
ROICE

Repurposing Offshore Infrastructure for Continued Energy

# ROICE : A Framework for Repurposing Offshore Infrastructure

August 2025

**An academia-industry-government effort**
**to extend energy-life and maximize commercial value of**
**abandoned/aging offshore infrastructure**

## SPONSORS

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Endeavor

RODI systems

promethean energy

ELENA KEEN CONSULTING, LLC
COASTAL ZONE MANAGEMENT

wsp

TechnipFMC

# University of Houston ROICE Program

The ROICE Program at UH and its advisory group, the ROICE Program Collaborative (RPC), form an **academia-industry-government effort** **to extend energy-life and maximize commercial value of abandoned/aging offshore infrastructure** facing billions of dollars in decommissioning costs

**ROICE-TE**
Techno-Economic Analysis of ROICE Installations

**ROICE-PIF**
Project Implementation Framework for ROICE Installations

- Funded by research grants from state and federal agencies
- Advised by ROICE Project Collaborative (RPC) – industry & academic experts & business leaders
- Phase Gate approach to implementing and operating a demonstration project

**ROICE Vision**

*To implement a **ROICE Pilot Project** - a continued energy project on a repurposed oil & gas facility*

# ROICE Program Collaborative (RPC)

- The ROICE Program is advised by the RPC made up of experts from over 40 organizations – engineering and OEM companies, operators, national labs, associations
- Three categories of RPC members with increasing influence on project direction
  - Participant – All are welcome
    - Invitation to bi-monthly RPC meetings
  - Associate Members
    - Sign an Association Agreement
    - Agree to provide experts' time and data as needed
    - Invited to join select funding opportunities and collaboration with UH faculty
  - Sponsors
    - Sign an MOU; serve on the planning group influencing direction of the project
    - Agree to devote self-funded staff to carry out work scope
    - First right of refusal on funding opportunities, collaboration with UH faculty and demonstration project

## Sample of Current RPC Members

### OEM Companies

NEL, IMI, **Rodi Systems**, Hatenboer Water, Power2Hydrogen, GE, GTA H2

### Operators & O&G Service Companies

**Promethean Energy**, **Technip FMC**, **Black & Veatch,** Subsea 7, Noble Corp, Technip Energies, *Baker Hughes*, Neuman-Esser, Siemens

**Operators (Data Partners)**

*Hess, Talos, BP, Shell, Walter Oil, Arena Offshore*

### National Labs

Argonne, NREL

### Advisory and Consulting Companies

**Endeavor Management**, **Elena Keen Consulting**, Grid Advisors, **WSP**, ABS, *DNV, Gulf Offshore Research Institute*, Centre for Houston's Future, XODUS Group, AquaTerra

**Sponsors /** Associate Members / *Participants*

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# ROICE As An Alternative to Decommissioning

## Multiple options are being explored for repurposing offshore infrastructure

### Low-carbon & Sub-surface

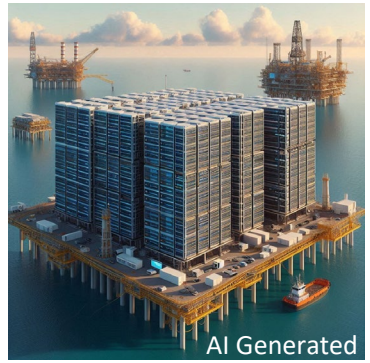
- Stranded Gas Monetization
- $CO_2$ Sequestration
- $CO_2$ EOR
- Geothermal
- Gas Hydrates

RPC

ROICE

### Other Options

- Offshore Data Centers
- Sport Fishing / Diving
- Aquaculture
- Desalination



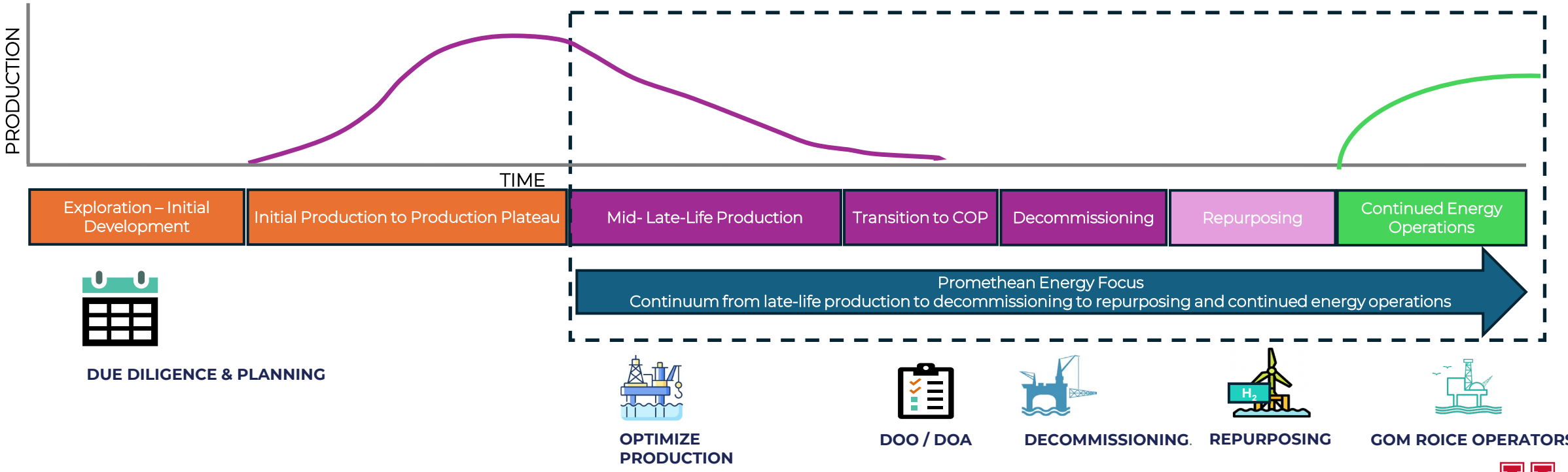

### Alternate Energy

- Wind Power
- Wind to Hydrogen
- Wind to Hydrogen to X (e.g., methanol, ammonia)
- Wave Energy
- Tidal Energy
- Ocean Thermal

# The ROICE Phase of Asset Life

## ROICE focuses on maximizing value across late-life and decommissioned assets by repurposing infrastructure

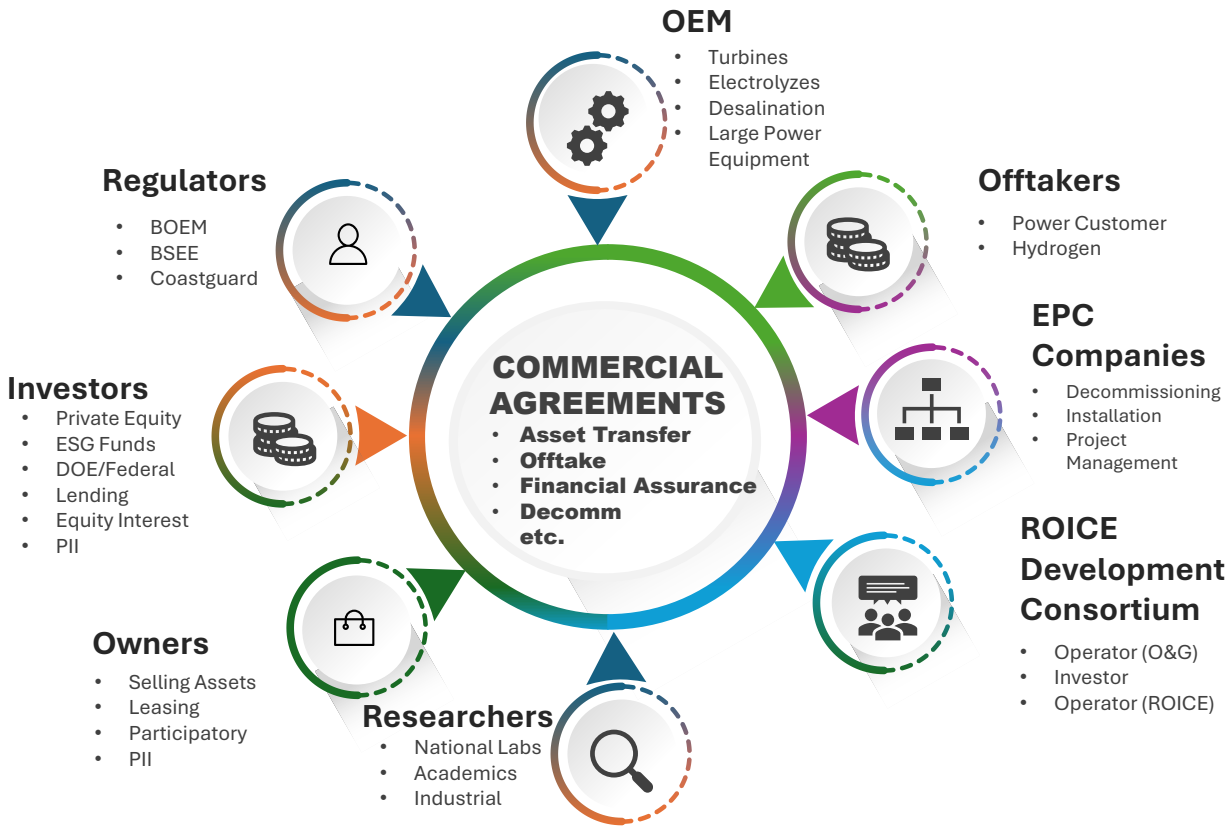
### *Offshore Asset Lifecycle**




* Courtesy: Promethean Energy

# ROICE Stakeholders

## The ROICE Program brings together the multiple stakeholder groups needed to make a repurposing project successful




Requires coordinated efforts across:

- ✓ Regulatory Environment
- ✓ Technology Innovation
- ✓ Investments/Financing
- ✓ Engineering & Construction
- ✓ Operations

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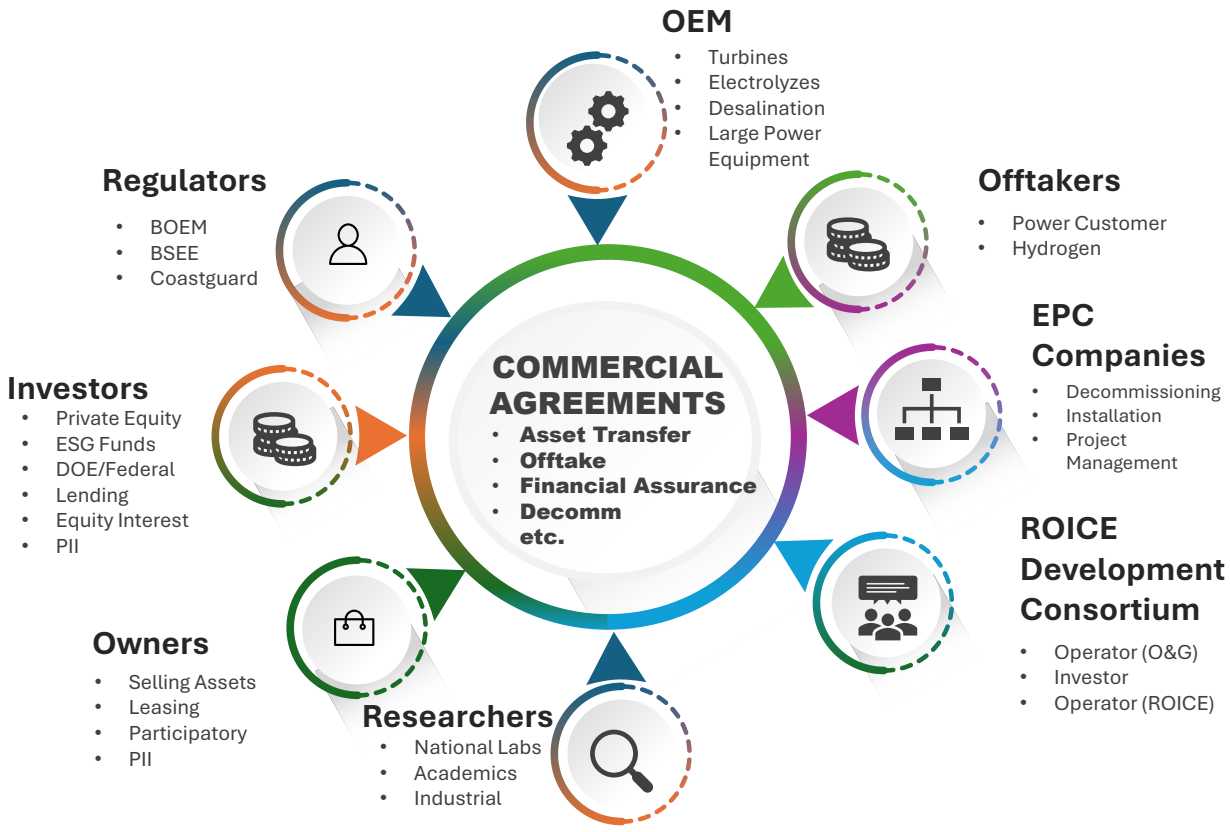


Requires coordinated efforts across:

- ✓ Regulatory Environment
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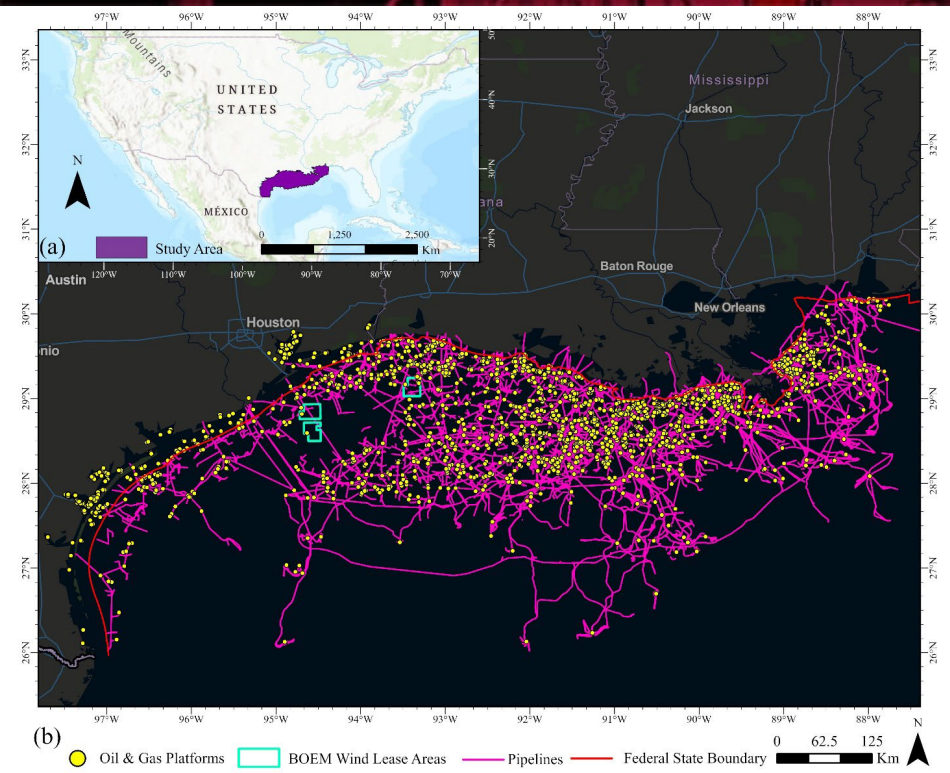
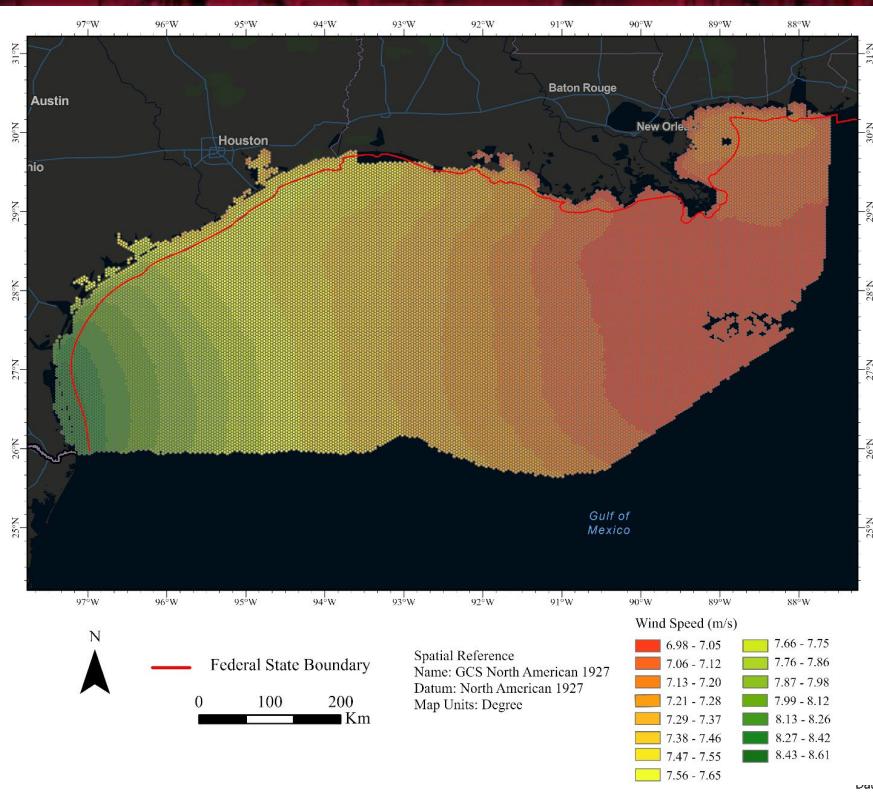
- ✓ Operations

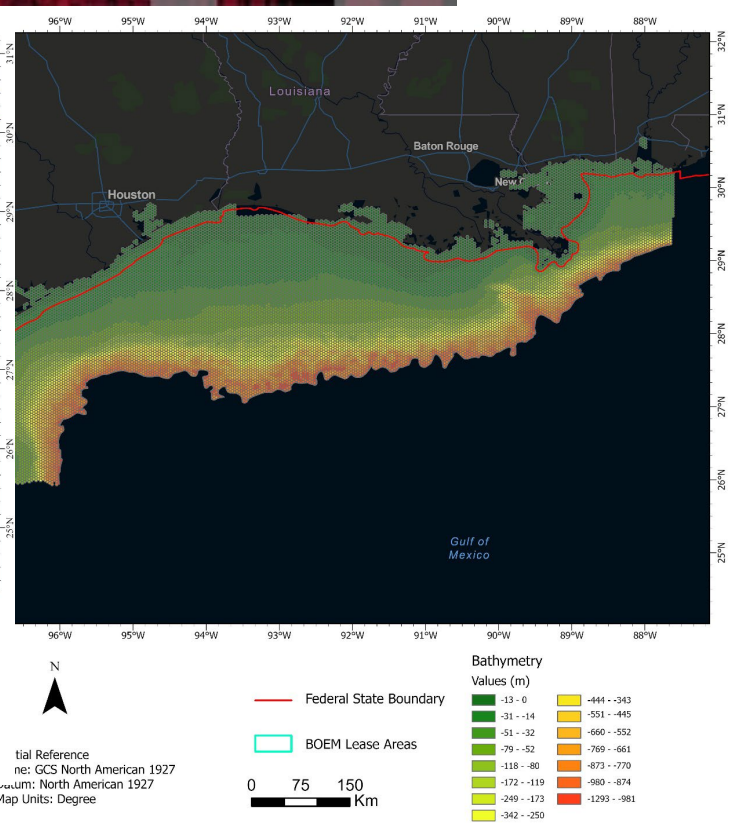
# ROICE Potential in the Gulf of America




*Large inventory of assets to explore potential to repurpose*



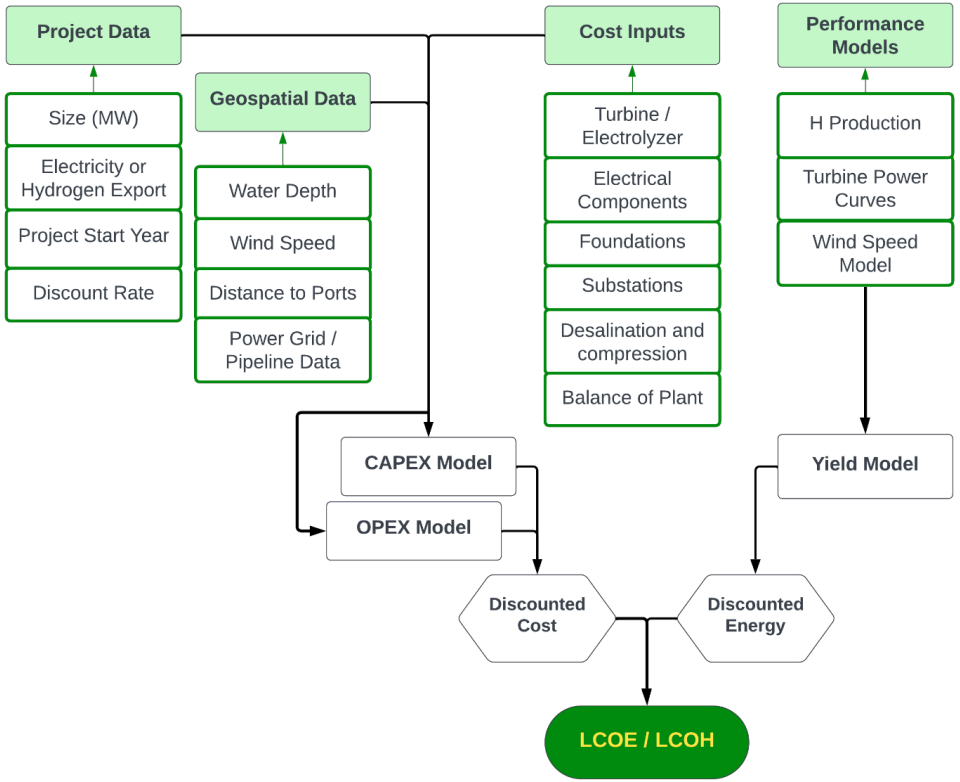

*Favorable wind speed patterns*




*Favorable bathymetry*

*… and well-established infrastructure and workforce to leverage*

# ROICE Levelized Cost Model




*Workflow of our Model*

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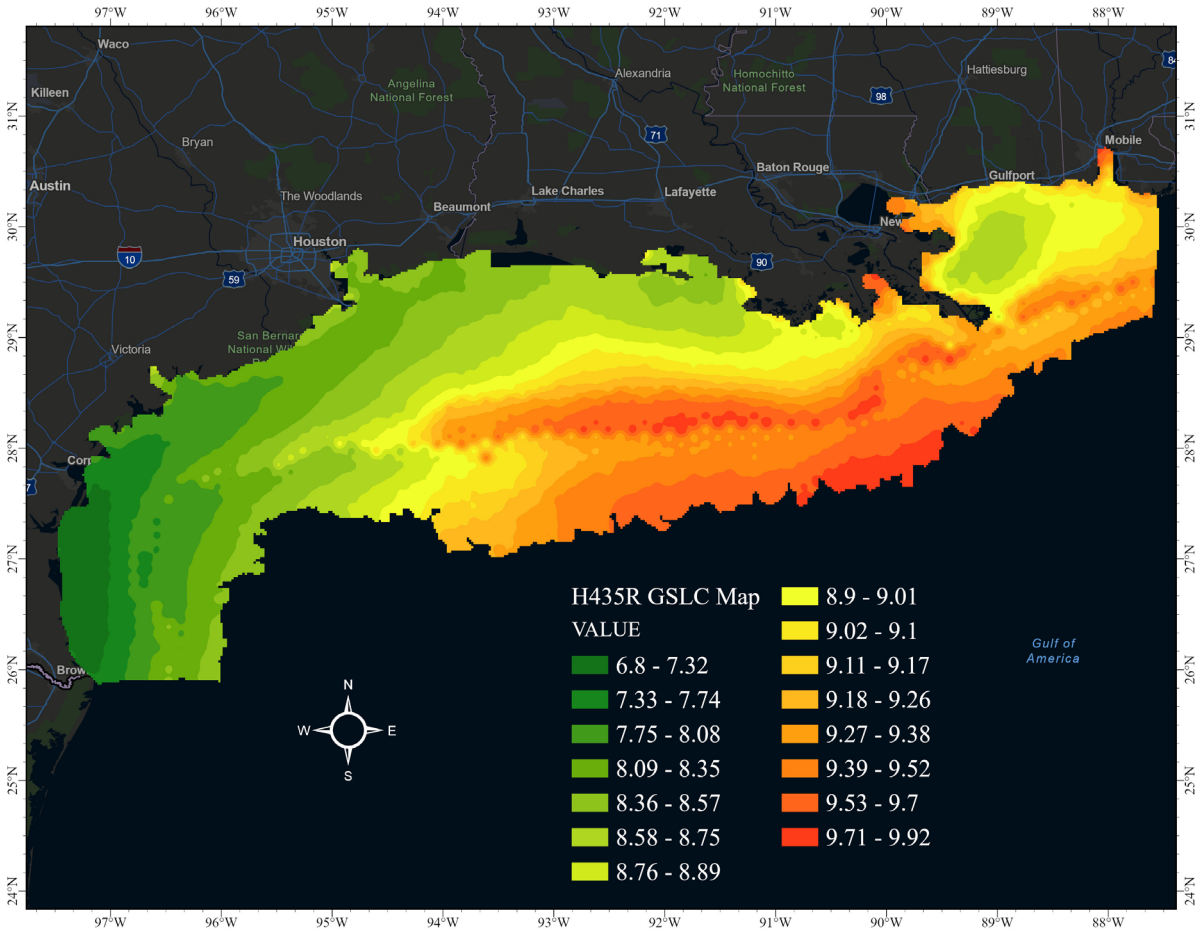
journal homepage: www.elsevier.com/locate/rser

Levelized cost of repurposing oil and gas infrastructure for clean energy in the Gulf of Mexico

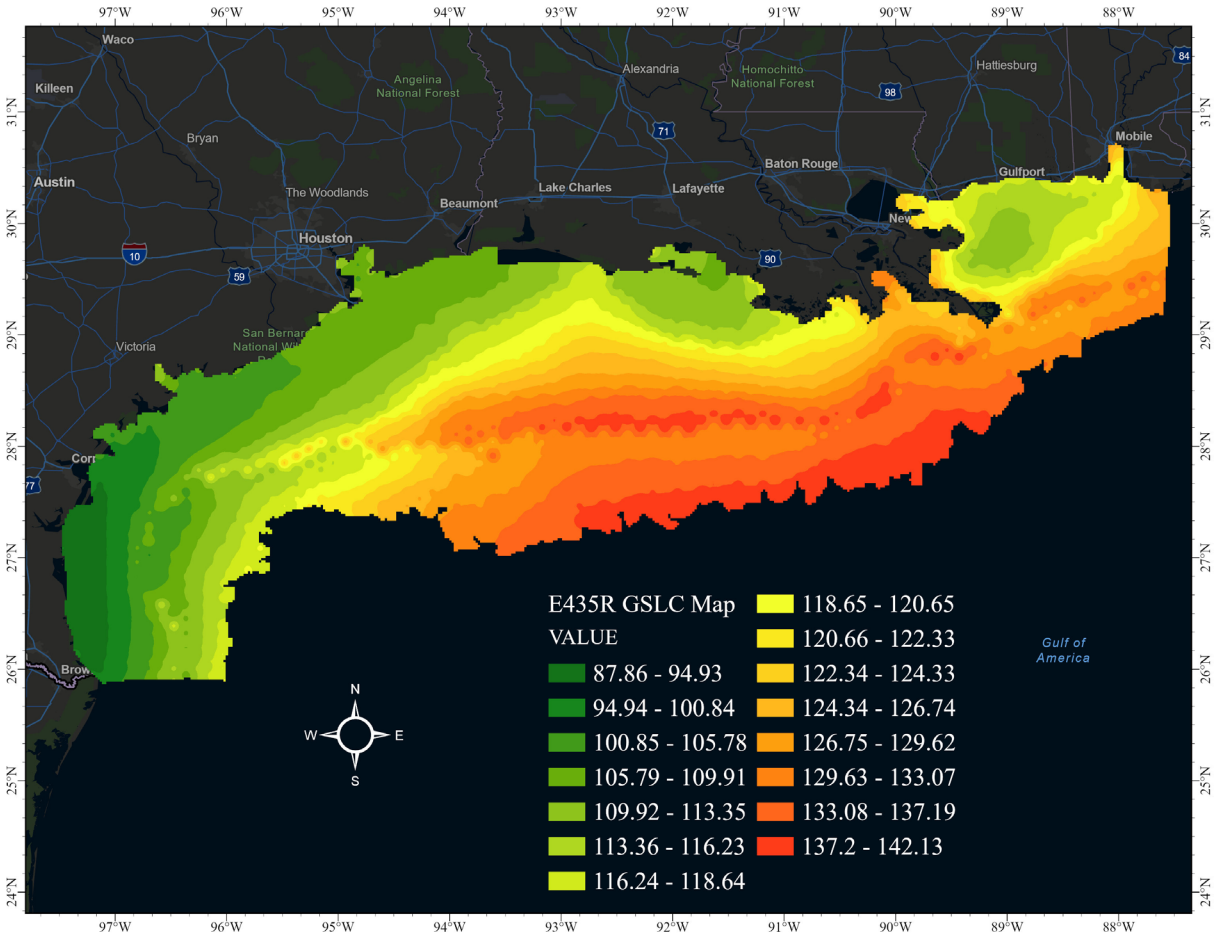
Yugbhai Patel, Muhammad Younas, Paulo Liu, Ram Seetharam *

- ROICE projects (Repurposing Offshore Infrastructure for Clean Energy) have the potential to transition significant fraction of offshore infrastructure in the GOM and other areas into clean energy projects
- ROICE Levelized Cost (LC) model built for wind or wind to hydrogen projects; LC values estimated for all locations in the GOM
- Levelized costs for ROICE projects are a complex function of various variables – wind speed, water depth, distance to shore, project size, new build vs. repurposed

# Levelized Cost Maps




*Geospatial LC Map for 435 MW Repurposed Hydrogen Export Project*
*Levelized Costs in $/kg of Hydrogen*




*Geospatial LC Map for 435 MW Repurposed Power Export Project*
*Levelized Costs in $/MWh for Electricity*

# ROICE Potential Evaluation Workflow

4-Step workflow developed to evaluate the potential of a given offshore platform to be repurposed into a continued energy project

- Asset Screening
- Levelized Costs
- Project Economics
- Equipment Placement

## 1 Asset Screening & Data Collection

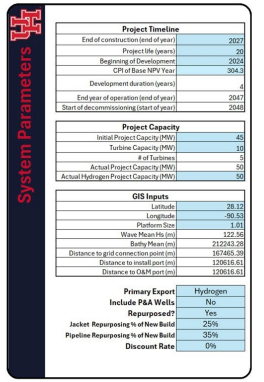
Obtain asset data, conduct preliminary screening, and eliminate those not suitable for repurposing.

## 2 Levelized Cost Estimation

Derive levelized cost estimates using asset and geospatial data and expected project size

**Levelized Cost Estimation**

- 2.1 Set Up: Input Asset Data
- 2.2 Extract GIS data – water depth, wind speeds
- 2.3 Generate Capex, Opex and Production Profiles
- 2.4 LC Values for a single wind and hydrogen project size



System Parameters

| | |
|---|---|
| **Project Timeline** | |
| End of construction (end of year) | 2027 |
| Project life (years) | 20 |
| Beginning of Development | 2024 |
| CPI of Base NPV Year | 304.3 |
| Development duration (years) | 4 |
| End year of operation (end of year) | 2047 |
| Start of decommissioning (start of year) | 2048 |
| **Project Capacity** | |
| Initial Project Capacity (MW) | 45 |
| Turbine Capacity (MW) | 10 |
| # of Turbines | 5 |
| Actual Project Capacity (MW) | 50 |
| Actual Hydrogen Project Capacity (MW) | 50 |
| **GIS Inputs** | |
| Latitude | 28.12 |
| Longitude | -90.53 |
| Platform Size | 1.01 |
| Wave Mean Hs (m) | 122.56 |
| Bathy Mean (m) | 212243.28 |
| Distance to grid connection point (m) | 167465.38 |
| Distance to install port (m) | 120616.61 |
| Distance to O&M port (m) | 120616.61 |
| Primary Export | Hydrogen |
| Include P&A Wells | No |
| Repurposed? | Yes |
| Jacket Repurposing % of New Build | 25% |
| Pipeline Repurposing % of New Build | 35% |
| Discount Rate | 0% |

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## 3 Economic Modeling

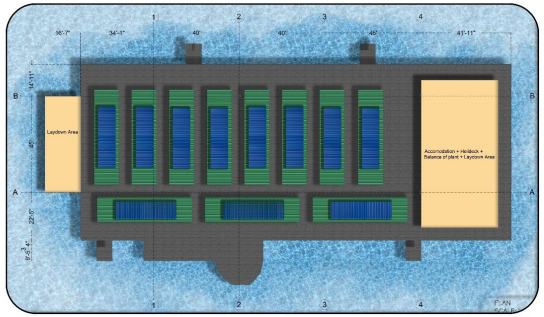
Identify minimum size for a profitable project for given asset

ROICE Economic Model Results

| Case # | P/H | MW | Price* | Cost Red | Perf Impr | CAPEX (M$) | AVP (M$) | IRR (%) | Levl. Cost |
|---|---|---|---|---|---|---|---|---|---|
| | | | * c/kwh or $/kg | | | | | | * $/MW or $/kg |
| 56 | P | 480 | 8 | 0% | 10% | 1940.1 | -920.1 | NA | $ 83.14 |
| 59 | P | 480 | 8 | 30% | 10% | 1358.1 | -211.6 | NA | $ 67.31 |
| 62 | P | 480 | 8 | 50% | 10% | 970.1 | 260.8 | 1.8% | $ 56.76 |
| 65 | P | 480 | 10 | 0% | 10% | 1940.1 | -339.1 | NA | $ 83.14 |
| 68 | P | 480 | 10 | 30% | 10% | 1358.1 | 369.4 | 1.8% | $ 67.31 |
| 71 | P | 480 | 10 | 50% | 10% | 970.1 | 841.8 | 5.2% | $ 56.76 |
| 74 | P | 480 | 15 | 0% | 10% | 1940.1 | 1113.4 | 3.6% | $ 83.14 |
| 77 | P | 480 | 15 | 30% | 10% | 1358.1 | 1821.9 | 7.4% | $ 67.31 |
| 80 | P | 480 | 15 | 50% | 10% | 970.1 | 2294.2 | 11.5% | $ 56.76 |
| 146 | H | 180 | 5 | 0% | 10% | 1131.4 | -978.3 | NA | $ 7.33 |
| 149 | H | 180 | 5 | 30% | 10% | 934.6 | -738.8 | NA | $ 6.60 |
| 152 | H | 180 | 5 | 50% | 10% | 708.4 | -463.4 | NA | $ 5.76 |
| 155 | H | 180 | 10 | 0% | 10% | 1131.4 | 85.6 | 0.5% | $ 7.33 |
| 158 | H | 180 | 10 | 30% | 10% | 934.6 | 325.0 | 2.3% | $ 6.60 |
| 161 | H | 180 | 10 | 50% | 10% | 708.4 | 600.5 | 5.1% | $ 5.76 |

## 4 Placement Workflow

Use placement workflow to see if asset can accommodate minimum or larger profitable project.



**Final Result: Optimum Project Size for Repurposing**

# Repurposing Case Study:
# Gulf of America Platform As An Offshore Wind Substation

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- ST-311-A* - operating oil and gas fixed platform installed in 2015 100 miles offshore in the Gulf of America in 400 ft of water
- Evaluating feasibility of repurposing into offshore substation at the end of oil and gas production

**Substation Equipment Distribution**

- **Drilling Deck**
  - Transformers
  - Gas-Insulated Switchgear
  - Coolers
  - Control and Ancillary Equipment
- **Production Deck**
  - Medium Voltage Hybrid Switchgear
- **Cellar Deck**
  - Diesel Generators & Diesel Tanks

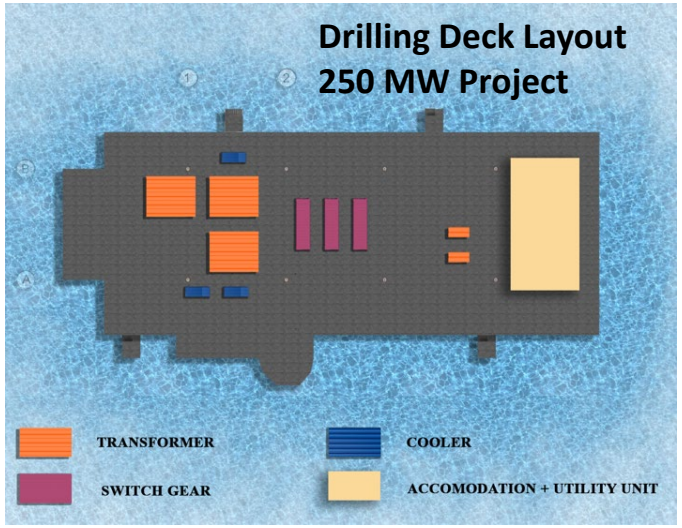
** Data provided for research purposes only by Walter Oil*

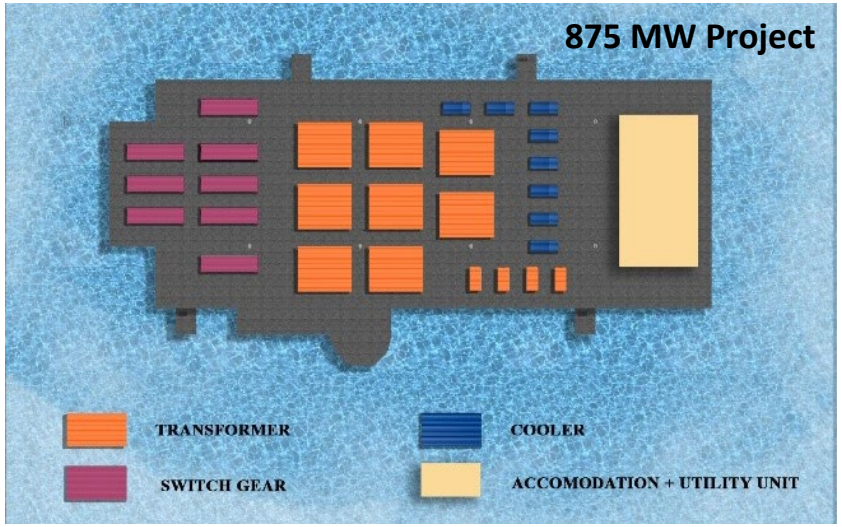
# Repurposing Case Study: Gulf of America Platform As An Offshore Wind Substation

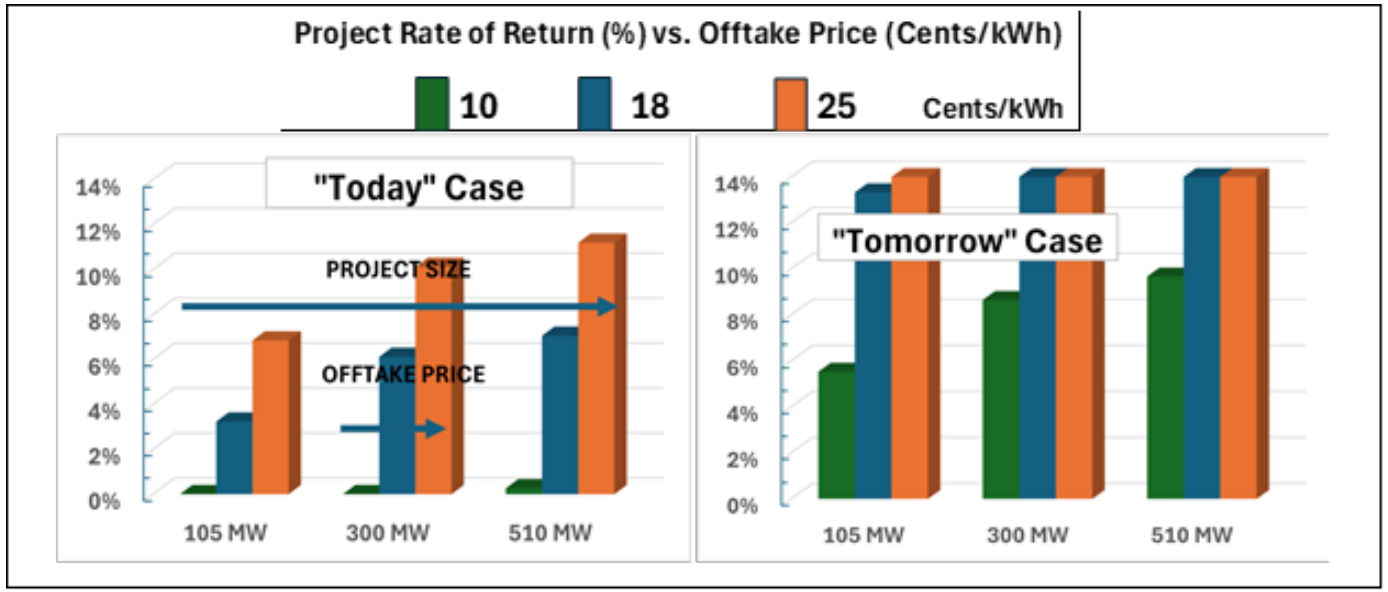
**Project Size:** ST-311-A* can support a project as large as 875 MW

**Economics:**

- At current capital costs and performance levels, need power offtake price > 18 cents/kWh to be viable (“Today” Case)
- With incentives, cost reduction and performance improvements, projects viable even at 10 c/kWh (“Tomorrow” Case)




**Conclusion:**

- With cost and performance improvements, offshore platforms in the GOA can profitably serve as substations to support wind farms in the range of 100 to 1000 MW

** Data provided for research purposes only by Walter Oil*

# Repurposing Case Study:
# Gulf of America Platform As Hydrogen Generation Project

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- Walter Oil and Gas Asset is an operating oil and gas fixed platform  installed in the year 2015.
- 400 ft of water; 6-leg platform; 100 miles offshore

**Production Equipment Distribution**

- **Drilling Deck (El. +99’ 9”)**
  - 11 x 5MW Process Containers
  - 11 X Dry Cooler Assemblies (stacked)
- **Production Deck (El. +70’ 6”)**
  - 11 x Transformers
  - 11 x Rectifiers
- **Cellar Deck (+57’ 0”)**
  - 6 x Seawater Desal Modules
  - [?] x Seawater Lift Pumps

IMI REMOSA
IMI Critical Engineering
RODI systems


- *ST-311 data sets received with thanks from Walter Oil*
- *To be used purely for research purposes*
- *Electrolyzer designs received with thanks from IMI*
- *Desalination designs received with thanks from RODI Systems*

# Repurposing Case Study:
# Gulf of America Platform As Hydrogen Generation Project

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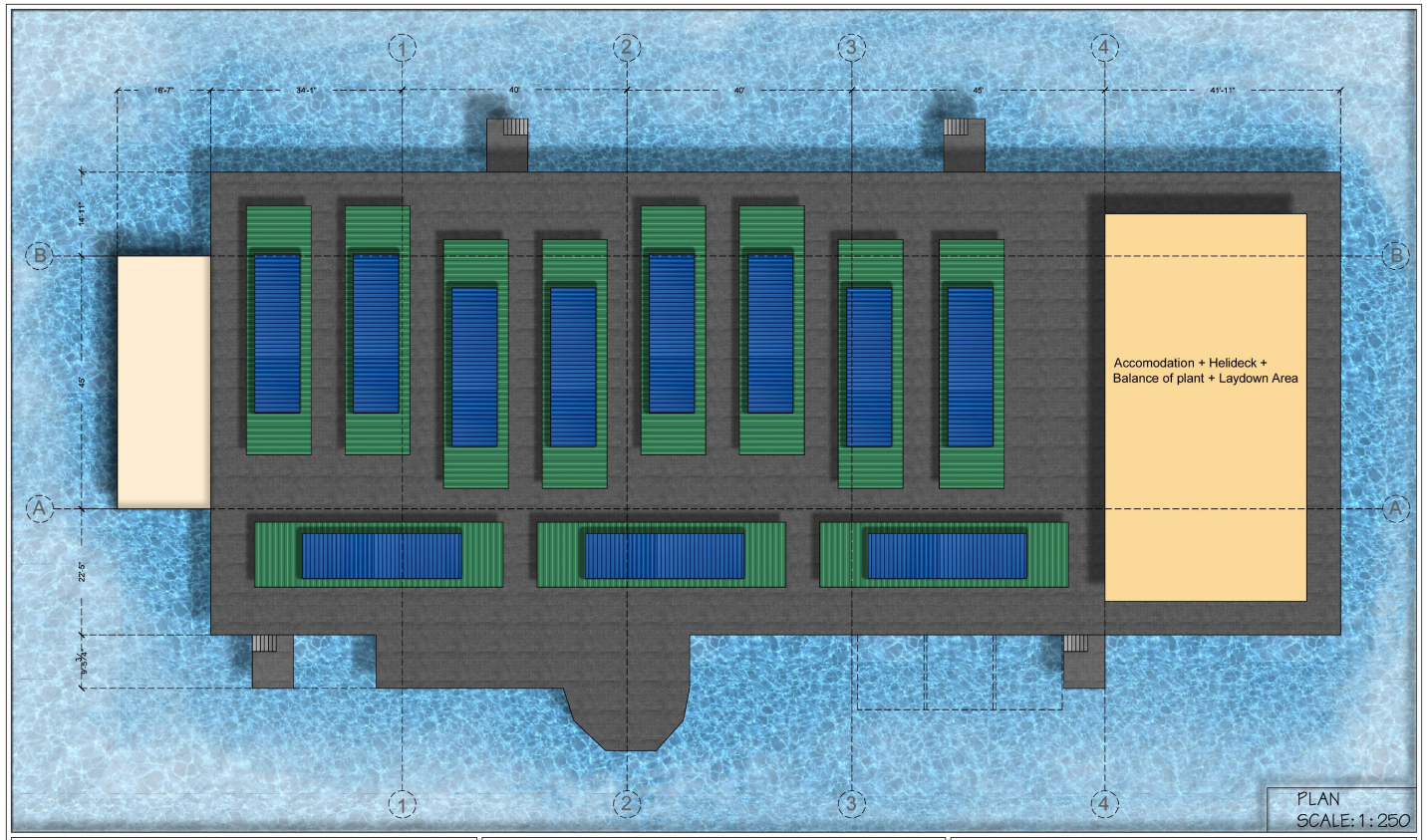
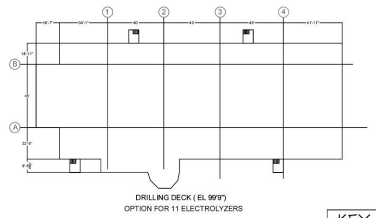
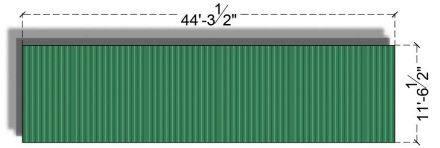
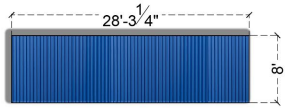



ROICE

DRAWING TITLE:
ST 311 - A _ PROCESS CONTAINER (HOUSING ELECTROLYZERS) PLACEMENT PLAN_DRILLING DECK

SPECIFICATIONS:

ELECTROLYZER :
IMI MODEL
DIMENSIONS: 44' 3" X 11' 5"

COOLER :
IMI MODEL
DIMENSIONS: 28' 4" X 8'

DESIGN PRINCIPLES :
- 6' SPACE AROUND THE EQUIPMENT HAS TO BE PROVIDED FOR CIRCULATION AND MAINTENANCE.
- 20% OF TOTAL DECK SPACE HAS TO BE PROVIDED FOR BALANCE OF PLANT & ACCOMMODATION.

NORTH:

TRUE NORTH
PLATFORM NORTH

DRAWING NUMBER: ST-311-A : 01

| | |
|---|---|
| DATE: | 02/04/2025 |
| UNITS: | STANDARD US |
| SCALE: | 1 : 250 |
| REV: | 1 |

Total: 11 x 5 MW Process Containers on drilling deck

Requires 1 Cooling unit to 1 Process Container

Project size can be doubled by building an additional deck on top of drilling deck

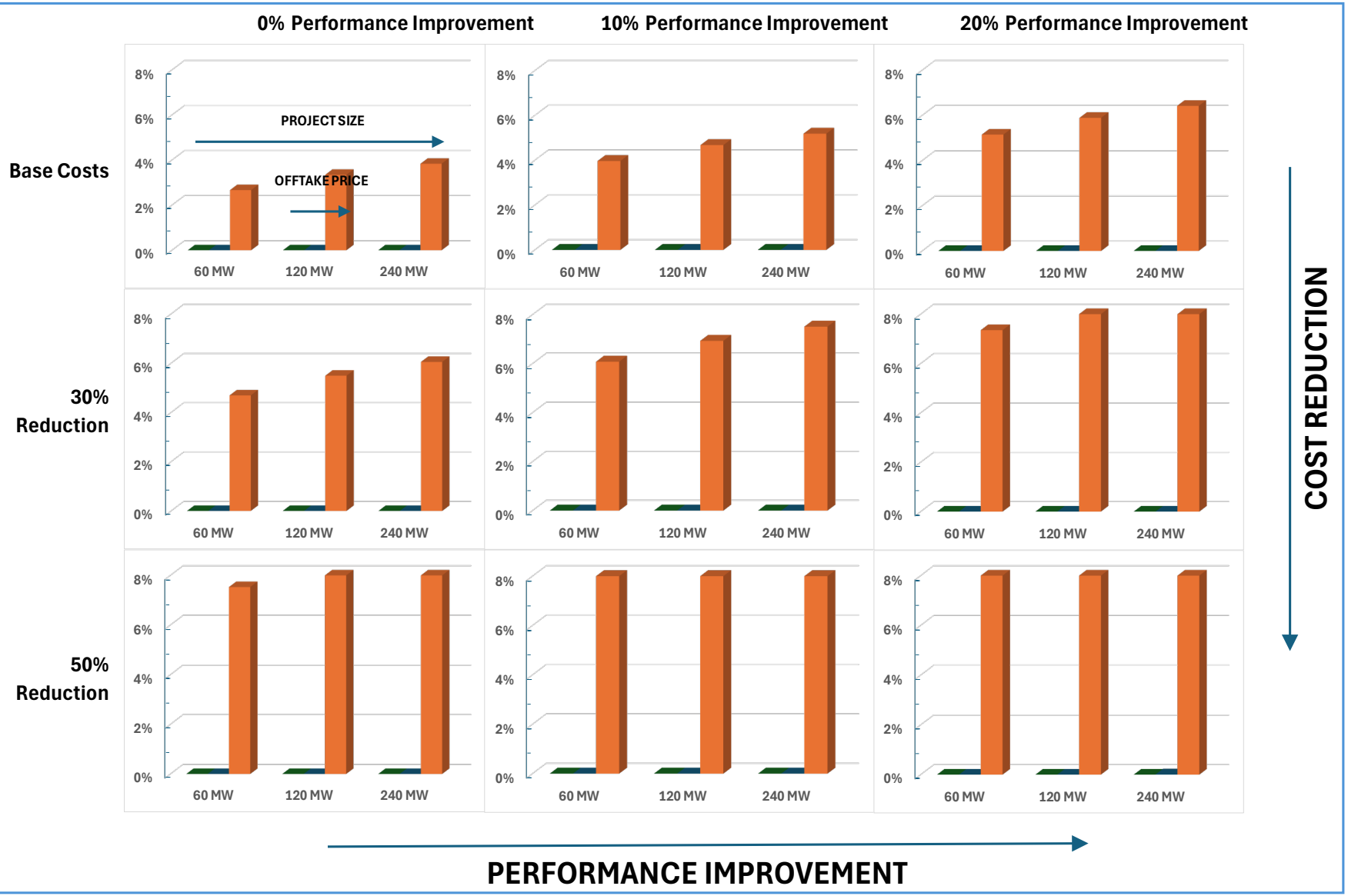
**Project Size: 55 MW / 110 MW**

**Proton Exchange Membrane (PEM) Electrolyser**


IMI Critical Engineering

Breakthrough Engineering

# GOA Hydrogen Export Project Economics




**Case: Western Gulf Coast / Repurposed Hydrogen Export Projects**
**Project Rate of Return (%) vs. Offtake Price* ($/kg)**

**2.00** **5.00** **10.00 ($/kg)**

* 45V Credits not applied

- ROICE Workflow generates IRR vs. Offtake Price graphs for a range of sensitivity cases
  - Project Size
  - Offtake Price
  - Cost Reductions
  - Performance Improvements
- Results shown here for repurposed hydrogen projects at a favorable location in the GOA with high wind speeds in shallow water
- Footprint constraints limits project size to 250 MW or less
- Conclusion: Even with the most favorable conditions, offtake price between $5 and $10/kg needed to generate acceptable IRR's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# BACKUP SLIDES

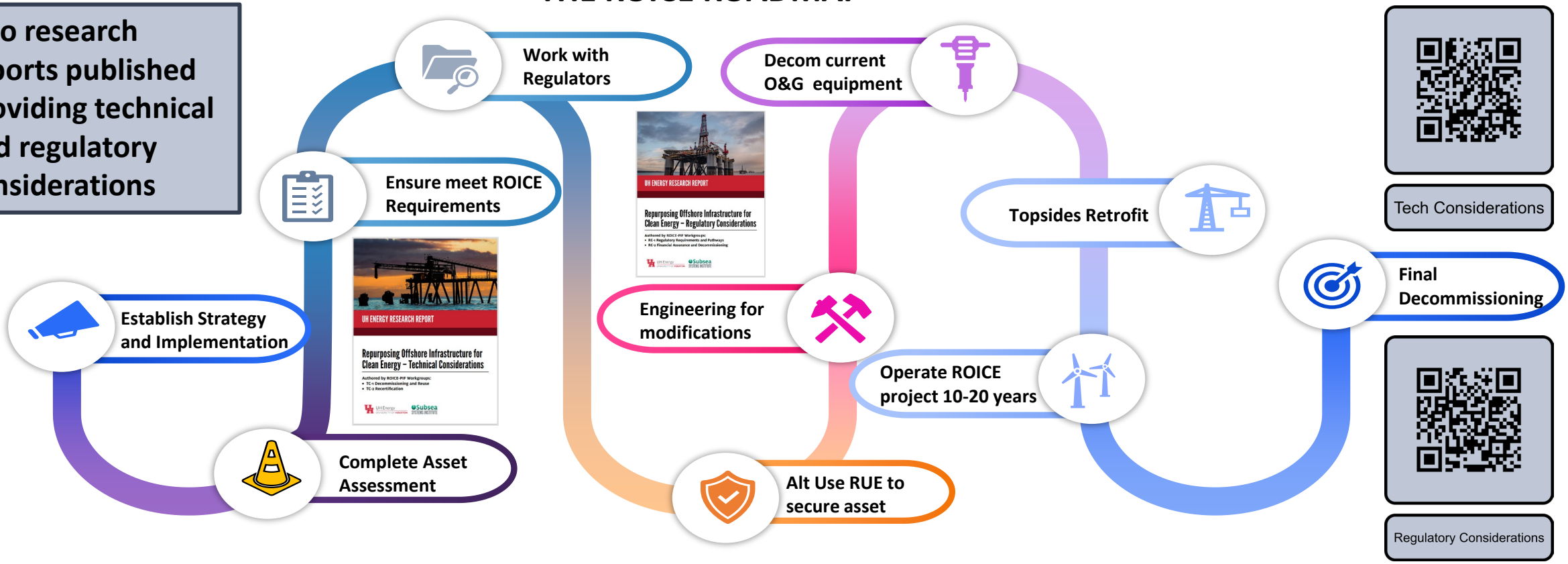
August 2025

# The ROICE Roadmap

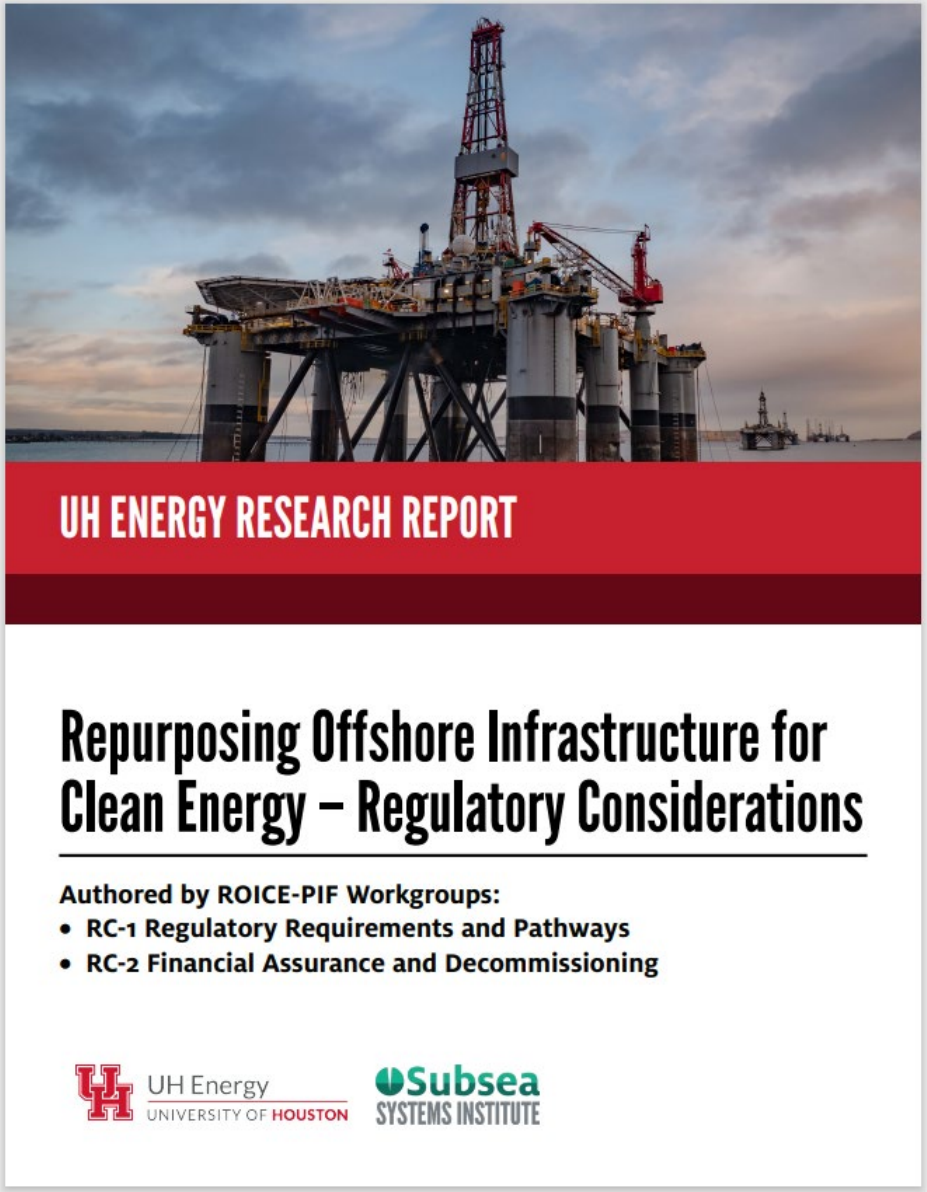
## ROICE and the RPC are developing a structured roadmap & commercial templates to accelerate the developments

**Two research reports published providing technical and regulatory considerations**

### THE ROICE ROADMAP



# ROICE-PIF – Regulatory Considerations Report



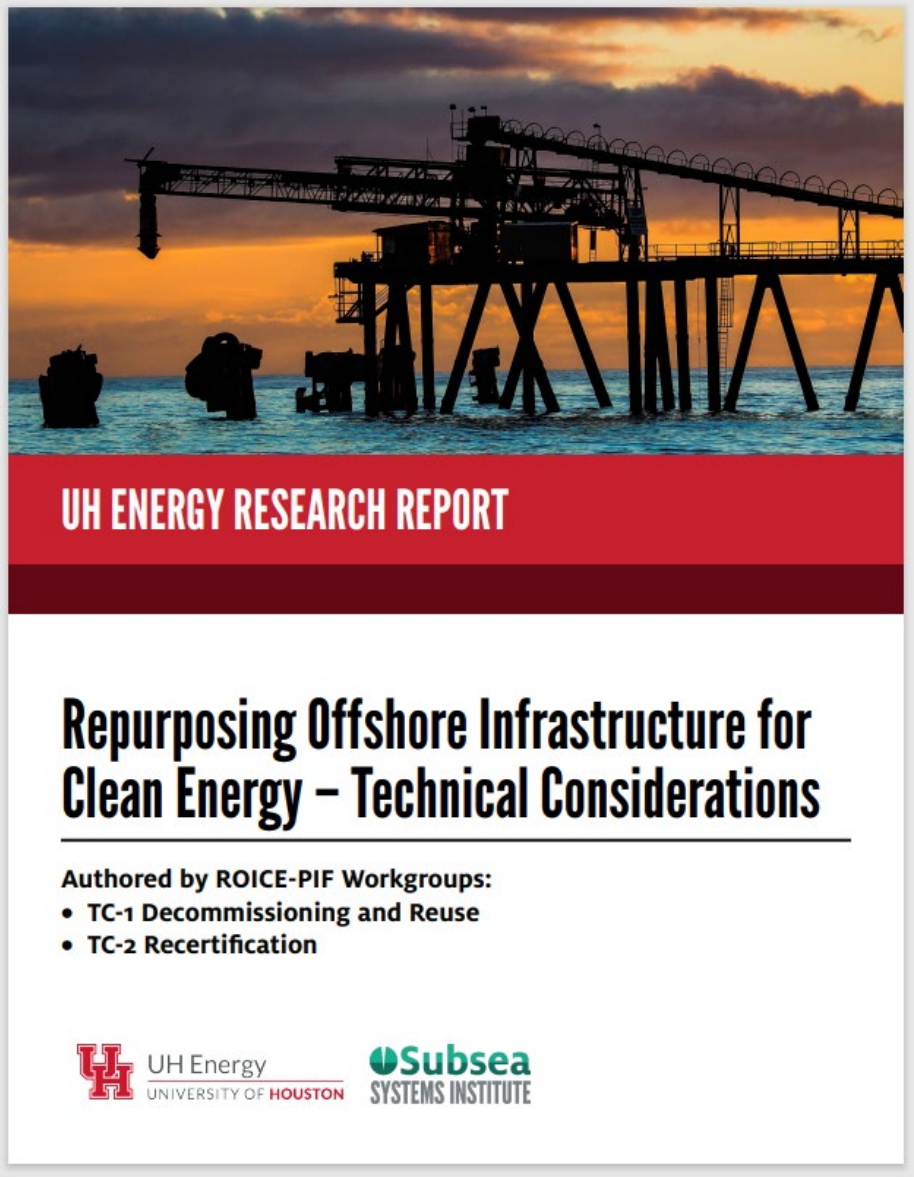

**ROICE-PIF Workgroups** made up of RPC Members develop detailed guidance for stakeholders of ROICE projects in the GOM:

- Regulatory compliance requirements
- Liability transfer pathways
- Financial assurance mechanisms
- Commercial and operational frameworks
- Technical certification of structures
- Pre- and post-ROICE decommissioning requirements

The **Regulatory Considerations Research Report** guides stakeholders in a ROICE project to focus on the following pillars of success:

1. **Communication:** Being transparent and holding proactive discussions with all regulators, agencies, communities and investors
2. **Regulatory Compliance:** Consider using 30 CFR Part 285 to obtain permits; stay up to date with regulatory changes from BOEM and BSEE
3. **Financial Assurance:** Straightforward and comprehensive transition of decommissioning and regulatory liability and responsibilities from current oil and gas operator to ROICE operator

# ROICE-PIF – Technical Considerations Report




The **Technical Considerations Research Report** guides stakeholders in a ROICE project in the GOM to focus on the following key elements to ensure the structure is suitable for repurposing:

## Risk Assessments

Assessments should be performed to help determine an existing asset's suitability. Consequence scenarios(life safety, environment, business disruption) are identified

## Decommissioning

Required decommissioning must be completed; existing wells must be plugged and abandoned; oil and gas processing equipment and risers and conductors removed prior to commencing a ROICE project

## Platform Recertification

Structural inspections, a life extension study, and a structural integrity management plan to validate the existing condition

## Regulatory Compliance

Ensure compliance with BOEM and BSEE mandates – engage early.