The great use of life is to spend it for something that will outlast it.
Brave Tern is an offshore wind installation jack-up vessel specially designed for offshore wind installation.

Brave Tern is capable of being used for decommissioning platforms in 300-ft water depths.

Fred Olsen installed the offshore wind turbines on Block Island.

Fred Olsen Windcarrier, Norway-based shipping company, owns Brave Tern vessel.

Fleet consists of two self-elevating, self-propelled jack-up vessels and 7 crew transfer vessels.
America's first offshore wind farm, located in Rhode Island, constructed in 2015

Developed by Deepwater Wind and powered by GE

5 turbines capable of powering 17,000 homes

Reduces carbon dioxide emissions by about 40,000 tons per year
OFFSHORE WIND IN THE US

- 2001: Cape Wind
- 2006: NJ Legislation
- 2008-2010: DE Projects
- 2011: DOE Demo Projects Round 1
- 2012: MD Legislation
- 2013: The Network Is Founded
- 2014: The Network Expands Scope Beyond MD COP 21 & White House Summit
- 2015:
- 2016:
- 2017:

**Key Events:**
- The Network is founded in 2013
- The network expands scope beyond MD COP 21 & White House Summit in 2014
- MA Legislation in 2017
- DOE Demo Round 2 Block Island
- COP 21 & White House Summit

**Projects:**
- Cape Wind
- NJ Legislation
- DE Projects (2008-2010)
- DOE Demo Projects Round 1 (2011)
- MD Legislation
- MA Legislation
- DOE Demo Round 2 Block Island
LEASE AREAS

- Alaska OCS Region
- Gulf of Mexico OCS Region
- Pacific OCS Region
OSW WIND DRIVERS
THE US HAS BECOME A LEADER IN RENEWABLES

INSTALLED WIND CAPACITY (MW)
REGIONAL ENERGY CHALLENGE

OVER 8,000 MW OF EXISTING GENERATION AT RISK
THE POTENTIAL

OFFSHORE WIND DELIVERS ENERGY WHEN AND WHERE IT'S NEEDED MOST.
# US Water Depth

<table>
<thead>
<tr>
<th>REGION</th>
<th>GW BY DEPTH (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 30</td>
</tr>
<tr>
<td>NEW ENGLAND</td>
<td>100.2</td>
</tr>
<tr>
<td>MID ATLANTIC</td>
<td>298.1</td>
</tr>
<tr>
<td>S. ATLANTIC BIGHT</td>
<td>134.1</td>
</tr>
<tr>
<td>CALIFORNIA</td>
<td>4.4</td>
</tr>
<tr>
<td>PACIFIC NORTHWEST</td>
<td>15.1</td>
</tr>
<tr>
<td>GREAT LAKES</td>
<td>176.7</td>
</tr>
<tr>
<td>GULF OF MEXICO</td>
<td>340.3</td>
</tr>
<tr>
<td>HAWAII</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1,071.2</td>
</tr>
</tbody>
</table>
Offshore wind prices continue to decrease. In Europe, the purchase price is as low as 5.5¢ / kWh.

Maryland offshore wind price is 13¢ / kWh, representing a reduction in energy costs for offshore wind since 2012 of 32%.

15 GW of offshore wind power is approved, pending, or completed across various US wind energy areas equalling 13 new projects.

NY, MA, NJ, and MD are committed to buy Maryland Offshore Wind's 368 MW Project and Long Island Power Authority's 90 MW Project. Construction of the Long Island Power Authority project will start in 2020.

Block Island Wind Farm, America's first offshore wind farm, is completed in RI.

Pending projects in MA include 400-800 MW capacity.
BOEM PROCESS

1. PLANNING & ANALYSIS
   - BOEM publishes Call for Information and Nominations
   - BOEM identifies priority Wind Energy Areas (WEAs) offshore. WEAs are locations that appear most suitable for wind energy development, or
   - Processes unsolicited application for lease
   - BOEM may prepare an Environmental Assessment for Lease Issuance and Site Assessment Activities

2. LEASING
   - BOEM determines whether Competitive Interest exists
   - If Competitive Interest exists, BOEM notifies the public and developers of its intent to lease through Sale Notices before holding a lease sale
   - If Competitive Interest does not exist, BOEM negotiates a lease (note: issuance may be combined with plan approval)

3. SITE ASSESSMENT
   - Lessee conducts site characterization studies
   - Lessee submits Site Assessment Plan (SAP)
   - BOEM conducts environmental and technical reviews of SAP, eventually deciding to approve, approve with modification, or disapprove the SAP
   - If approved, Lessee assesses site (usually with meteorological tower(s) and / or buoy(s))

4. CONSTRUCTION & OPERATIONS
   - Lessee may conduct additional site characterization
   - Lessee submits Construction and Operations Plan (COP)
   - BOEM conducts environmental and technical reviews of COP, eventually deciding to approve, approve with modification, or disapprove the COP
   - If approved, Lessee builds wind facility
US OSW STRUCTURE

STATES
Policy / market drivers / regulations

US BOEM / US BSEE
Leasing and approval of plans / regulators

PRIVATE DEVELOPERS / LEASEES
Dong Energy, Statoil, Avangrid / Iberdola, Copenhagen Offshore Partners, Deepwater Wind, US Wind, Fishermen's Energy

SUPPLY CHAIN

BUSINESS NETWORK OSW

STRONGER TOGETHER
THE NETWORK

DEVELOPMENT

NETWORKING

DEVELOPERS

POLICY MAKERS

GLOBAL EXPERTS

OVER 130 MEMBER BUSINESSES

ADVANCEMENT
TO ADVOCATE & SUPPORT
The Network advocates for its Member business community by promoting and supporting policies that advance the industry.

TO BUILD & ESTABLISH
The Network is dedicated to building a supply chain that supports domestic wind farms and establishes the US as a global competitor in the offshore wind energy market.

TO EDUCATE & LEAD
Our Members are empowered with the education, tools and connections to take a leading role in the creation of the industry.
150 BUSINESS NETWORK MEMBERS
THE US SUPPLY CHAIN

- RESOURCE CHARACTERIZATION/ENVIRONMENTAL PLANNING/PERMITTING
- ENGINEERING
- MANUFACTURING

Balance of Plant (foundations, towers, transition pieces, OTMs), ship building, marine construction / installation
NETWORK MEMBERS
IN THESE SUPPLY CHAIN AREAS

RES. CHAR./ENVIRO. PLAN./PERMITTING

Alpine
Preti Flaherty
ATKINS
DHI
AWB Engineers
Found Ocean
SAAB Offshore
SABIK Offshore
UMBC JRC
Mott MacDonald

ENGINEERING

DYNABEAM
GTA Inc.
JFGRD

MANUFACTURING

Seaproof Solutions
Ventower Industries
IP Subsea
Pharos Marine
Toroid

Chet Morrison Contractors
Versabar
CIANBRO
LM Wind Power
SUPPLY CHAIN GAPS

VESSELS

NACELLE & BLADE MANUFACTURING
Large wind components for Nacelles

CABLES

O&M WORKFORCE TRAINING
INTERNATIONAL OSW PARTNERING FORUM

NREL / DOE use the IPF to deliver scientific and technical information
It is the #1 US OSW Technical conference

International Wind Partnering Forum

2018 will be our 5th year

More than 600 people attend from more than 11 countries

135 speakers

Major sponsors: Dong Energy, GE, LM Wind Power, Siemens

Join us! Early bird registration is now open. Register now!
FROM THE IPF
WE MAKE PARTNERSHIPS HAPPEN

(left to right)
Daniel Woodman (Offshore Design Engineering),
Liz Burdock (Business Network for Offshore Wind)
Jay Borkland (Apex Companies, LLC)
DOE aims to reduce the levelized cost of energy through technological advancement to compete with local electricity costs, and create the conditions necessary to support DOE’s Wind Vision2 study scenario levels [2] of deployment by supporting the coexistence of offshore wind with the environment, coastal communities, and other users of ocean space.

DOI aims to enhance its regulatory program to ensure that oversight processes are well-informed and adaptable, avoid unnecessary burdens, and provide transparency and certainty for the regulated community and stakeholders.
WORKING GROUPS

GRID & TRANSMISSION

INFRASTRUCTURE

WORKFORCE & ECONOMIC DEVELOPMENT

HEALTH & SAFETY

INNOVATION & COMMERCIALIZATION
US INNOVATION

LOGISTICS

CYBER SECURITY

GRID TRANSMISSIONS

VESSELS

FLOATING WIND

UNMANNED SYSTEMS
FUTURE OF US INNOVATION

FUTURE:
- Floating offshore wind
- US offshore wind potential 2,000 GW
- US OSW standard development
BUSINESS NETWORK PARTNERS
BRIDGING THE TRANSATLANTIC

UNITED STATES

FRANCE
WORKING TOGETHER

LEND EXPERTISE

STRENGTHEN THE US SUPPLY CHAIN

OPPORTUNITIES TO PARTNER
MARKET OUTLINES

ROBUST PROJECT FINANCE MARKET
- New York is an active Project Financing center
- Financing parties have experience with renewable financing structures from on-shore wind space

SUPPORTIVE, YET UNCOORDINATED, GOVERNMENT REGULATIONS & INCENTIVES
- Federal lease area provides one-stop permitting and site control (BOEM)
- Federal Renewable Clean Energy Mandates and other programs (DOE)
- Federal Tax incentives that help secure partial off take (ITC/PTC)
- ITC/PTC result in about 1/3 off project capital cost or cash flows being converted/contracted
- State level REC and other clean energy mandates

EXCELLENT LOCATIONAL ADVANTAGE PARTICULARLY ALONG THE EASTERN SEA-BORDER
- Good wind regime and water depth
- Close to load centers (eg New York, Boston, Greater Baltimore/DC

TECHNOLOGY IMPROVEMENTS AND ESTABLISHED OPERATING HISTORY OF EUROPEAN PROJECTS WILL PROVIDE BENEFITS IN THE US MARKET

HIGH COMPETITION INTEREST OVER THE LATEST AUCTIONS
## BOEM’s Offshore Site Approval Process

### Planning & Analysis / 2 years
- Intergovernmental Task Force
- Request for Information (RFI) / Call for Information & Nominations (Call)
- Area Identification
- Environmental Reviews

### Leasing / 1-2 years
- Publish Leasing Notices
- Conduct Auction
- Issue Lease(s)

### Site Assessment / 5 years
- Site Characterization
- Site Assessment Plan (SAP)

### Construction & Operations / 2 years (+25)
- Construction & Operations Plan (COP)
- Facility Design Report (FDR) and Fabrication & Installation Report (FIR)
- Decommissioning

---

**Lead Time: 7-10 years**
AN EMERGING SECTOR FACING SEVERAL CHALLENGES

REGULATION
- Lack of Federal, State, Local, and Tribal Coordination
- Regulatory process is not mature, which led to extended delays in approval of SAP, COP, and other permits
- Political risks associated with renewable incentives (Federal and State incentives tied to political process, and can be out of step even when reliant on one another)

PROJECT ECONOMICS
- Offshore wind LCOE vs other alternative and conventional energy, with low cost natural gas
- Financing and securing of tax credits
- Lack of stable, long term policy incentives (RPS, PTC, ITC, OREC, etc)
- Limited market mechanisms to monetize benefits of offshore wind

SUPPLY CHAIN
- No domestic supply chain for major offshore wind components resulting in expensive foreign suppliers and manufacturers
- Limited amount of vessels that can support US windfarm installation in compliance with Jones Act and its potential changes under cbp review
- Lack of experienced work force
- Stop and go of the US market has resulted in vendor fatigue

INFRASTRUCTURES
- Interconnection / transmission
- Availability and performance of new manufacturing facilities and harbors

PROJECT DEVELOPMENT
- Challenging sites: soil conditions, extreme conditions due to hurricanes, earthquake, DoD compliance, etc
- Social acceptance, risk of legal recourse against authorizations
- Potentially restrictive Standard Operating Conditions
## Wind Energy Supply Chain in the US

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>LAND-BASED</th>
<th></th>
<th></th>
<th>OFFSHORE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INVESTMENT REQUIRED</td>
<td>MAJOR HURDLES</td>
<td>INVESTMENT REQUIRED</td>
<td>MAJOR HURDLES</td>
<td>INVESTMENT REQUIRED</td>
<td>MAJOR HURDLES</td>
</tr>
<tr>
<td><strong>TOWERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3MW</td>
<td>LOW</td>
<td>Capability exists</td>
<td>LOW-MODERATE</td>
<td>Logistics: Rail/road challenges to ports. Mfgs located in Midwest.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BLADES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3MW</td>
<td>LOW</td>
<td>Capability Exists</td>
<td>MODERATE-HIGH</td>
<td>Logistics: Rail/road challenges to ports. Mfgs located in Midwest.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5MW</td>
<td>MODERATE-HIGH</td>
<td>Logistics: Rail/road challenges, Facility and equipment upgrades likely</td>
<td>HIGH</td>
<td>Logistics: Rail/road challenges to ports. No blade mfg port side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GENERATORS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3MW</td>
<td>LOW</td>
<td>Capability Exists</td>
<td>LOW</td>
<td>Capability Exists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5MW</td>
<td>LOW-MODERATE</td>
<td>Fac/Equip: Possible upgrades for crane capacity &amp; finish tanks</td>
<td>LOW-MODERATE</td>
<td>Fac/Equip: Possible upgrades for crane capacity &amp; finish tanks</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>JACKET</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3MW</td>
<td>n/a</td>
<td></td>
<td>MODERATE-HIGH</td>
<td>Capability exists in Gulf &amp; Pacific region. Investments likely for serial production. Port side facilities needed for Atlantic and Great Lakes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5MW</td>
<td>n/a</td>
<td></td>
<td>MODERATE-HIGH</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>