

A large white offshore wind turbine dominates the foreground, with its three blades extending across the frame. In the background, several other similar turbines are visible on a vast blue ocean under a clear sky. The image is used as a background for a presentation slide.

Empire Engineering
Offshore Wind Conference Foundation Ex 2022
10 May 2022 Bristol, United Kingdom

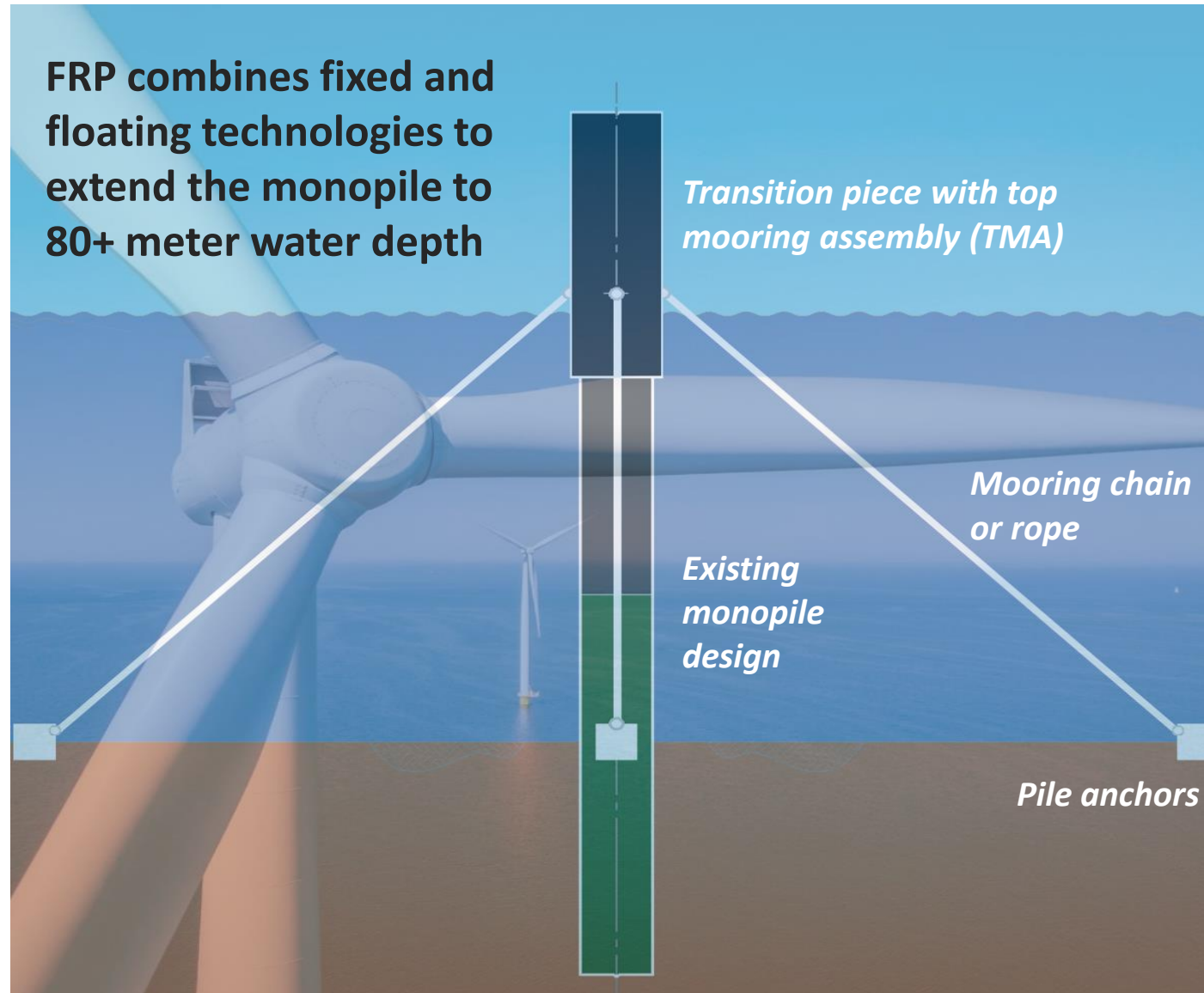
Benefits of the FRP™ Monopile

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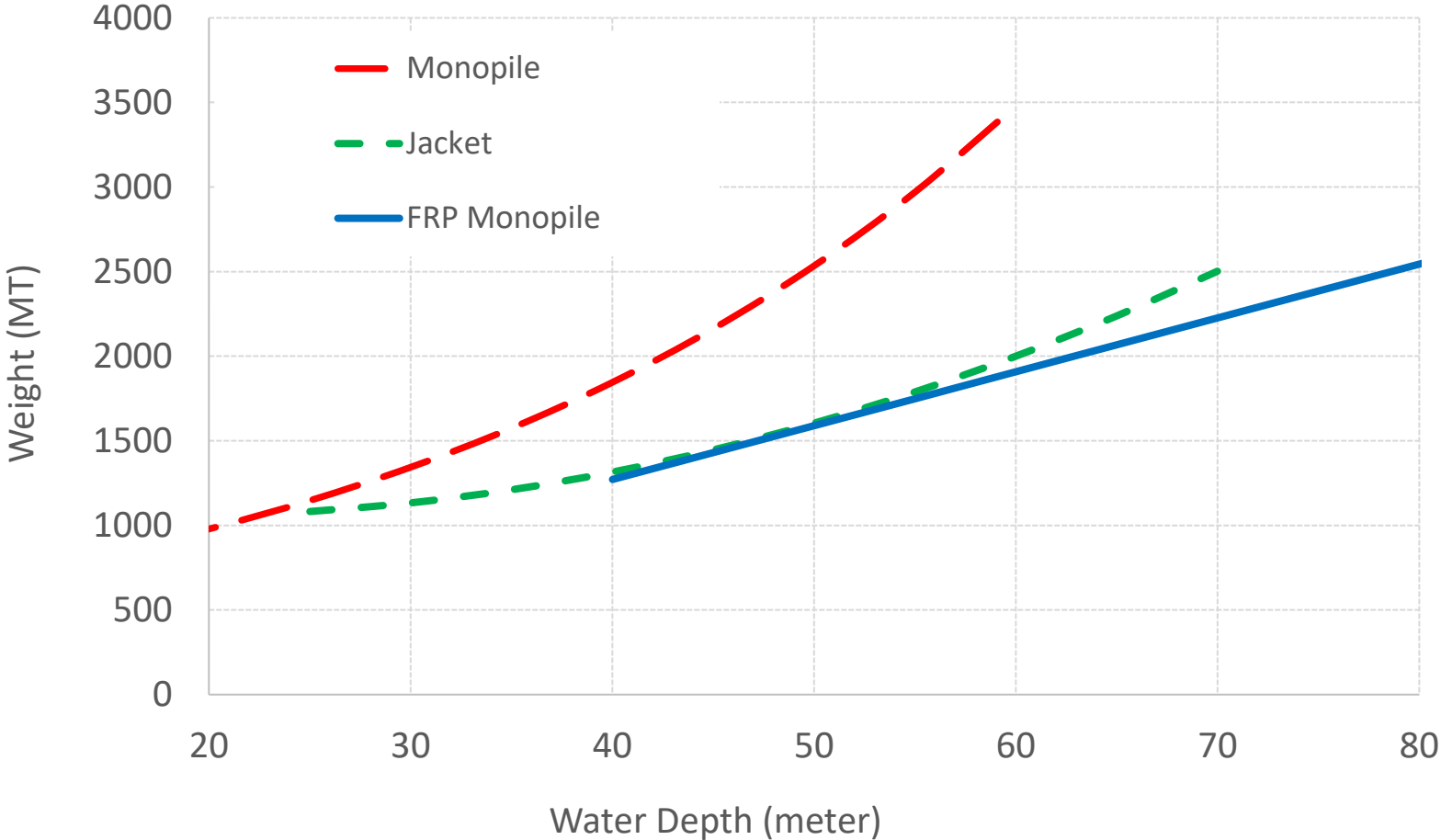
The FRP monopile technology extends the monopile operating depth to 80+ meter. This session explores the benefits and the technology development process for the FRP™

Industry Challenge – Reduce the Cost of Offshore Energy in Deeper Waters



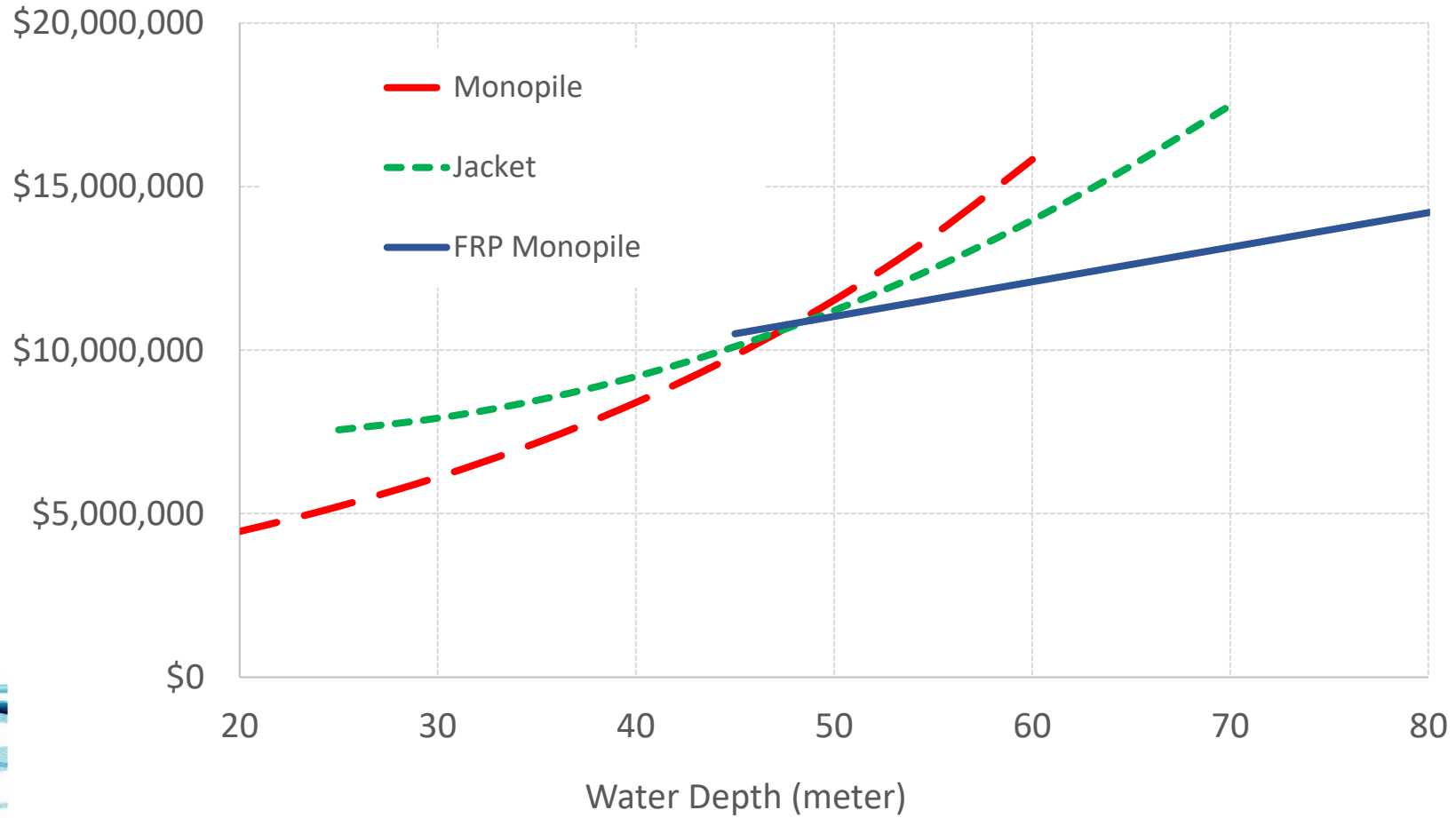
Lighter Less Complex Structure

Foundation Weight Estimates for a 15MW Unit

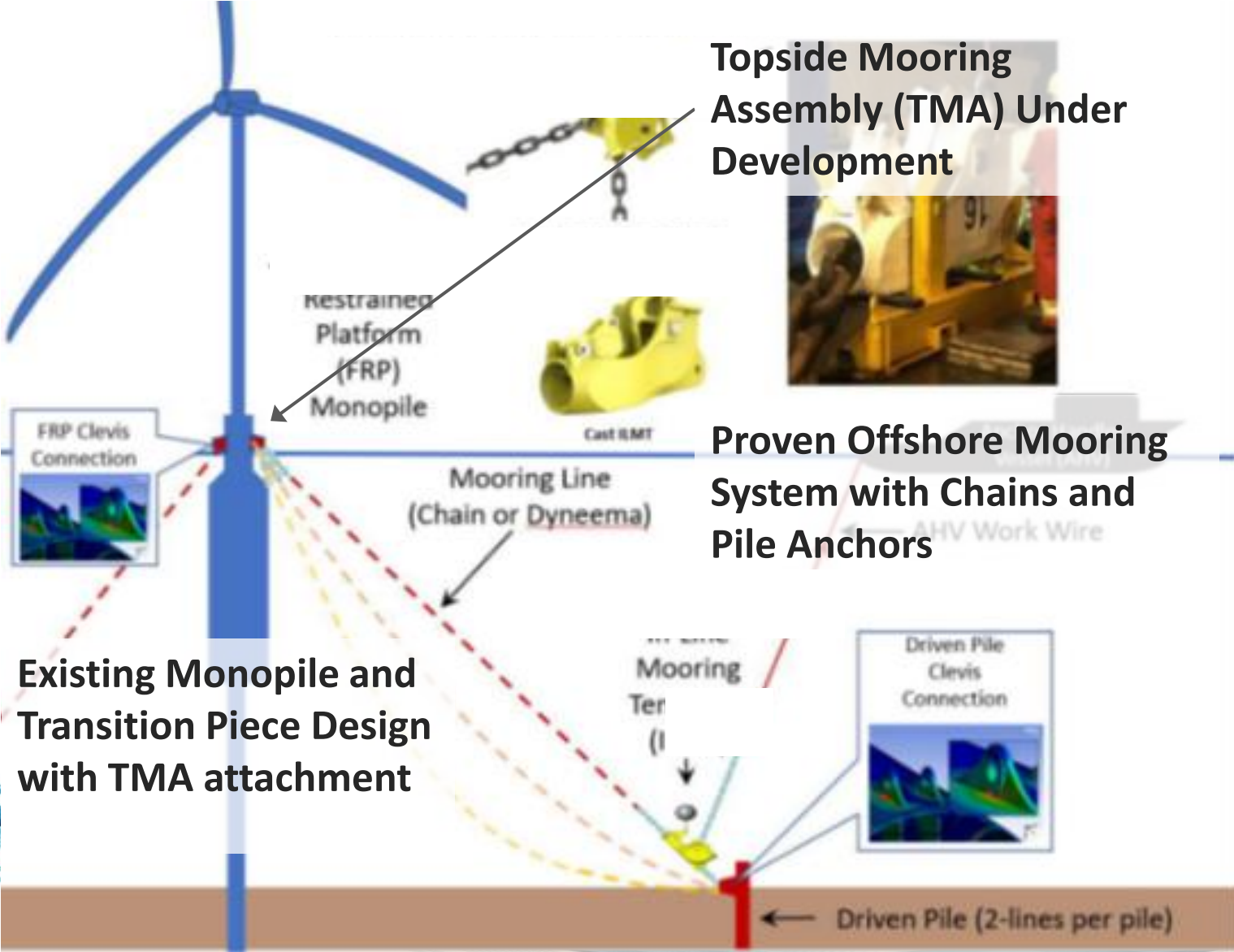


Cost Improvements

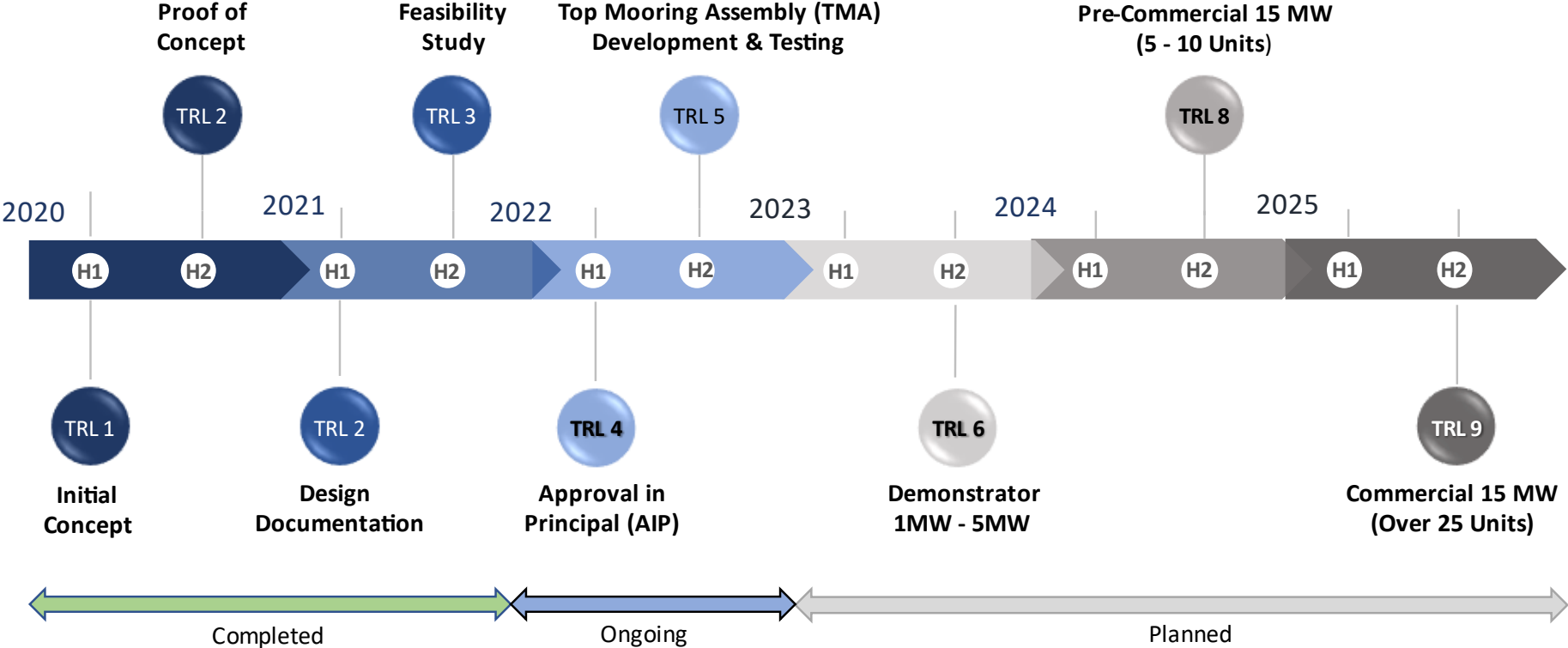
Foundation EPCI Estimates for a 15MW Unit



Existing Supply Chains and Fabrication Capacity



FRP Development Plan



- TRL 1: FRP concept and patent, FRP patent**
- TRL 2: Proof of concept study (global motion) & design documentation**
- TRL 3: Feasibility study offshore Massachusetts (15MW turbine in 40-to-80-meter)**
- TRL 4: Ongoing AIP certification project with DNV**
- TRL 5: Ongoing TMA project planning, TMA patent**

Offshore Massachusetts Study Confirms Feasibility

Conclusions

Technically feasible up to 80m / 15MW

Economically feasible with improvements in LCOE beyond 55m

At the limit of existing fabrication and installation capabilities at 80m

Project Partners



Overall FRP design, global motion and sizing and LCOE



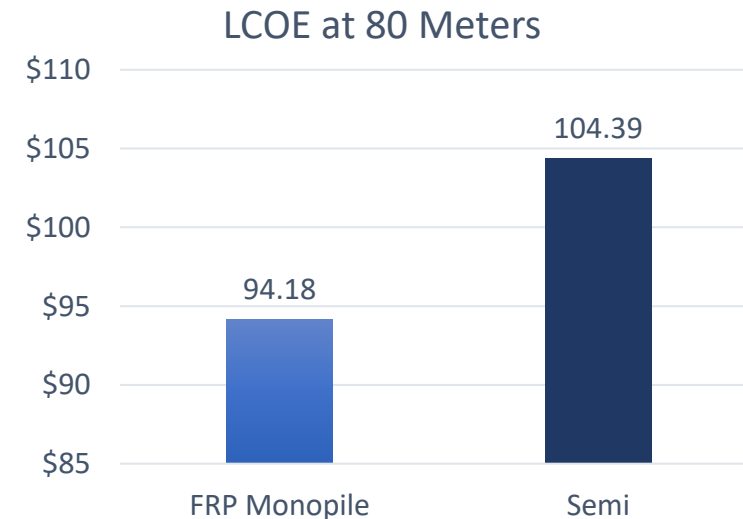
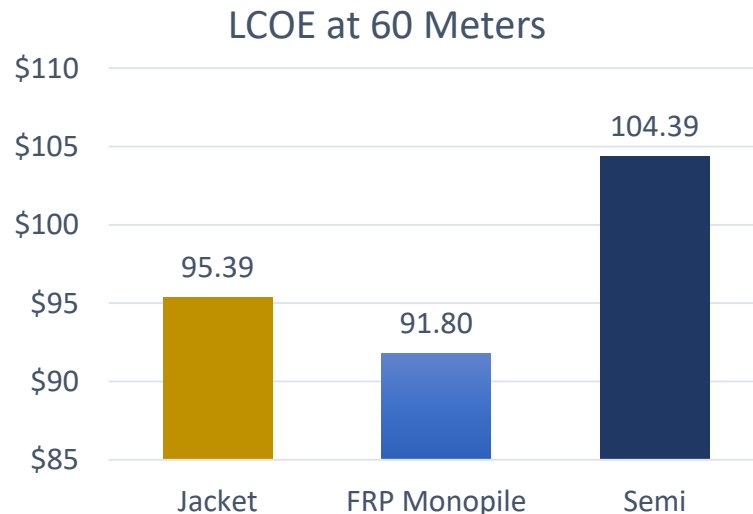
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engineering

Monopile and TP component design and costing



INTERMOOR

Mooring and anchor design and costing



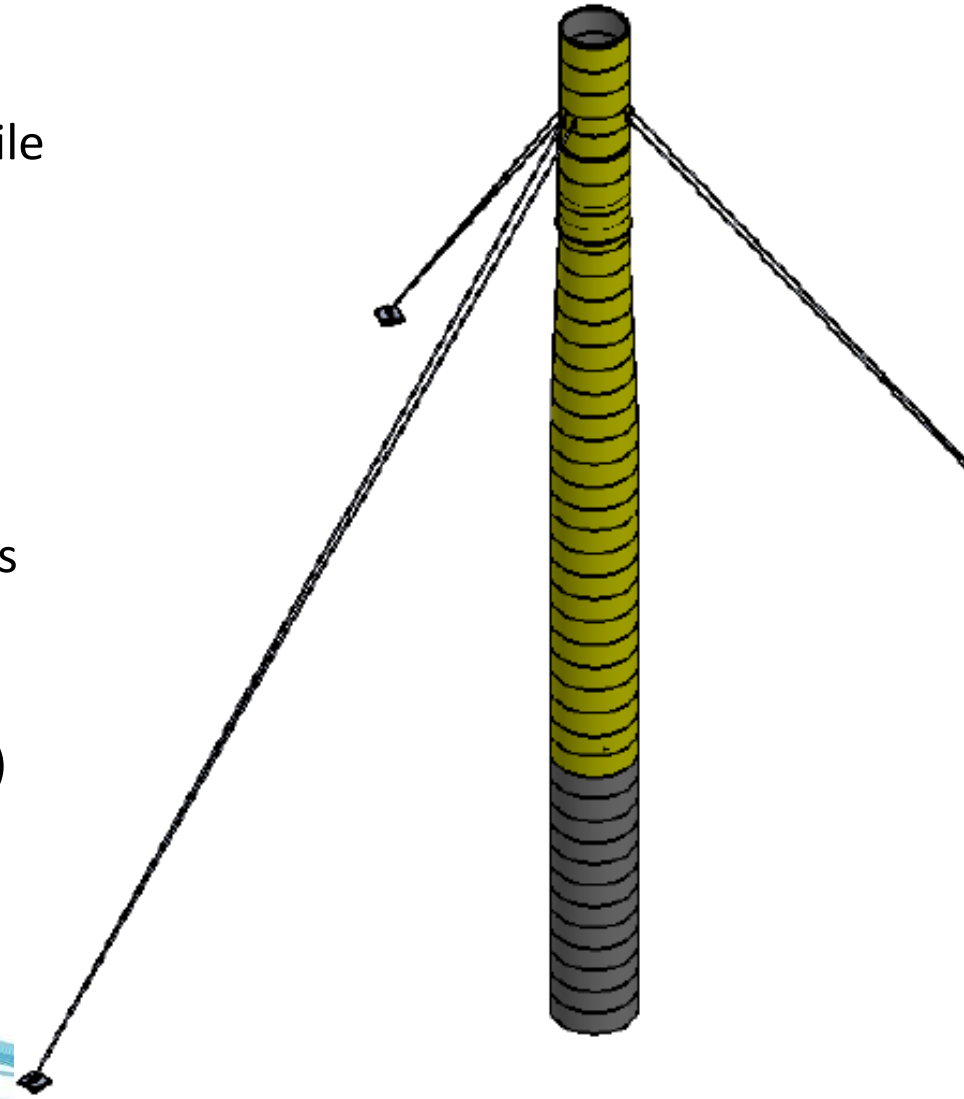
Summary

The FRP monopile extends the monopile to 100-meter operating depth

- Lighter less complex structure
- Improved economics
- Established supply chains
- Proven mooring technologies

Study offshore Massachusetts confirms technical and economical feasibility

TRL driven development milestones targeting demonstrator in 2023 (TRL 6)



Thank You



FRP™ Monopile Foundations for Deeper Water

- Reduced levelized cost of energy
- Extended operating depth to 100 meters
- Established monopile supply chain
- Proven mooring technology with less footprint
- Lighter and less complex structure

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