SHOWPLACE Concept Workshop

September 2021

Project SHOWPLACE – Key Modules

Module 2: Power Transmission to Shore

Module 3: Freshwater – Generation, Storage & Supply

Green Hydrogen Utilization

Module 1: Wind Power Generation

Module 4: Hydrogen Generation & Utilization

Module 6: Offshore Infrastructure

Module 5: Hydrogen Storage

Module 1: Wind Power Generation

Key Discussion Points:

- Commercially available wind turbines that can operate in Texas state waters (out to 9 nautical miles from shore)?
- Key constraints: e.g. water depth, foundation style (fixed/floating), seasonal wind speed variation, electrical grid interconnections
- Routine maintenance and extreme weather hardening issues?
- Data collection, transmission, and automation requirements?
- Turbines on platforms or satellite floating structures – cost tradeoffs of structural modifications vs satellite hookup?
- Energy utilization optimization algorithms – electricity, water or hydrogen; transmit vs. store
- Generation capacity estimation – key input to sizing other components
- Zero curtailment goal – feasible?

The modular SINN Power floating wind-solar generation platform is shown as a baseline implementation example on these slides.

Module 2: Power Transmission

Key Discussion Points:

- What is the current state of electrical transmission infrastructure in Texas state waters?
- How prepared is the electrical grid to accept hundreds of MW of future offshore power if all were transported ashore?
- What is the expected growth of offshore power required in Texas state waters, e.g. oil and gas, carbon sequestration, other?
- Offshore CO_2 Sequestration has the potential to be a significant consumer of green energy
- Opportunities for greenfield electrical infrastructure buildout offshore? Financing strategies, e.g. power purchase agreements?
- Security, "smart grid", and weather hardening requirements?
- Cost tradeoffs – energy transmission vs. water and hydrogen pipelines to shore?

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Module 3: Freshwater – Generation, Storage & Supply

Key Discussion Points:

- Commercially available desalination equipment that is suitable for operation on offshore platforms?
- Size and weight constraints for desalination considering overall system component needs to be hosted on central platform?
- Power and maintenance requirements? Waste (salt) disposal?
- Relative value of freshwater for sale vs. hydrogen feedstock? Current/future locations of highest market demand for each?
- Does future outlook for direct saline water electrolyzer R&D progress affect the decision to include freshwater as a product?

Module 4: Hydrogen Generation & Utilization

Key Discussion Points:

Generation:

- Technical maturity of electrolyzers suitable for offshore use and under intermittent wind conditions?
- Impact of freshwater shortage on SMR? Synergies with freshwater generation via desalination?
- Enhancements: Oxygen as a product? Saline electrolysis?

Utilization:

- Current capacity of Gulf Coast hydrogen pipeline network?
- Outlook for continued H_2 use as refining and petchem feedstocks?
- Balance between Grey/Blue/Green Hydrogen?
- Current/future capacity of gas turbine power plants to accept hydrogen as auxiliary fuel?
- Capacity to blend hydrogen into gas network?
- Avoid "stranded" power generation assets by investment in dual fuel methane-hydrogen gas turbine designs?

Module 5: Hydrogen Storage

Key Discussion Points:

- What is the expected hydrogen storage capacity (salt and depleted hydrocarbon reservoirs) in Texas state waters?
- Compare costs and benefits of salt domes vs. depleted hydrocarbon reservoirs vs. saline reservoirs as storage locations
- Can learnings from depleted gas field storage of hydrogen in UK North Sea and Irish Sea be transferred to Texas Gulf of Mexico?
- Potential synergies from co-located, i.e. stacked, geologic storage of carbon dioxide and hydrogen at optimal sites?
- Unique regulatory and safety considerations for geologic hydrogen storage?

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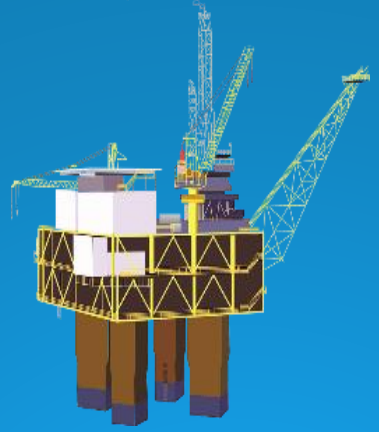

Module 6: Offshore Infrastructure

Key Discussion Points:

- Site selection for demonstration project; are there enough sites for scale-up?
- Sweet spot overlay of existing infrastructure with wind speeds, storage reservoirs, etc.
- Structural integrity of older structures
- Feasibility of replacing existing topsides modules with new modules such as desalination, compression, wind turbines, electrolysis units
- Hydrogen storage/production vs oil & gas wells – what design considerations?