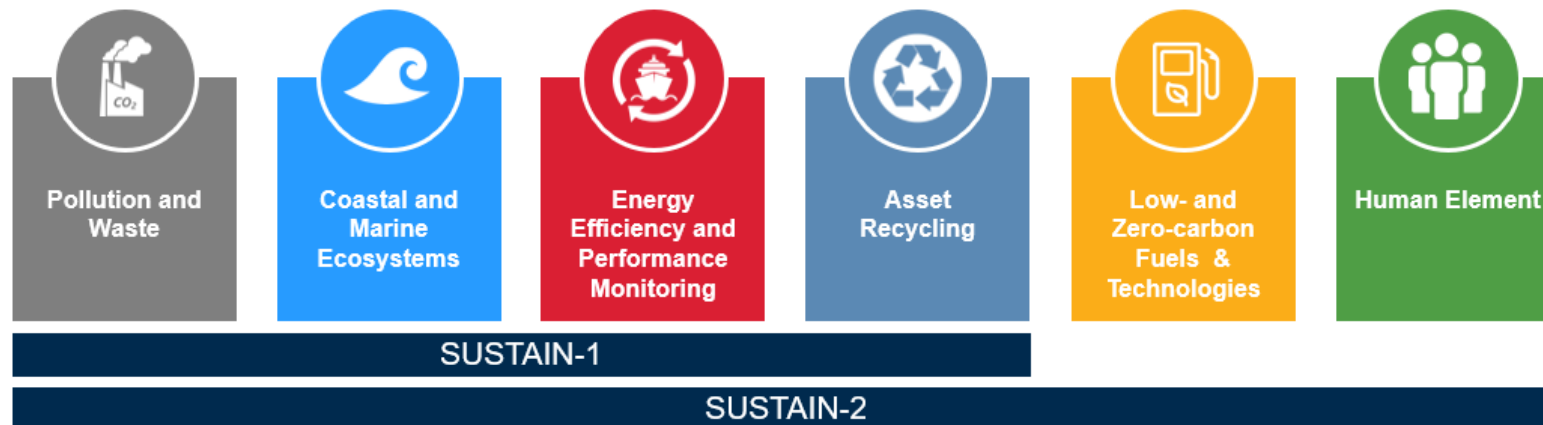
### Considerations

- Hazardous materials
- Residues: oil, chemicals, NORM
- Recycling facilities: environmental impact, human aspects



# ABS Guide for Sustainability Notations








- ABS Guide for Sustainability Notations - published December 2020 (**Revised August 2022**)
- Developed the industry's first Sustainability Class Notations:
  - SUSTAIN-1 & SUSTAIN-2
- Provides practical suggestions to improve Sustainable elements of Classed asset
- Enables link to Company and/or Project ESG Plans
- Alignment of Notations to UN Sustainable Development Goals (SDGs)
- Alignment to World Bank's IFC's EHS Guidelines



ITEM	TOPIC	SDG	SUSTAIN-1 (2020)	SUSTAIN-2 (2020)
1	Oil and Chemical Pollution	14 (Life Below Water), 3 (Good Health and Well-being)	✓	✓
2	Waste Streams	12 (Responsible Consumption and Production), 14 (Life Below Water)	✓	✓
3	Coastal and Marine Ecosystems	14 (Life Below Water)	✓	✓
4	Air Emissions	7 (Affordable and Clean Energy), 13 (Climate Action), 3 (Good Health and Well-being)	✓	✓
5	Efficiency and Performance Monitoring	7 (Affordable and Clean Energy), 9 (Industry, Innovation and Infrastructure), 13 (Climate Action)	✓	✓
6	Ship Recycling	12 (Responsible Consumption and Production), 3 (Good Health and Well-being)	✓	✓
7	Low-Carbon Fuels	7 (Affordable and Clean Energy), 13 (Climate Action)		✓
8	Human-Centered Design	3 (Good Health and Well-being), 8 (Decent Work and Economic Growth)		✓

# Guide Overview – Notations

SUSTAIN-1
Focus on the Vessel
Oil & Chemical Pollution
Waste Streams
Coastal & Marine Ecosystems
Air Emissions
Efficiency & Performance Monitoring
Ship Recycling
     

SUSTAIN-2
Focus on the Vessel
<b>SUSTAIN-1</b>
Low Carbon Fuels & Technologies
Human Element
      

# Guide Update – Additional Offshore Requirements

- A combination of **Prescriptive** and **Performance** requirements
- Prescriptive Requirements:
  - Carbon Reduction Technologies (SUSTAIN-2)
- Performance Requirements (Emissions & Discharges):
  - For Emissions and Discharges no prescriptive hard limits are imposed.
  - To be based on the implementation of management plans that identify the sources, mitigation methods and monitoring/control measures to reduce emissions and discharges
  - Intent is to demonstrate operator's/owner's effort in reducing emissions and discharges through an ABS verified viable plan throughout the lifecycle of the unit

# Guide Update – Additional Offshore Requirements

## SUSTAIN-1

### 3.3 Discharges – Offshore Units, Floating Installations, and Liftboats (1 September 2022)

For offshore units, floating installations, or liftboats, a discharge management plan is to be submitted to ABS for review.

This plan is to:

- Identify major sources of discharges,
- Provide monitoring and control methods, and
- Include mitigation measures.

The major sources of discharges for an offshore unit, floating installation, or liftboat, as applicable, are to at least include:

- Produced water
- Drilling and well fluids
- Drilling solids
- Displacement water
- Produced sand
- Chemicals
- Process area open and closed drain systems

### 5.7 Offshore Emissions – Offshore Units, Floating Installations, and Liftboats (1 September 2022)

For offshore units, floating installations, or liftboats, an offshore emissions management plan is to be submitted to ABS for review.

This plan is to:

- Identify major sources of emissions from topside equipment,
- Provide monitoring and control methods, and
- Include mitigation measures.

The major sources of emission for an offshore unit and installation, as applicable, are to at least include:

- Flaring,
- Power generation (turbines, combustion engines, fired heaters, etc.),
- Venting and
- Fugitive emissions.

#### Commentary:

ISO 14001:2015 provides guidance on environmental aspects identification and assessment. Efficiency monitoring is to be through defined key performance indicators (KPI's) with the aim to provide a more efficient operation and reduce carbon footprint through efficiency awareness. The selection of mitigation measures may be based on the principle of assessing and applying best available techniques as defined in Directive 2010/75/EU on industrial emissions, Article 2 and Annex IV.

End of Commentary

## SUSTAIN-2

### 2.2 Non-Self-Propelled Offshore Units, Floating Installations, and Liftboats (1 September 2022)

Offshore units, floating installations, and liftboats that are non-self-propelled are to use low or zero carbon fuels per the list in 3/2.1 for main power generation systems. In addition, depending on the technology installed (e.g., single/dual fuel engines, fuel cells, batteries, etc.), they are to comply with the applicable ABS notations as listed in Section 3, Table 1.

### 2.3 Carbon Reduction Technologies (1 September 2022)

Vessels are required to provide evidence of use of at least one of the following carbon-reduction technologies and policies:

- Carbon capture, which reduces carbon emissions by at least 50% for:
  - Main propulsion on self-propelled vessels
  - Main power generation systems for non-self-propelled offshore units, floating installations, and liftboats
- Wind installations which reduce vessel overall energy requirements by at least 10%
- Solar installations which reduce vessel overall energy requirements by at least 5%
- Propulsion improving devices which reduce propulsion fuel consumption by at least 5% for self-propelled vessels not including offshore units, floating installations, and liftboats. (Propulsion improving devices may include wake equalizing and flow separation alleviating devices, pre-swirl devices, post swirl devices, high-efficiency propellers, etc.)
- Waste Heat Recovery systems which reduce overall energy requirements by at least 10%
- Zero-flaring policies for offshore units, floating installations, and liftboats during normal operations
- Zero-methane slip policies for offshore units, floating installations, and liftboats during normal operations

#### Commentary:

- 1 Other carbon reduction technologies may be accepted by ABS on a case-by-case basis, provided the technology follows the path to a low and zero carbon future. Evidence is to be provided in all instances to ABS.
- 2 Vessels having an overall zero-carbon profile (e.g., using hydrogen as fuel, ammonia as fuel, batteries as power source, etc.) are exempt from installing carbon reduction technologies.



# Key Takeaways



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- Develop your carbon intensity profile
- Consider your options
- Implement your strategy
- Invest in technology
- Measure your progress

# Contact Us

## Email or Give Us a Call

Our team of experts can help you.



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