ROICE

Repurposing Offshore Infrastructure for Continued Energy

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

ROICE : A Framework for Repurposing Offshore Infrastructure

October 2025

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University of Houston ROICE Program

ROICE
Repurposing Offshore Infrastructure for Continued Energy

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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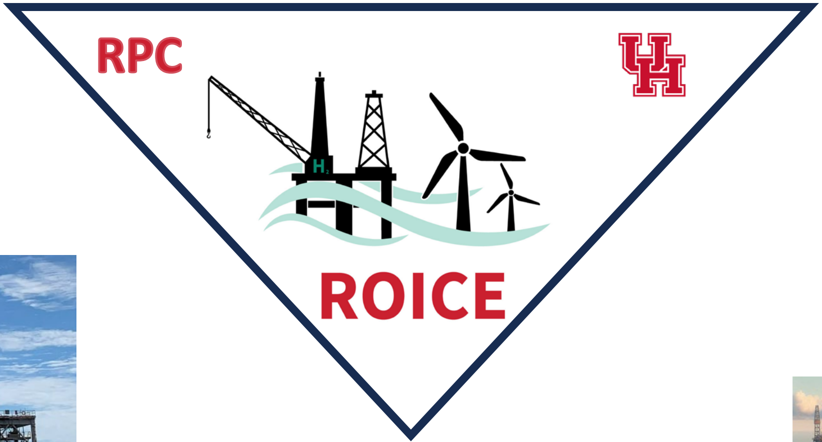
ROICE As An Alternative to Decommissioning

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

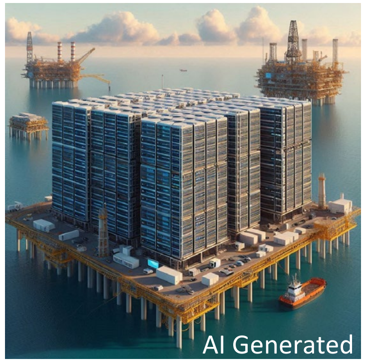


Alternate Energy

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

Other Options

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

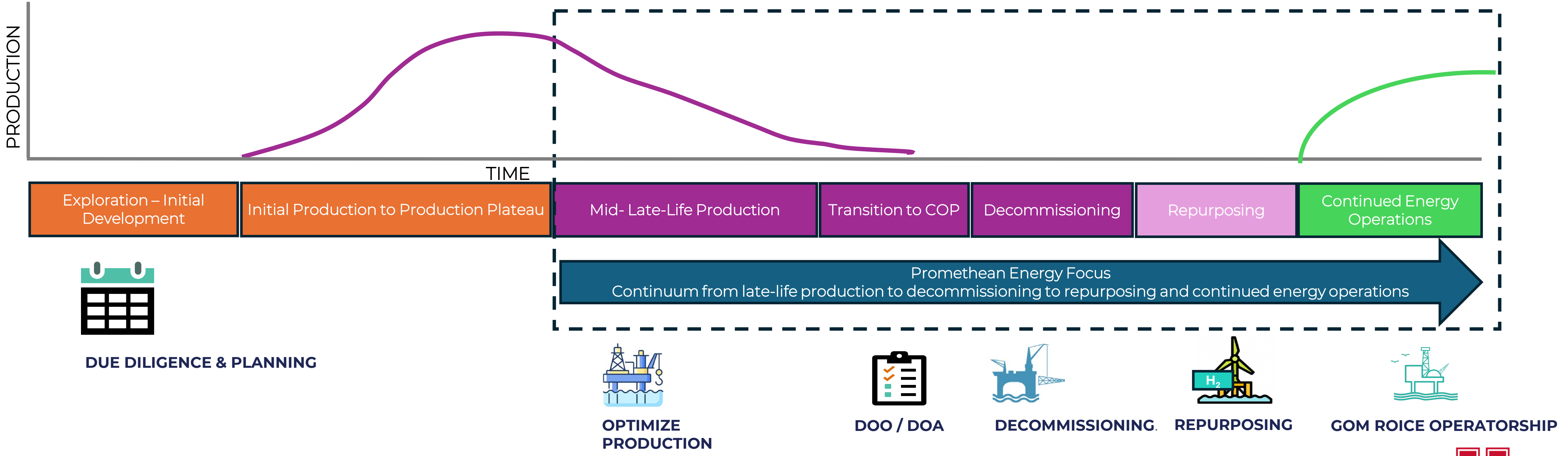


AI Generated

The ROICE Phase of Asset Life

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

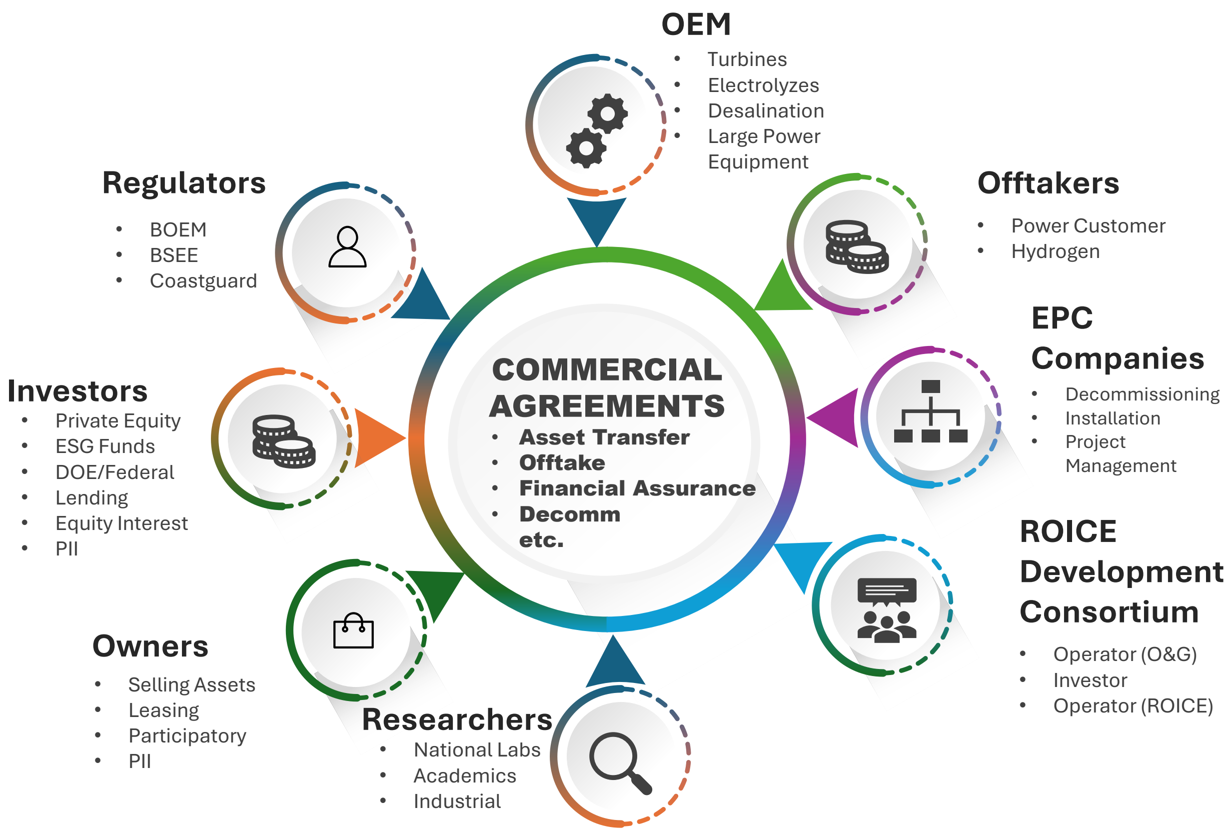
*Offshore Asset Lifecycle**



* Courtesy: Promethean Energy

ROICE Stakeholders

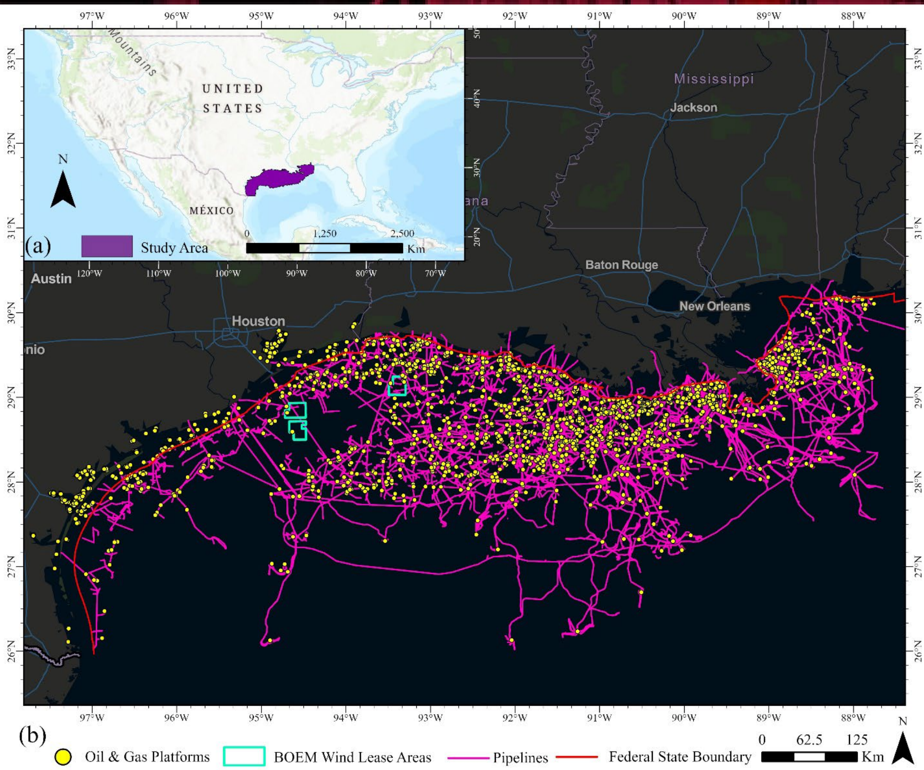
The ROICE Program brings together the multiple stakeholder groups needed to make a repurposing project successful



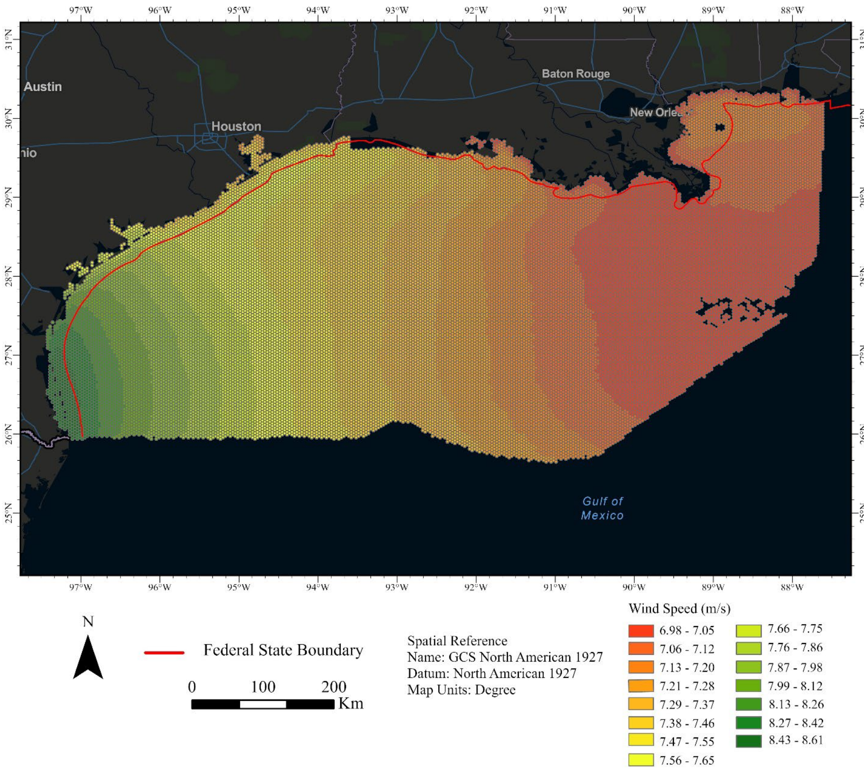
Requires coordinated efforts across:

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

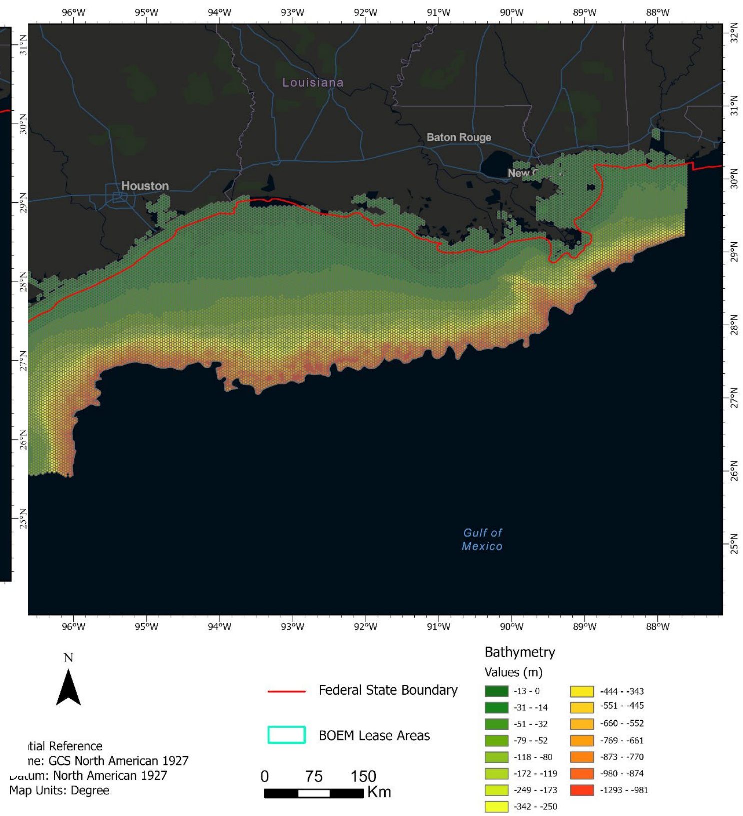
ROICE Potential in the Gulf of America



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

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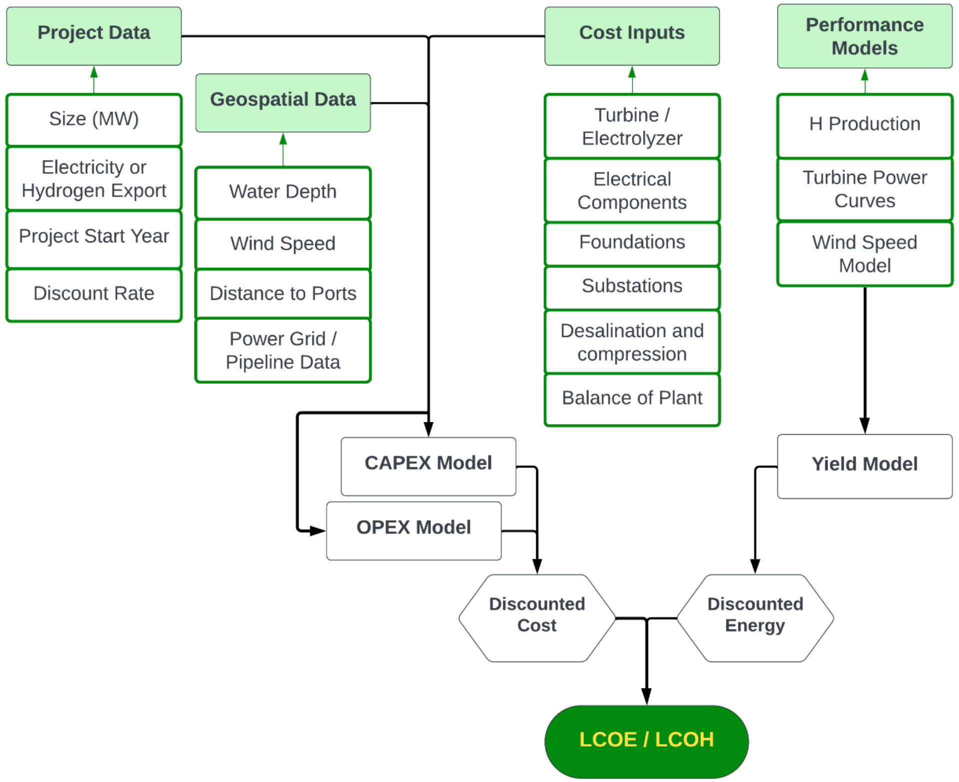
A UH ENERGY PROGRAM



Workflow of our Model

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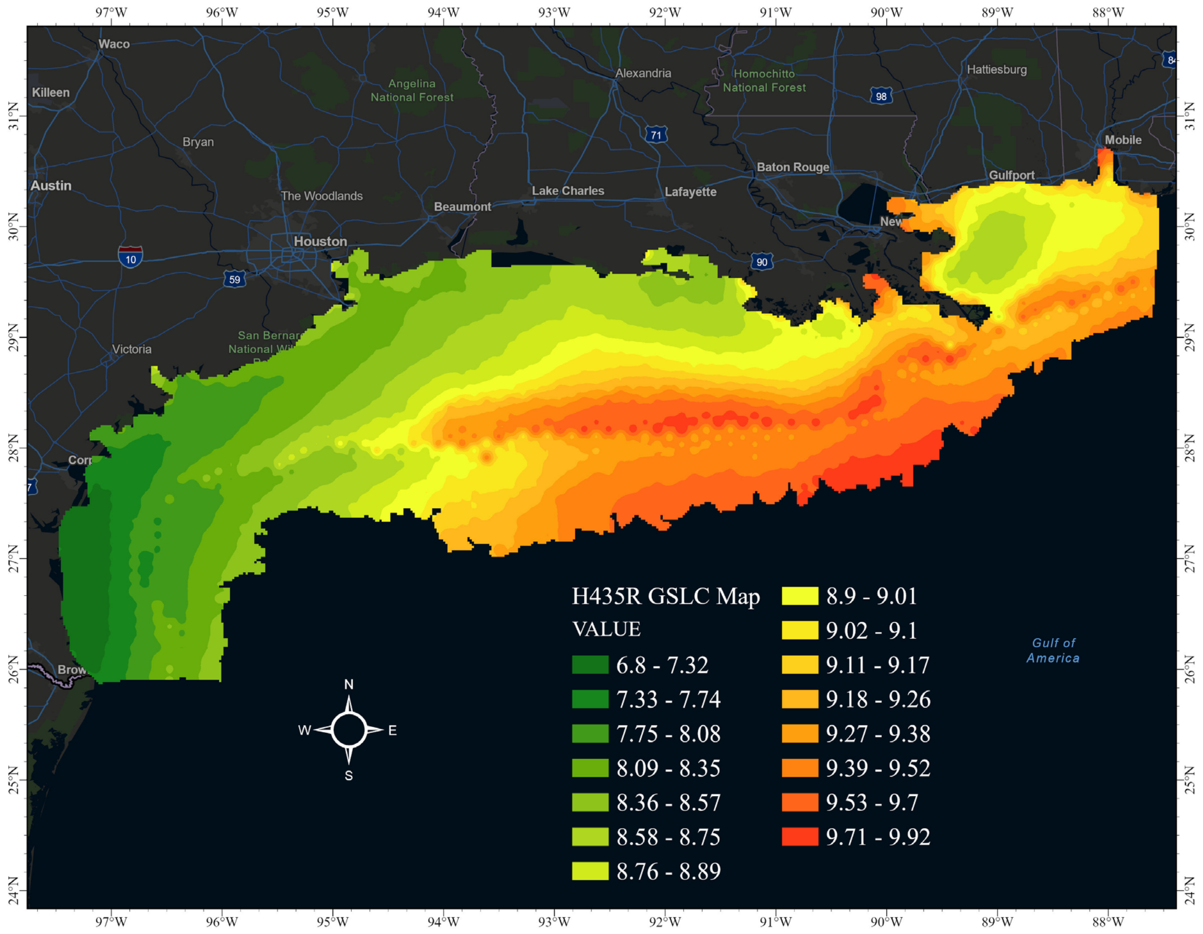
ELSEVIER

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

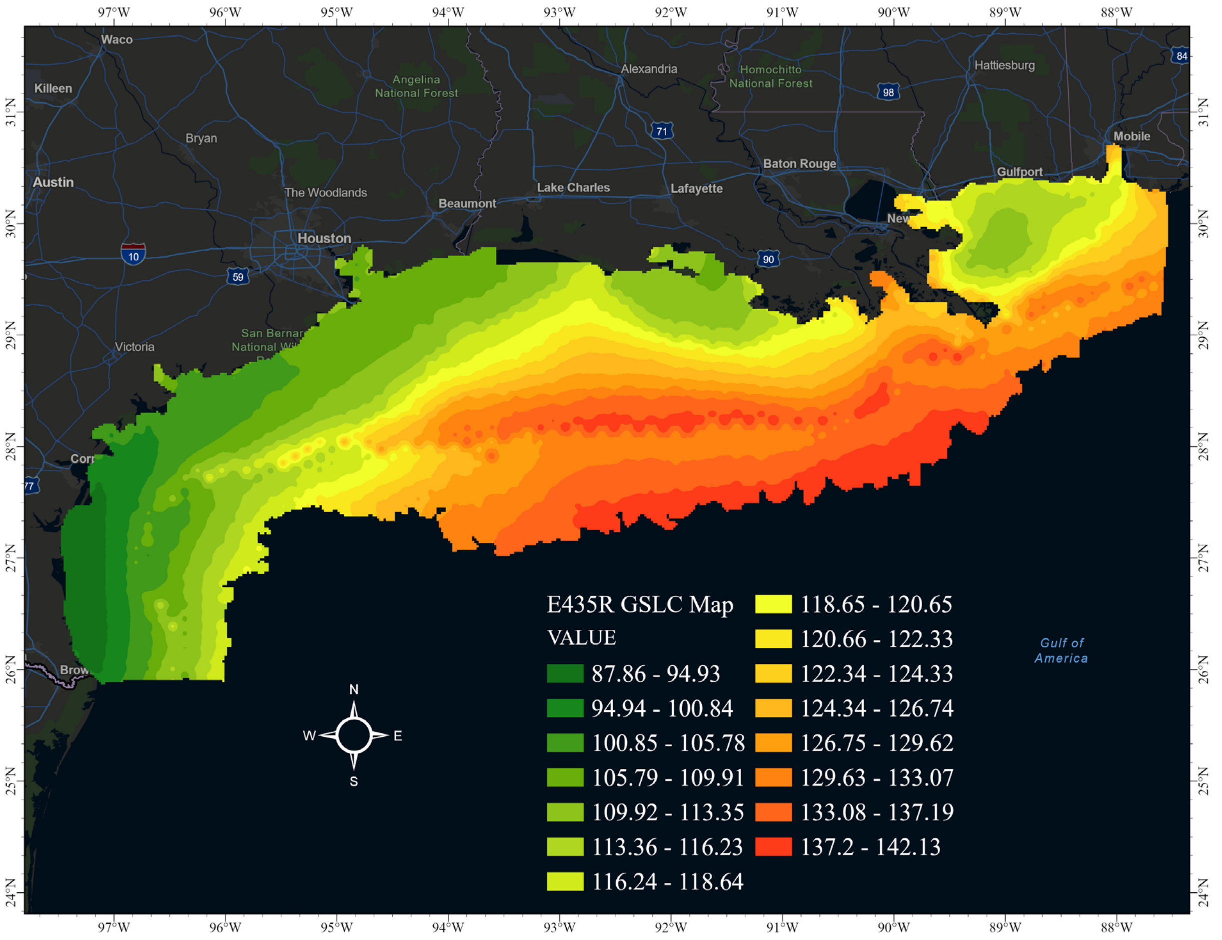
Yugbhai Patel, Muhammad Younas, Paulo Liu, Ram Seetharam *

- 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

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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 Capcity (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)	167465.39
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

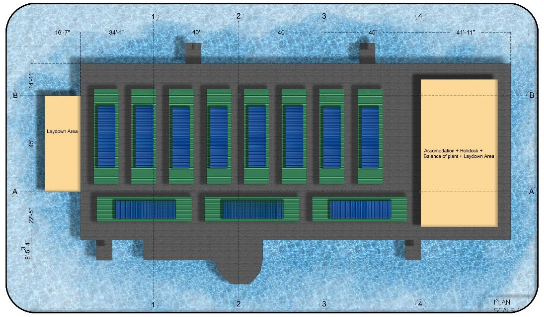
ROICE Economic Model Results

* c/kwh or $/kg * $/MW or $/kg

Case #	P/H	MW	Price*	Cost Red	Perf Impr	CAPEX (M$)	AVP (M$)	IRR (%)	Levl. Cost
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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Repurposing Offshore Infrastructure for Continued Energy

- 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

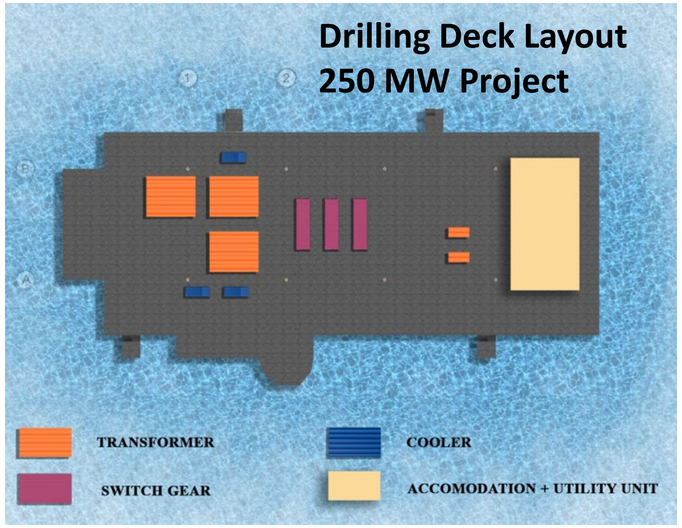
** Data provided for research purposes only by Walter Oil*

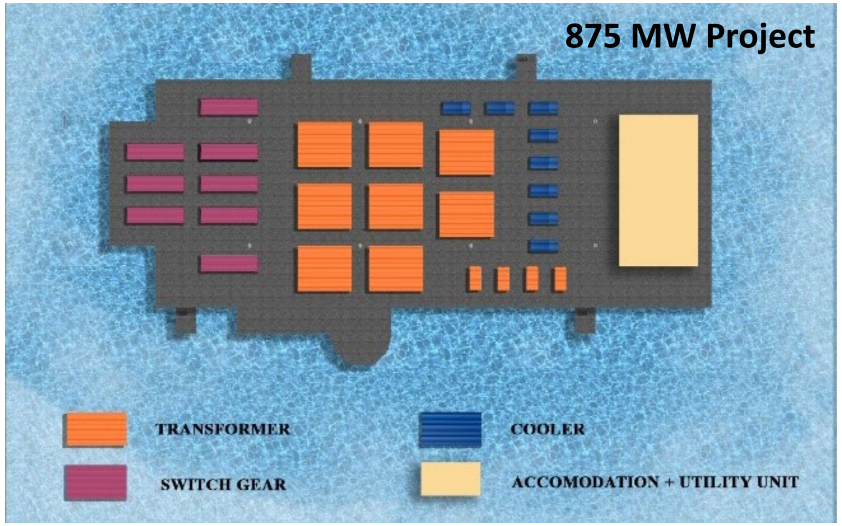
Repurposing Case Study:
Gulf of America Platform As An Offshore Wind Substation

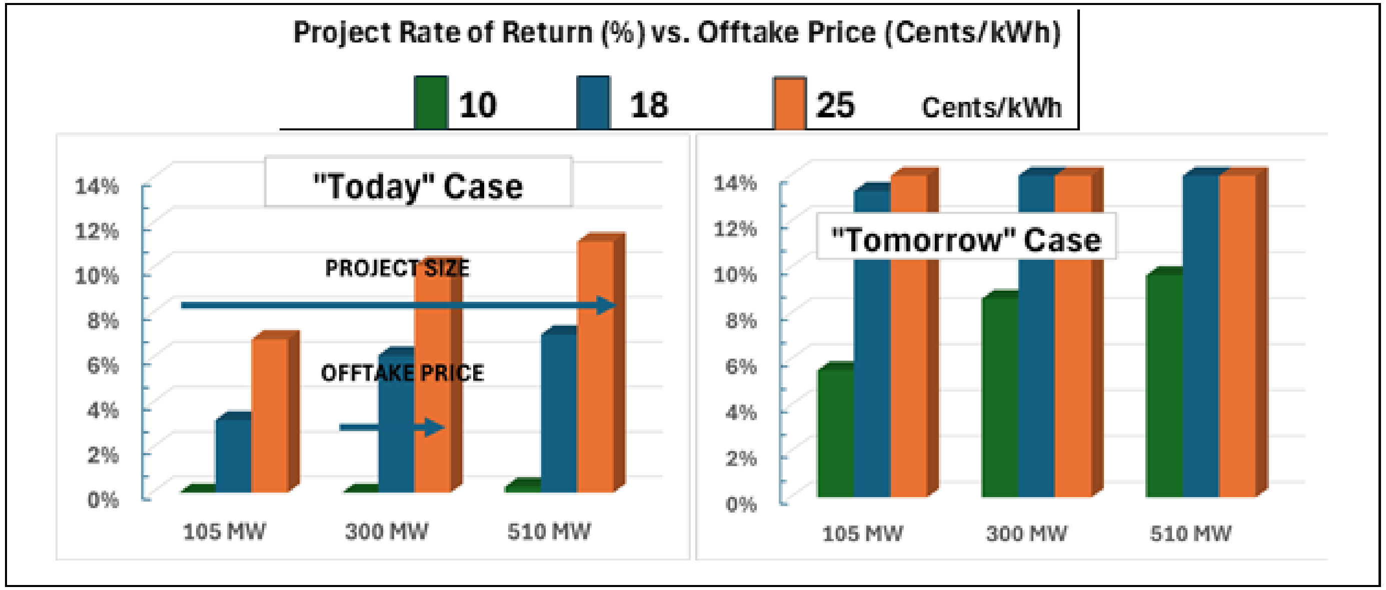
Project Size: ST-311-A* can support a project as large as 875 MW

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)





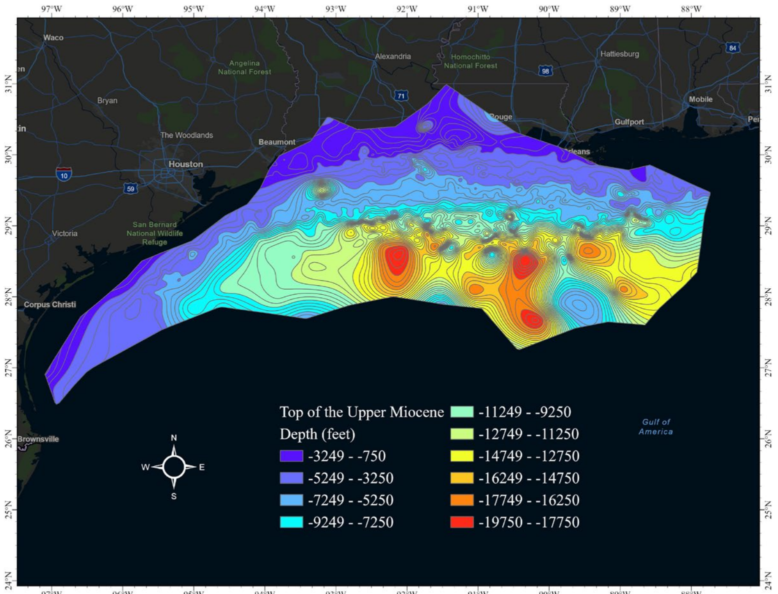


Conclusion:

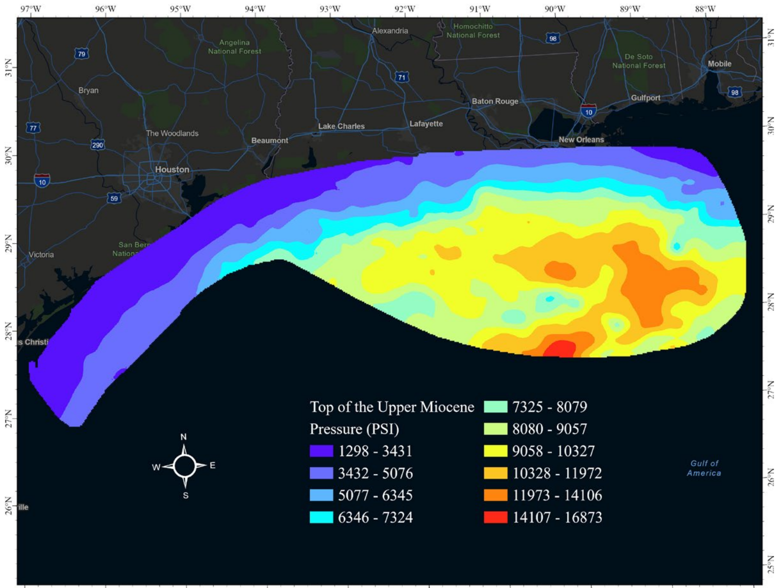
- With cost and performance improvements, offshore platforms in the GOA can profitably serve as substations to support wind farms in the range of 100 to 1000 MW

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

Offshore CO2 Sequestration



Source: US Geological Survey

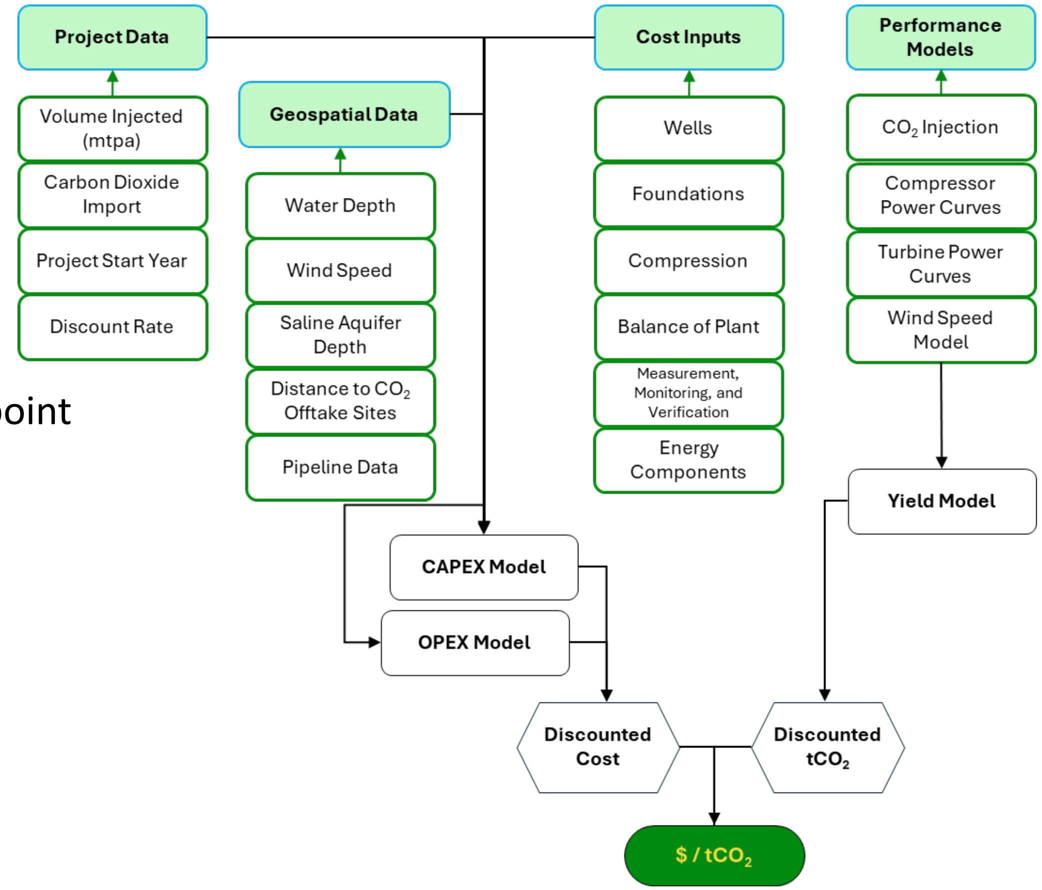


Key Variables

- Distance to shore / CO2 delivery point
- New vs. refurbished pipeline
- Offshore compression needed?
  - Arrival pressure
  - Reservoir Depth
  - Reservoir Pressure
  - Volume of CO2
- Monitoring program costs
- Injection wells - # and $

Levelized Cost

- Revenue stream = 45Q $85/ton + offtake charges to emitters
- Capture costs can be 40 to 60% of total sequestration costs
- Offshore component LC needs to stay well within $85/ton



Source: Gulf Coast Carbon Center (GCCC)

Advantages of Offshore Sequestration

- Multiple benefits seen for offshore CO_2 sequestration vs onshore
- Faster project start up easier permitting timeline:
  - Faster well permits: Class VI well permits critical path for onshore sequestration – given likely no freshwater aquifers to protect offshore eliminate requirement for Class VI well permits?
  - Faster approvals of pipeline right of way: minimal onshore pipelines, and easier permitting for offshore pipelines
  - Simpler permitting process for acreage: Plume acreage leasing can be a showstopper for onshore sequestration – not an issue offshore
  - Regulatory agencies working to develop regulations for offshore lease acreage permitting for sequestration
- Not advisable to reuse without careful studies and design”
  - Existing oil and gas wells: Cement integrity, metallurgy concerns at wellbore increase risk of CO_2 leakage
  - Depleted oil and gas reservoirs for CO_2 storage: potential for leakage of CO_2 through wells in the plume pathway
- However, other assets can be repurposed for sequestration projects:
  - Reusing existing pipelines can further reduce permitting time and environmental studies etc,
  - Reusing structures can reduce capex and execution time to improve project economics
  - Sidetracking existing wells and injecting into saline reservoirs can reduce costs and improve economics

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BACKUP SLIDES

August 2025

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

- 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

- *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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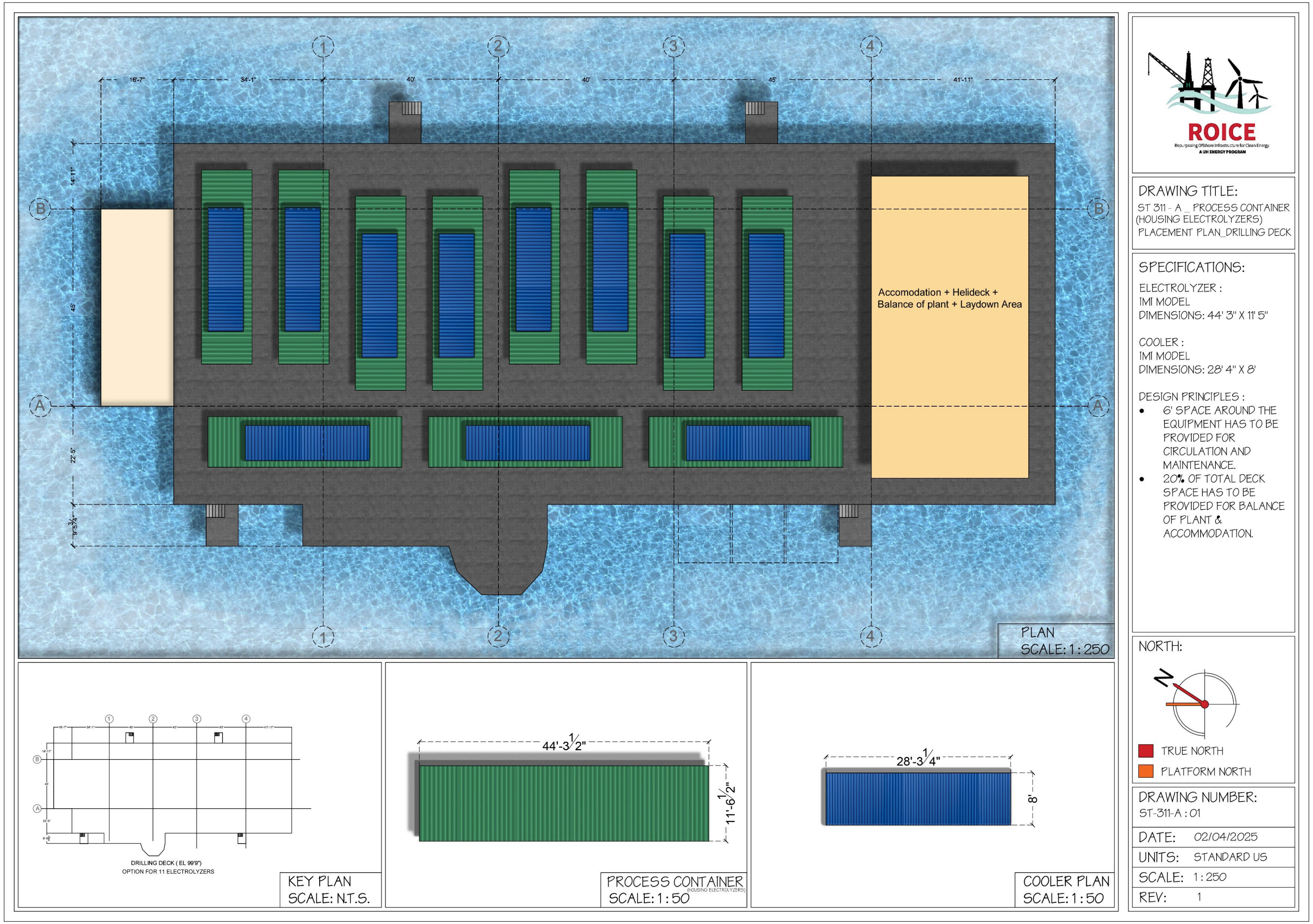

Total: 11 x 5 MW Process Containers on drilling deck

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

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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

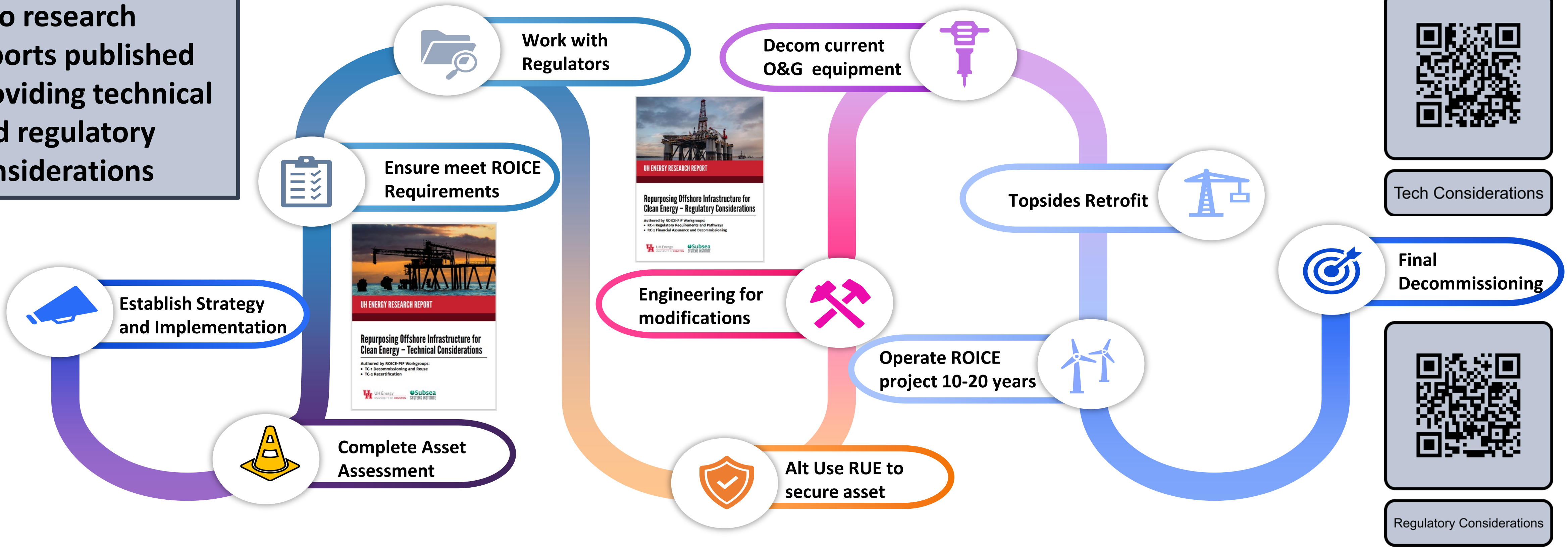
Division of Energy and Innovation
UNIVERSITY OF HOUSTON

The ROICE Roadmap

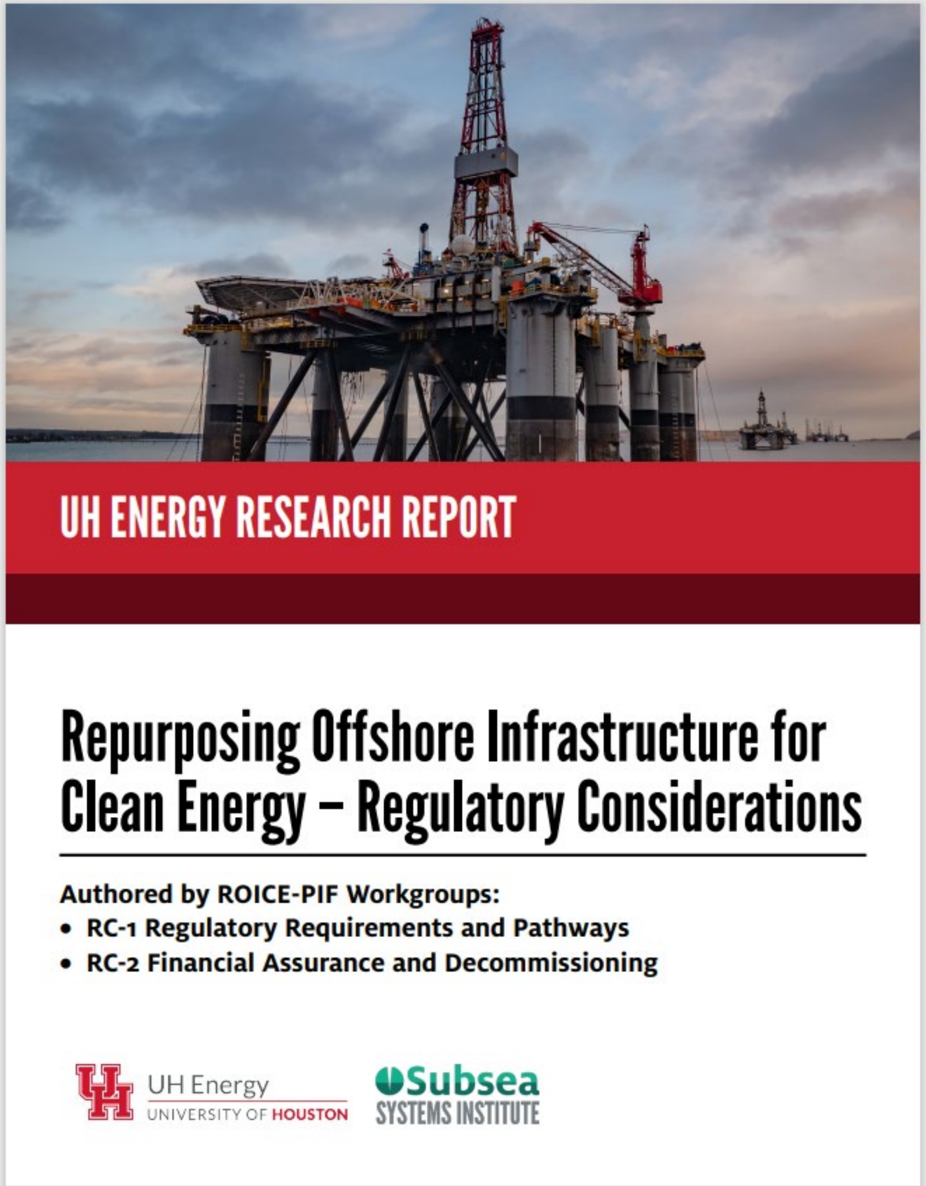
ROICE and the RPC are developing a structured roadmap & commercial templates to accelerate the developments

THE ROICE ROADMAP

Two research reports published providing technical and regulatory considerations



ROICE-PIF – Regulatory Considerations Report


UH ENERGY RESEARCH REPORT

Repurposing Offshore Infrastructure for Clean Energy – Regulatory Considerations

Authored by ROICE-PIF Workgroups:
- RC-1 Regulatory Requirements and Pathways
- RC-2 Financial Assurance and Decommissioning

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Subsea SYSTEMS INSTITUTE

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


UH ENERGY RESEARCH REPORT

Repurposing Offshore Infrastructure for Clean Energy – Technical Considerations

Authored by ROICE-PIF Workgroups:

- TC-1 Decommissioning and Reuse
- TC-2 Recertification

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Subsea SYSTEMS INSTITUTE

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.