



# OFFSHORE POWER GENERATION Application Scenarios & Challenges

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November, 2022

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# PETROBRAS

## CARBON STRATEGY



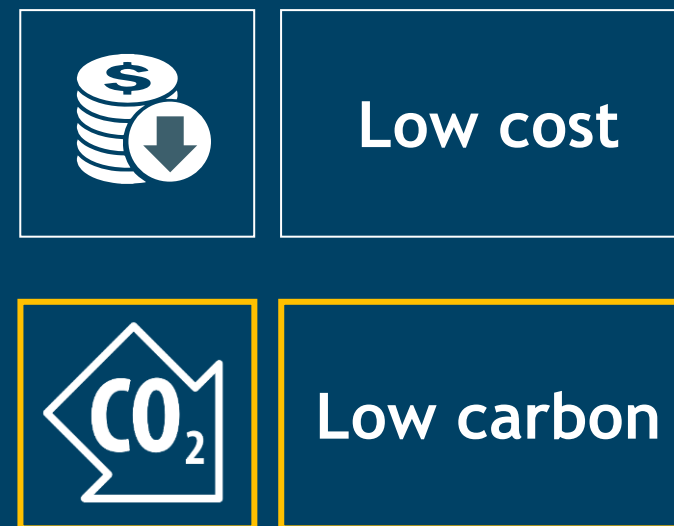
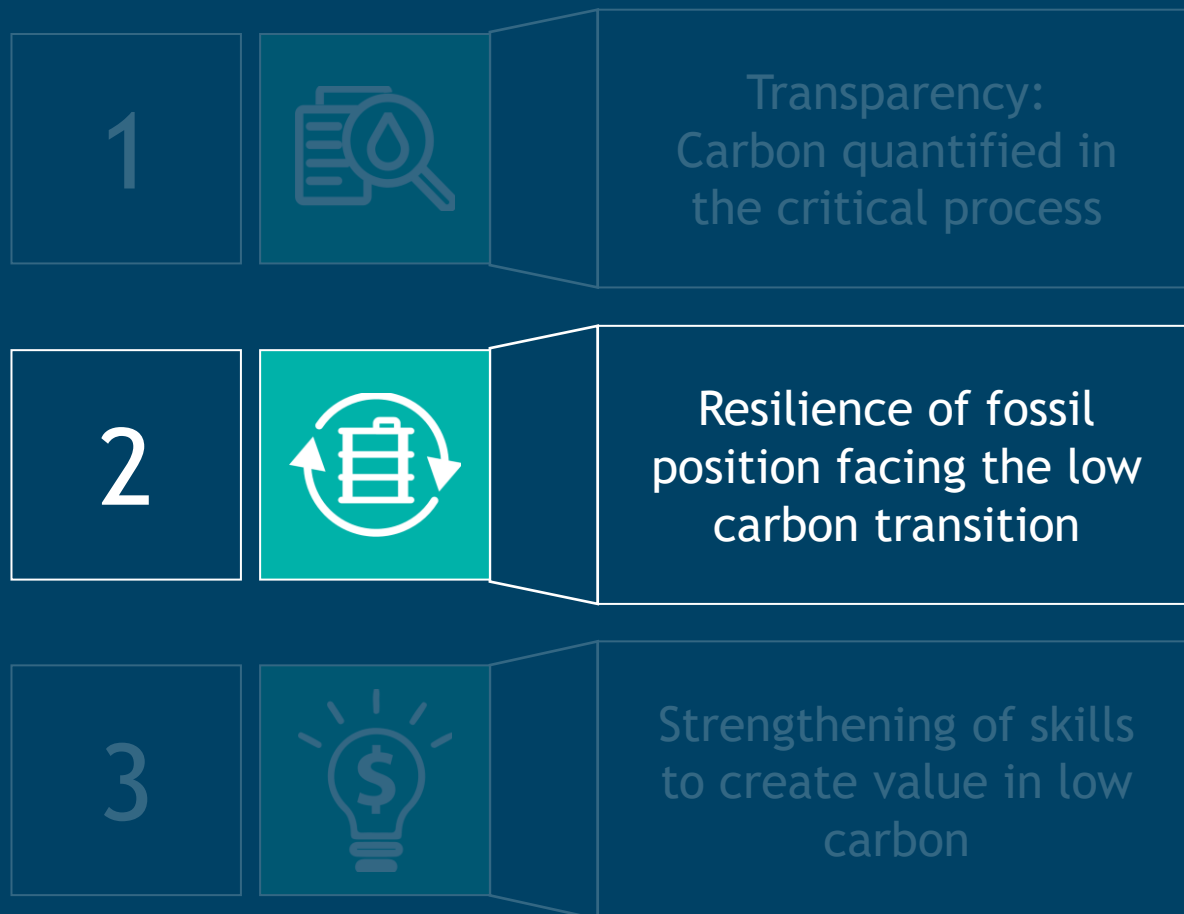


Our priority is to operate at **low costs** and with **superior performance in carbon**, protecting the competitiveness of our products in an low carbon future.



# Low Carbon strategy

3 pillars



## Carbon commitments

# Low carbon solutions on upstream

## Short term solutions



*Existing assets*



*Improvement of energy efficiency*



*Reduction of losses (flaring, venting and fugitive emissions)*



*Efficiency of maritime logistics*



*Digital transformation*

## Medium-long term solutions



*New projects*



*Electrification*



*Combined cycle*



*Zero routine flaring and venting*



*Carbon capture, utilization and storage (CCUS)*

Carbon mitigation roadmap

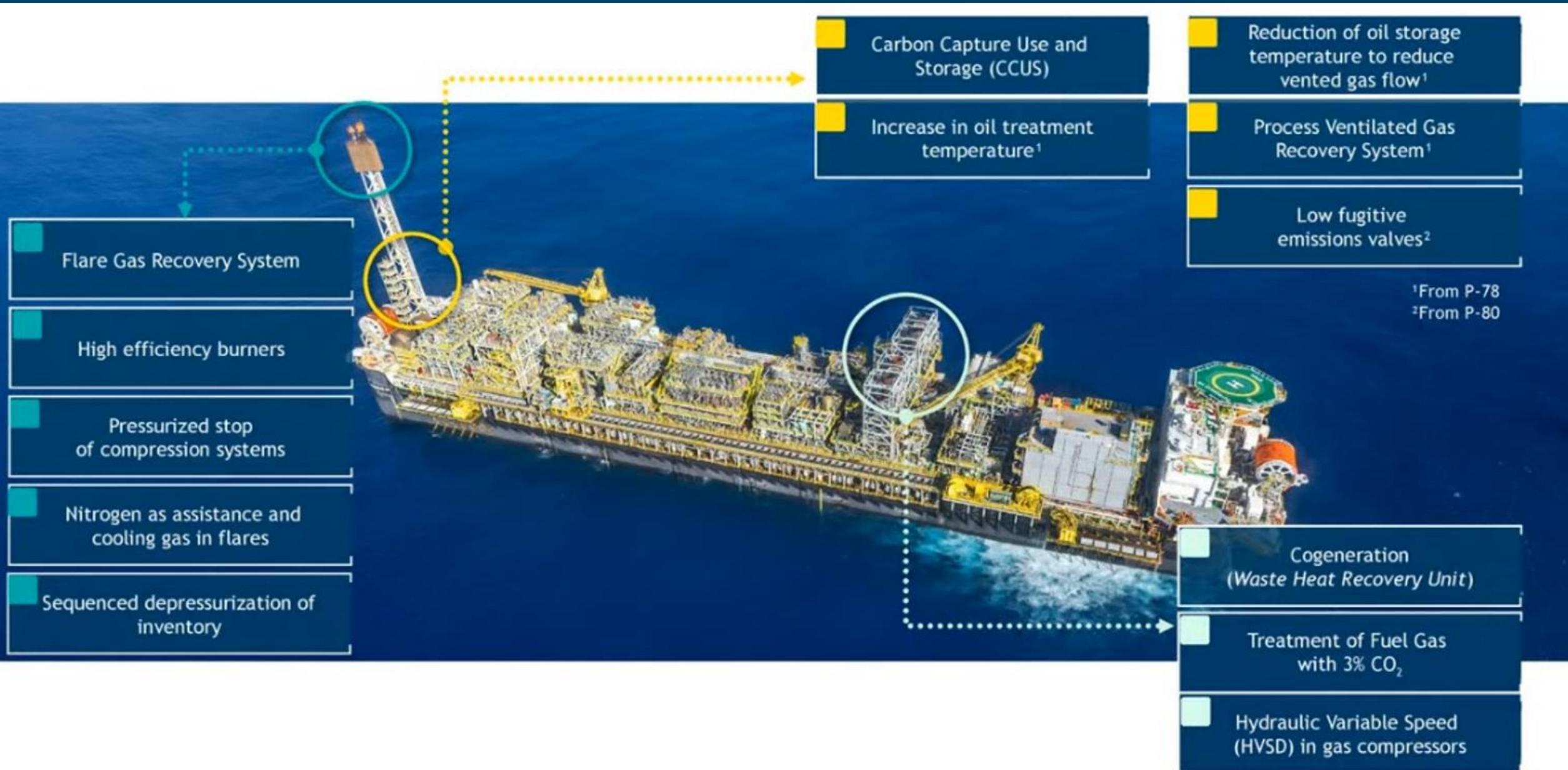
## Local Approach

- Energy Efficiency Actions
- All electric
- Combined Cycle
- Subsea Processing
- CCUS
- Others



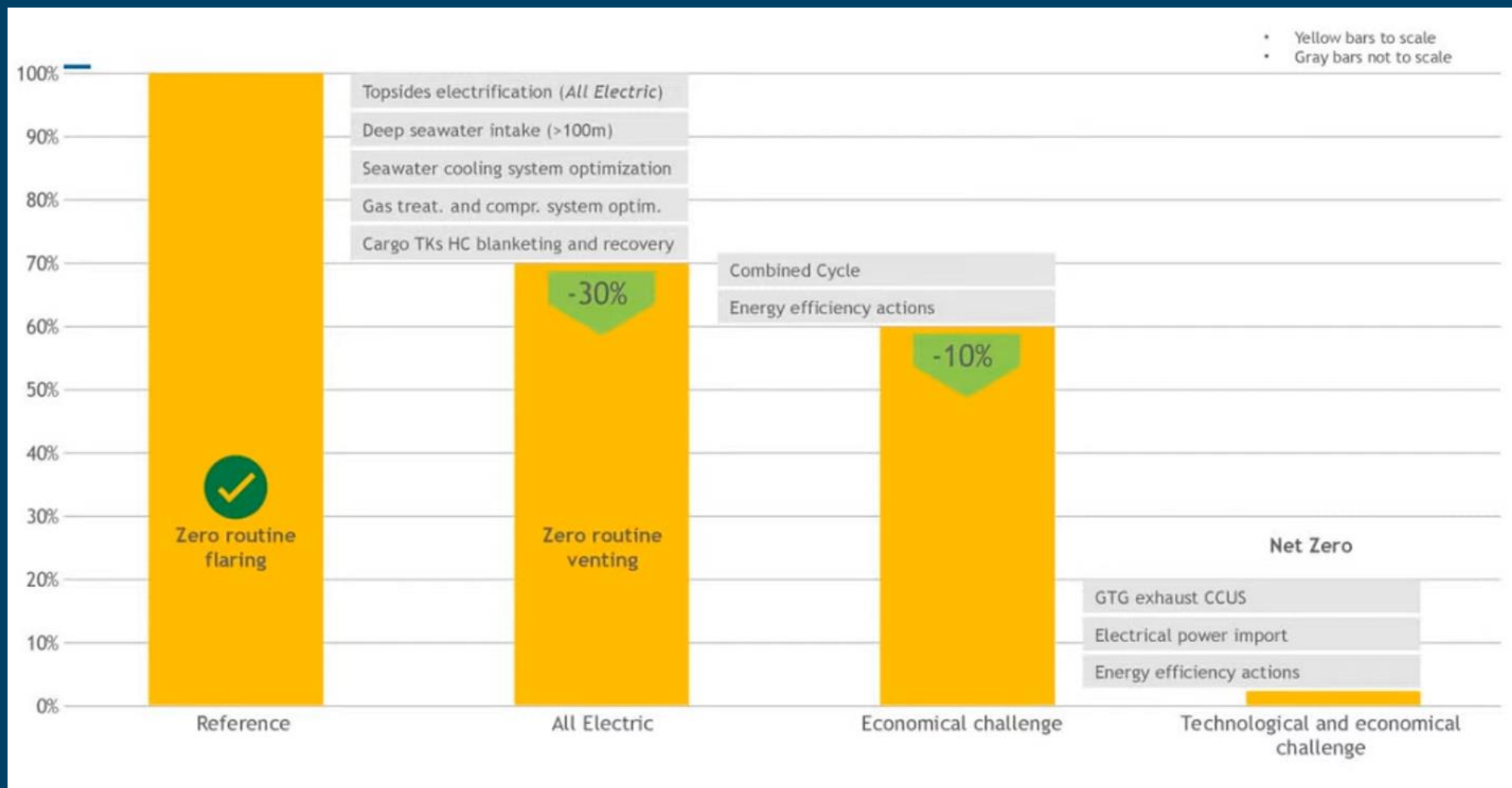


# Local Approach - Adopted Solutions





# Next Generation FPSOs : GHG Emissions Potential Reduction



## Global Approach

- Power HUB
- Power from shore
- Floating Wind
- Others

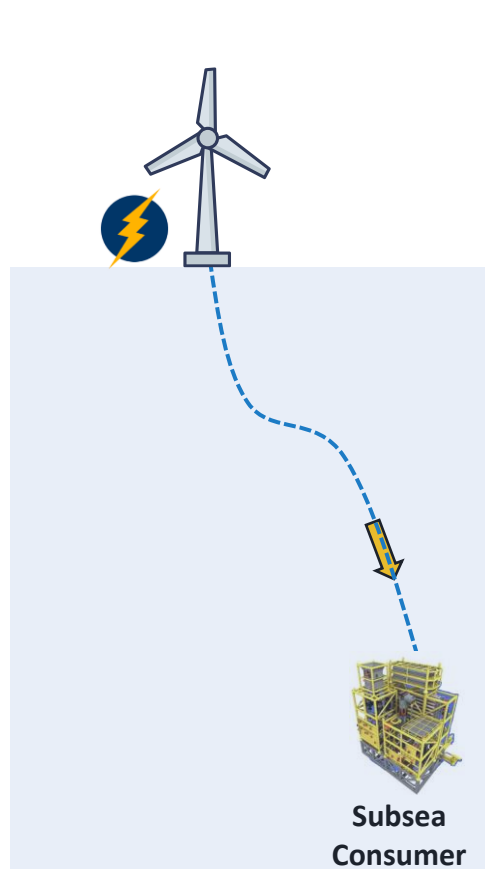




# Electrification routes

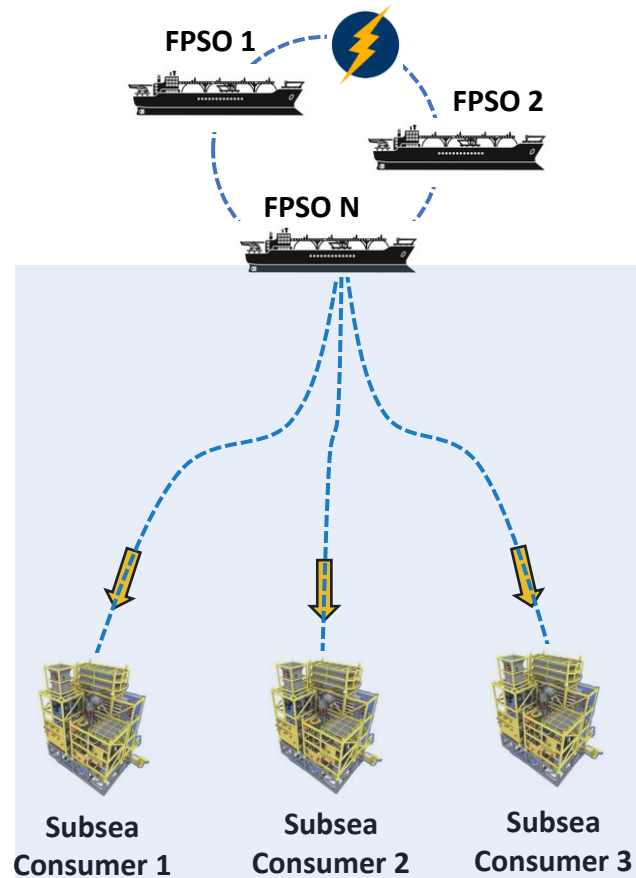
Range of Electrical Power:  
up to 5MW

Remote areas  
Intermittency tolerant systems



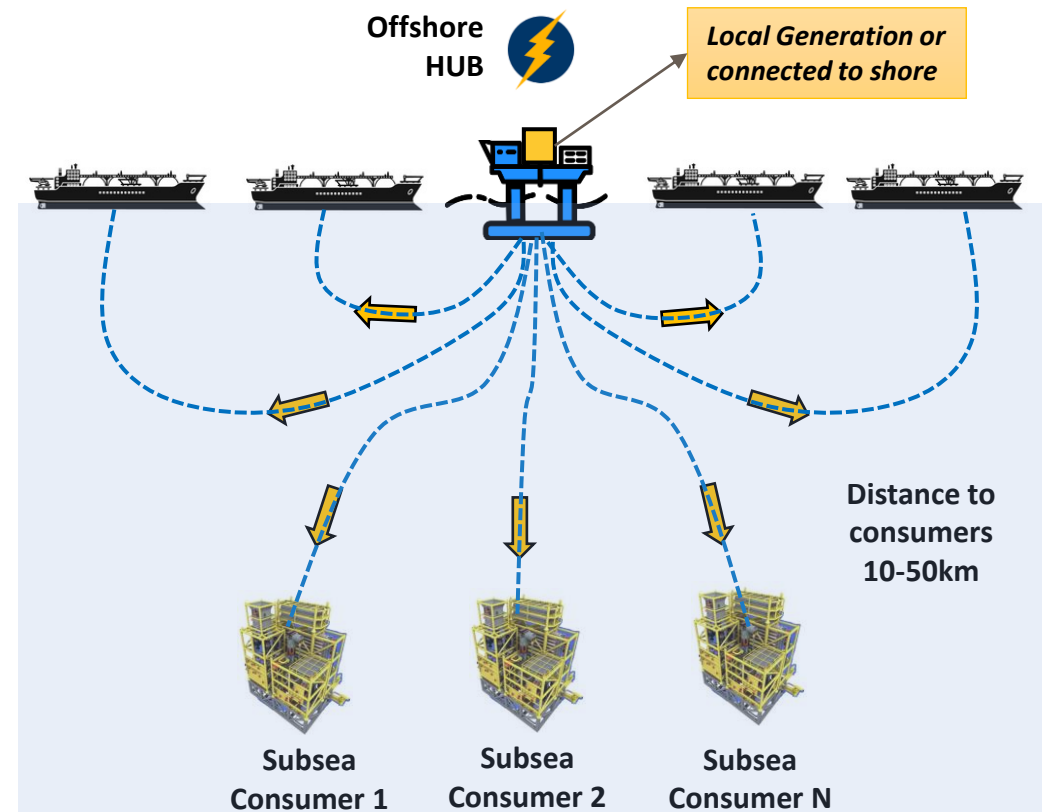
Range of Electrical Power:  
up to 50MW

Opportunity in brownfields  
Requires reliability and stability evaluation



Range of Electrical Power:  
beyond 50MW

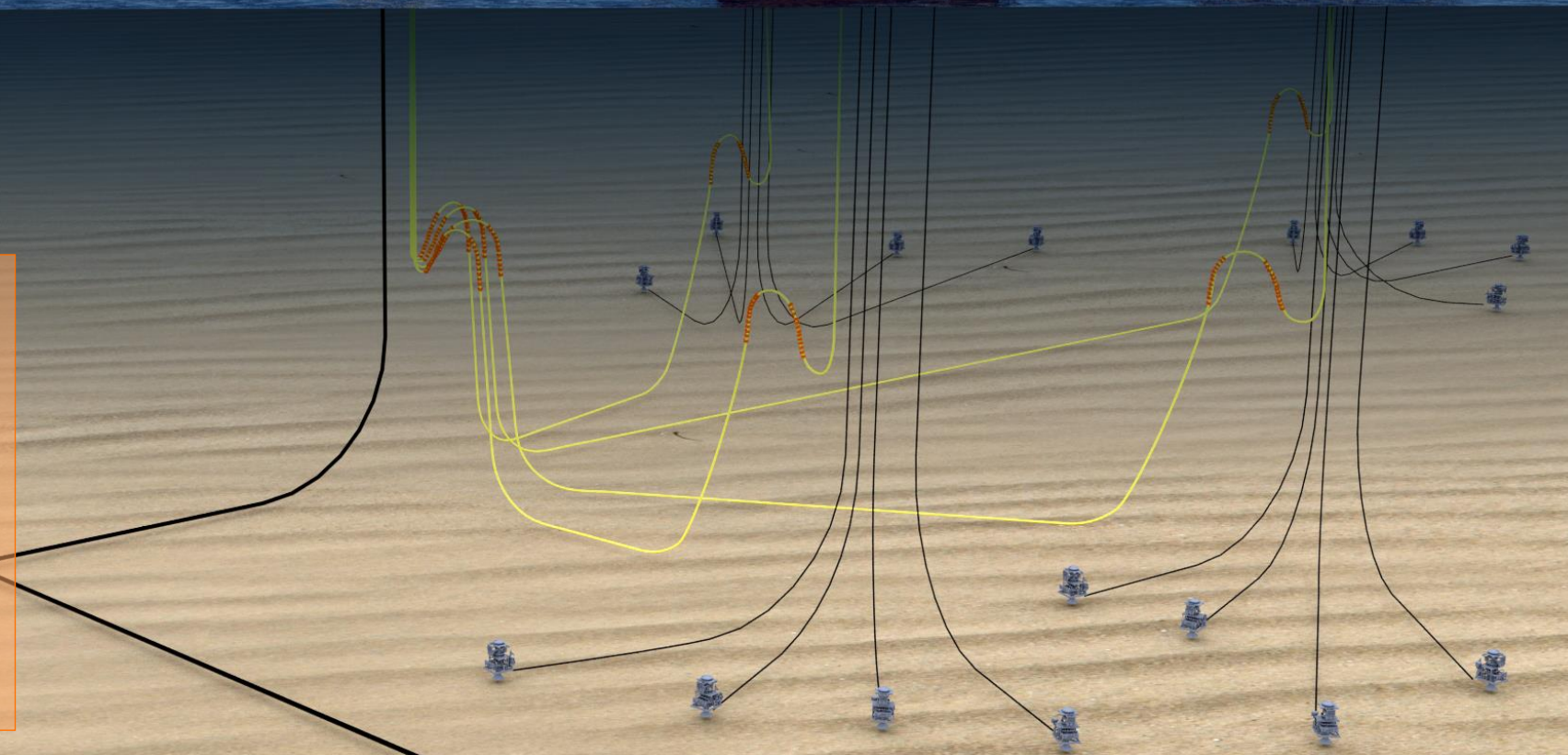
Requires high scale (power) for feasibility  
Possible integration with onshore grid



# Power Hub Offshore (PHUB)

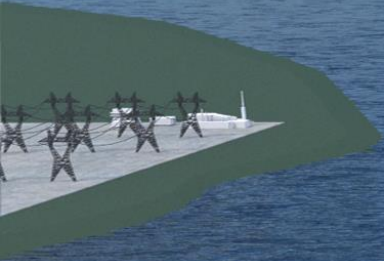


- Floater dedicated to power Generation based on combined cycle with natural gas
- Possible integration with existing gas pipelines considered
- Significant GHG emissions reduction when combined with CCUS
- Larger power hubs (>400MW) may be limited by hull size

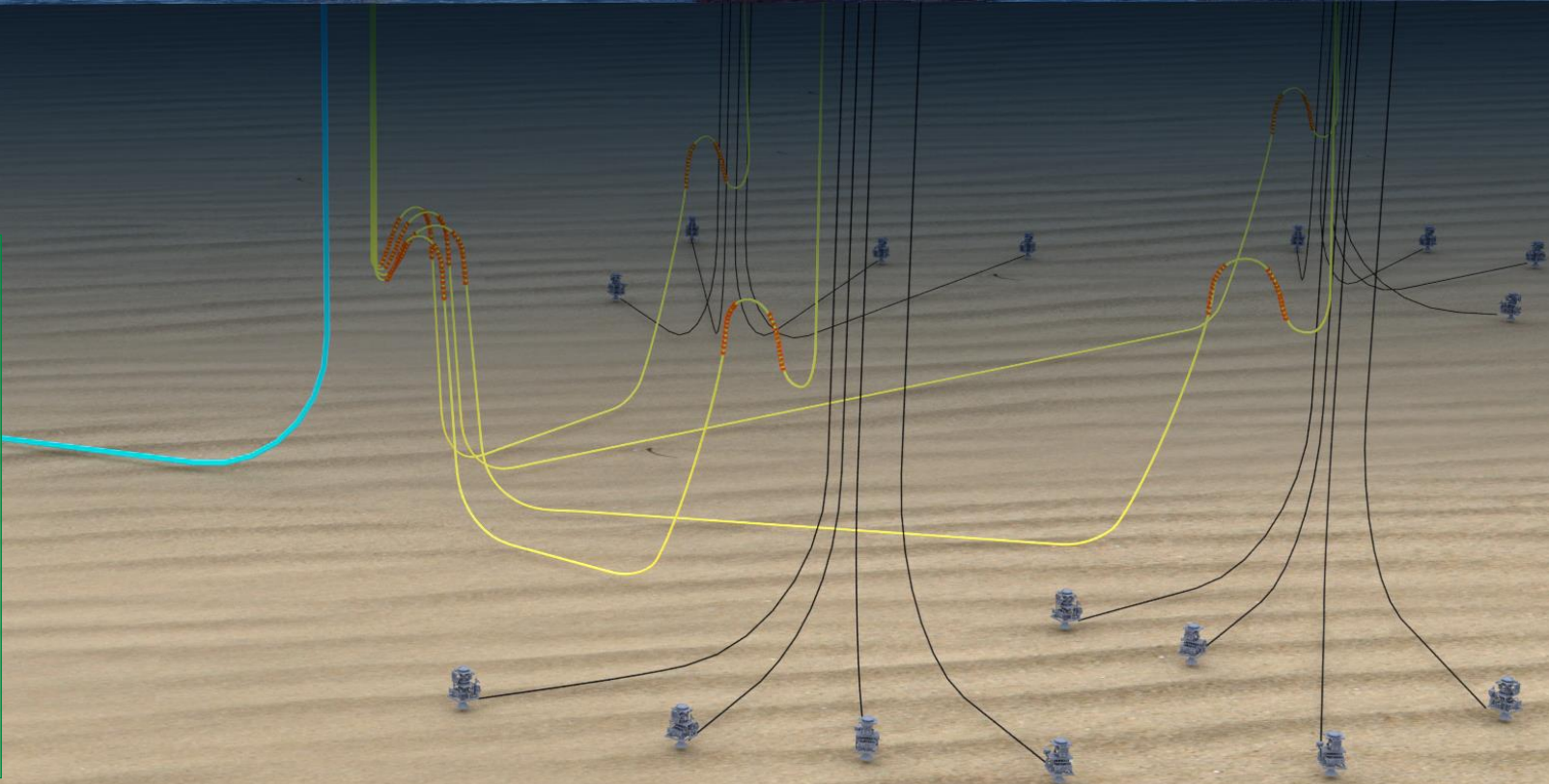




# Power from Shore



- Far offshore Fields (200km) require HVDC systems
- Offshore HVDC/HVAC conversion may require additional floater (electrical HUB)
- Significant GHG emission reduction due to high renewable content in Brazilian onshore grid (>80%)
- Dynamic power cables need to be qualified/developed





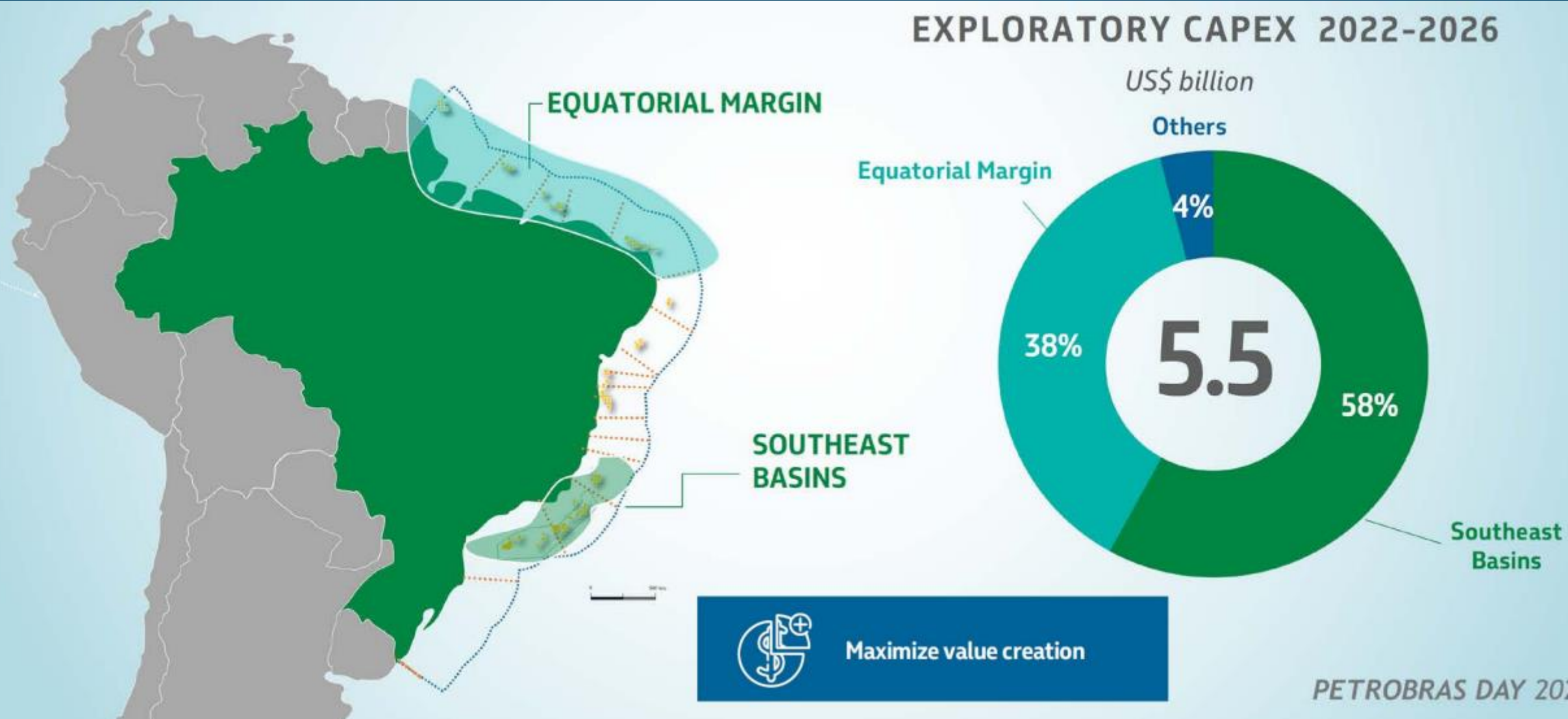
# Floating Offshore Wind



- 100% renewable Generation
- May be deployed for each platform
- Low energy density
- High costs associated to deep water scenario
- Requires special evaluation for the power manegement system



# Future perspectives



# Final Remarks

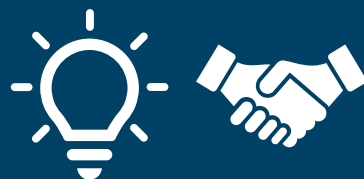
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Provide low carbon energy offshore is still economically challenging



Take into consideration the opportunities unlocked by additional availability of offshore electrical power



Innovation and strong technical partnerships are key elements for O&G industry





Thank you

November, 2022