

LARGE OFFSHORE WIND TURBINES

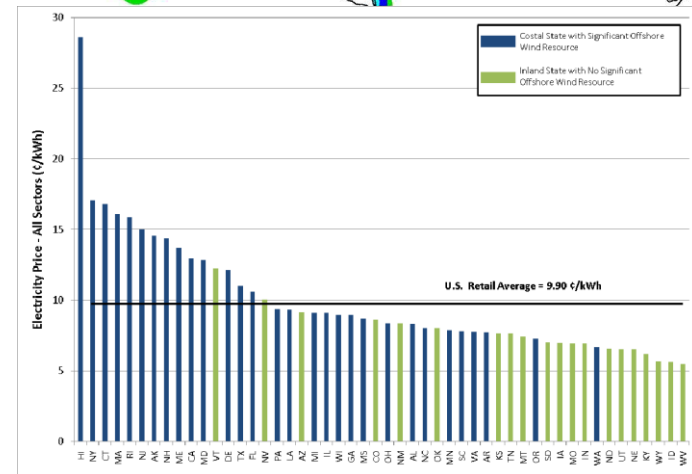
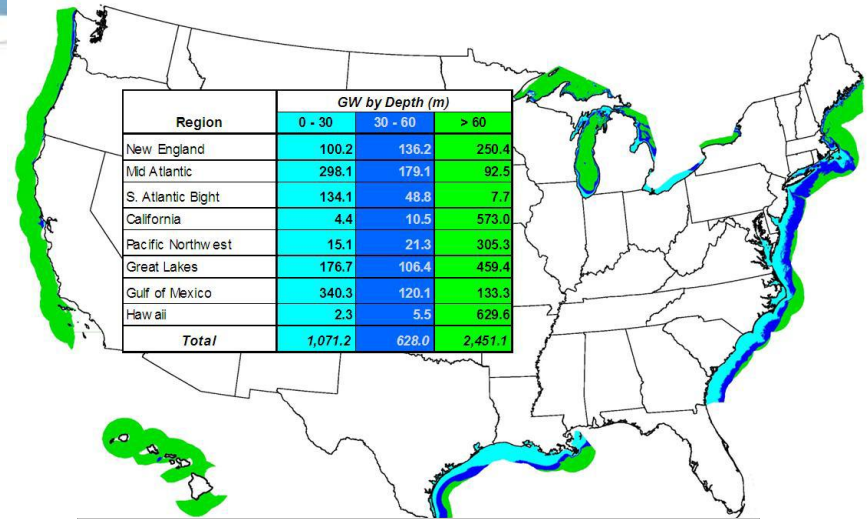


WHY OFFSHORE WIND?

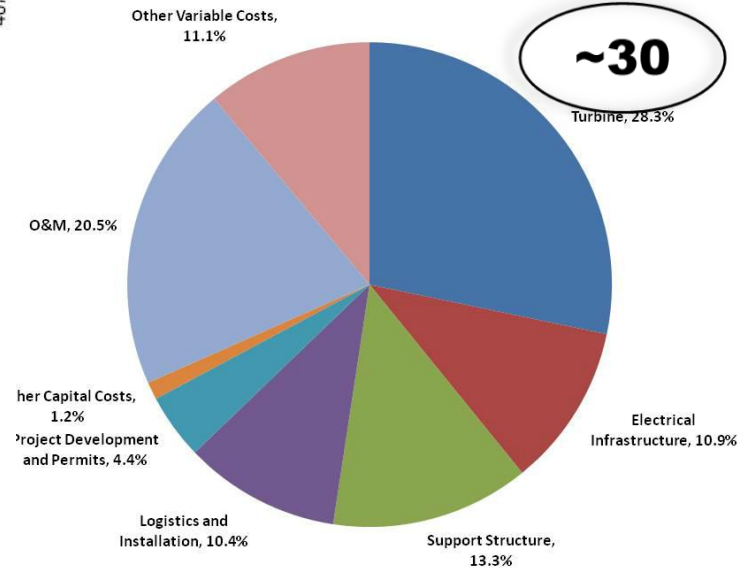
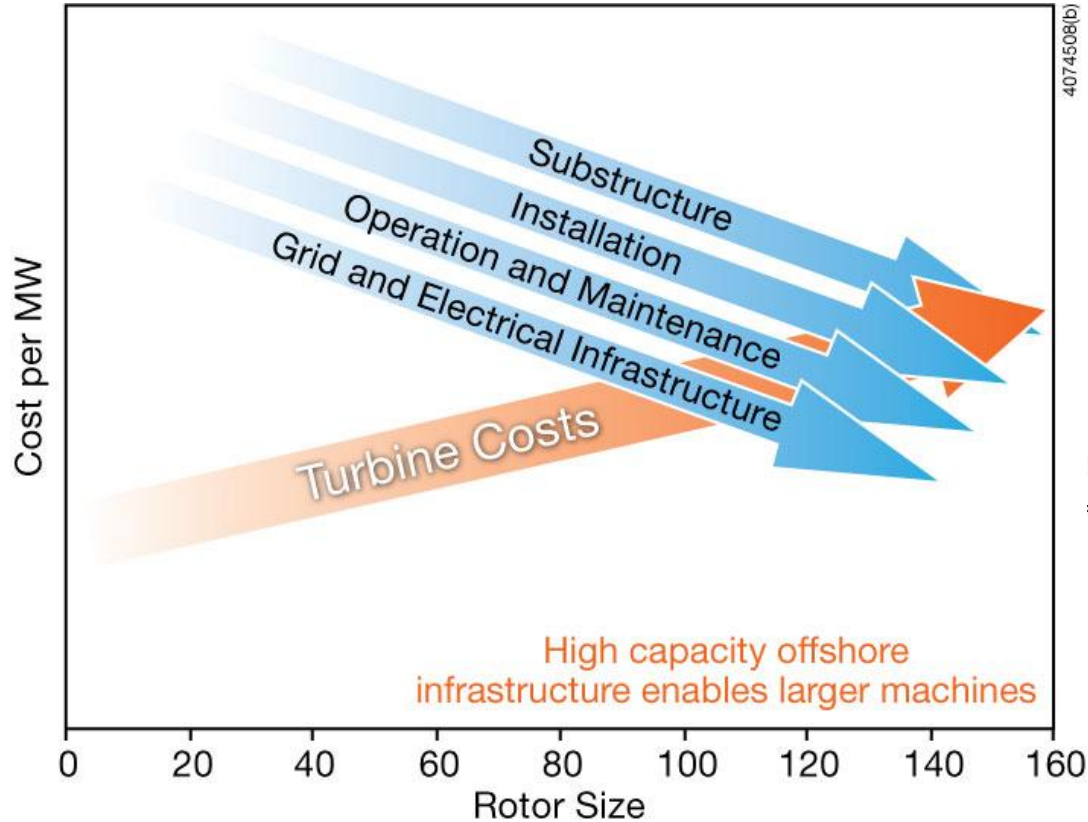
A POWERFUL RESOURCE IN US

- Resource near load centers
- Minimize greenhouse gas emissions from electricity generation
- Minimal water consumption for electricity generation
- Energy Independence
- Green Jobs and local economic development

- Higher Capacity Factors
- Low shear and turbulence
- Higher wind speeds
- Turbines can spin at higher tip speeds

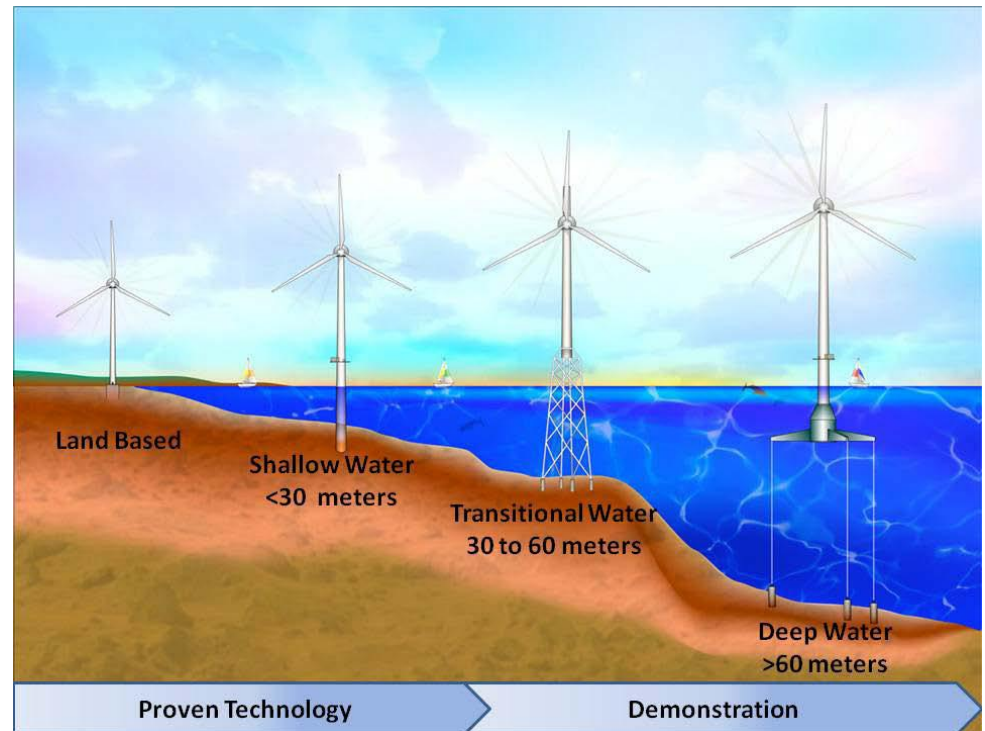


WHY LARGER TURBINES?



CHALLENGES and OPPORTUNITIES

- Rotor Blade Structure
 - New materials
 - Two-piece or Multiple pieces
 - Larger Chords
 - Independent blade pitch control
 - Active loads feedback w/sensors
- New Tower concepts
 - Composite materials
 - Lighter and corrosion resistance
 - Tower feedback controls
- Drive train
 - Direct drive or low speed
- Foundations



CHALLENGES and OPPORTUNITIES

- Corrosion protection
- Computational tools for reliable loads development (wind and wave combination) and structural analysis.
- Site specific wind data and correlation with meso-scale weather prediction models for wind assessment.
 - Further research and data collection using both anemometer but more importantly newer offshore friendly technology like LIDAR, SODAR etc... is very important
- Demonstration platforms or prototype farms are required to further develop offshore technology and its cost competitiveness. This can be similar to land based turbine testing at NREL or UK's (public-private) initiative to have 100MW offshore wind farm available for prototyping and testing.