

AWEA Offshore Compliance Recommended Practices AWEA OCRP 2012



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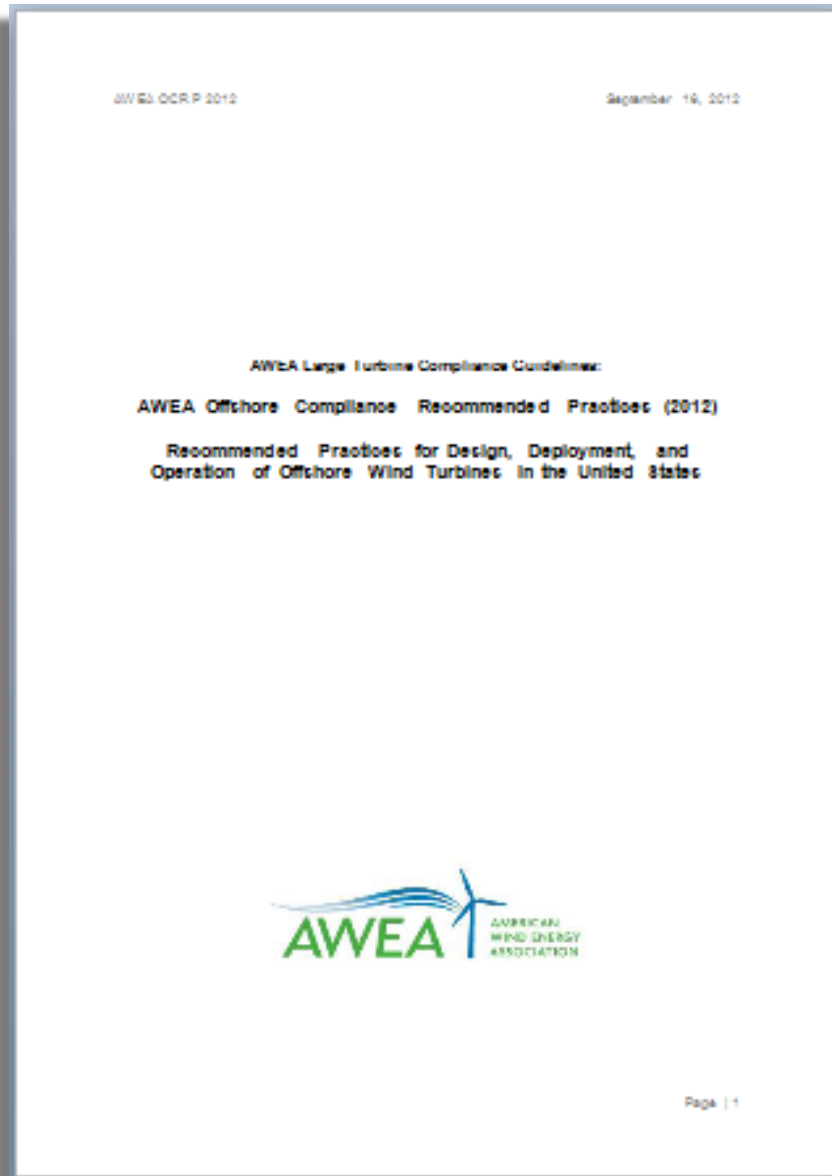
**Workshop on Offshore Wind Energy Standards and Guidelines:
Metocean-Sensitive Aspects of Design and Operations in the United
States**

**Artisphere, Arlington, Virginia
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AWEA Offshore Compliance Recommended Practices (AWEA OCRP 2012) – Motivation

- BOEM 30 CFR 585 rule does not specify standards – “Best Practices”
- NAS Report “*Structural Integrity of Offshore Wind Turbines: Oversight of Design, Fabrication, and Installation*” –2011 found that existing standards for offshore wind were applicable and could deliver adequate safety
- Offshore wind turbines cannot be addressed by any single set of standards
- Compliance solely with international standards may conflict with national and local requirements.
- US environmental conditions may not be adequately represented in current offshore standards

AWEA Offshore Compliance Recommended Practice

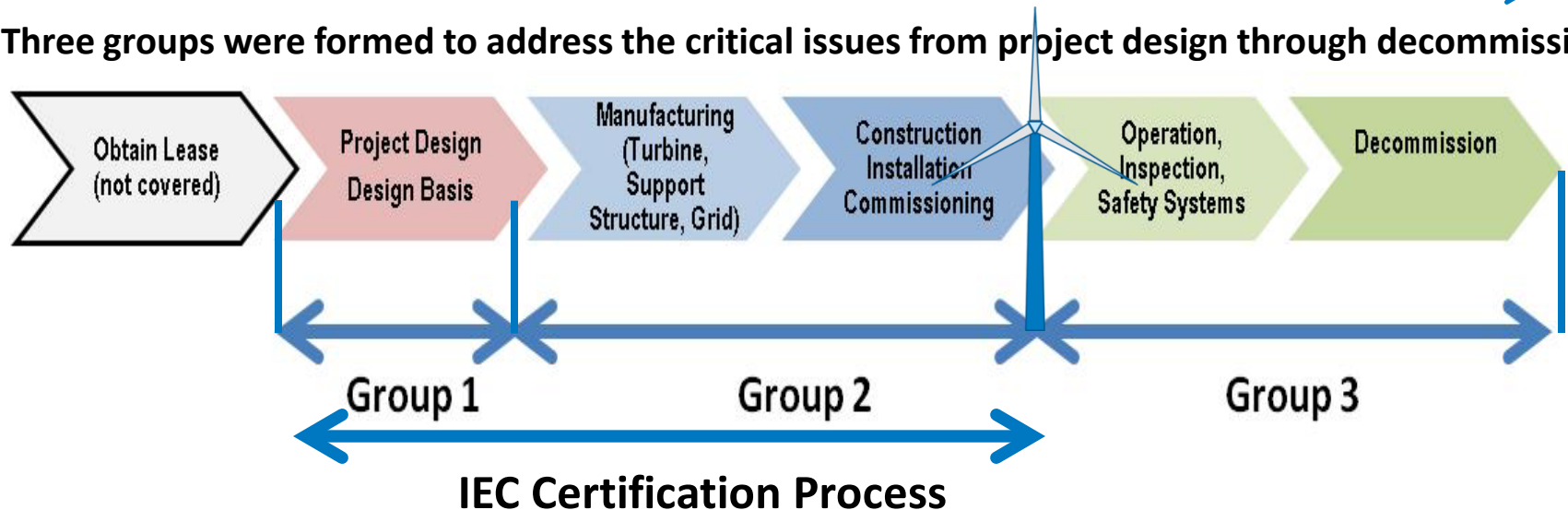


- **AWEA Offshore Compliance Recommended Practice (AWEA OCRP) is a consensus based guideline intended to clarify the requirements for offshore wind turbines in the United States.**
- **Over 50 industry members participated in its development from 2009 to 2012.**
- **IEC and ISO/API Standards govern the installation design.**
- **Adapts to latest versions as normative standards are updated to maintain relevance**
- **Key Limitations:**
 - Does not cover floating wind turbines
 - Due to shortcomings in current versions of IEC standards, ice, hurricanes, and metocean measurements are not treated sufficiently

Scope of AWEA OCRP 2012

Offshore Wind Facility Development Process

Three groups were formed to address the critical issues from project design through decommissioning:



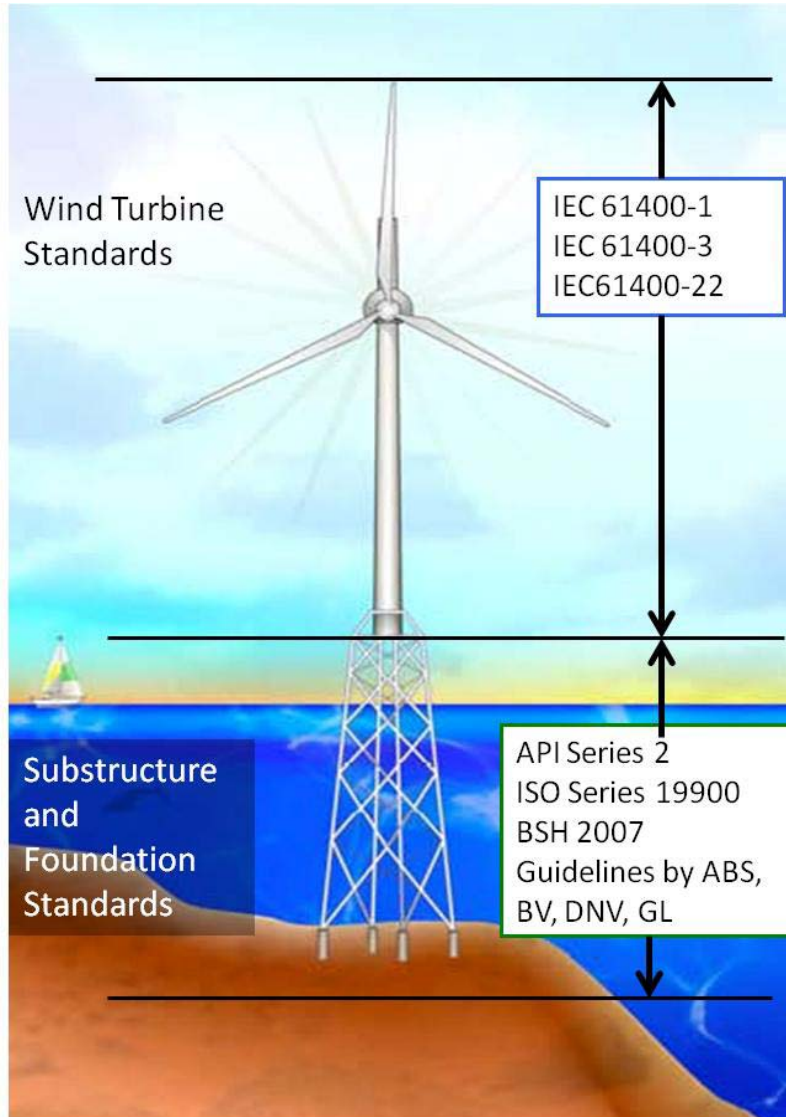
Addresses:

- All development phases from design to decommissioning
- All regulatory domains – state or federal
- All utility scale turbine and project sizes
- Fixed bottom support structures
- Does not address floating wind systems.
- Does not address siting and leasing issues.

Hierarchy of Standards Recommended for Facility Design

1. **AWEA OCRP 2012**
2. **IEC 61400-3, *Wind turbines—Part 3: Design requirements for offshore wind turbines***
3. **IEC 61400-1, *Wind turbines—Part 1: Design requirements***
4. **ISO 19900, *Petroleum and natural gas industries—General requirements for offshore structures***
5. **ISO 19902, *Petroleum and natural gas industries—Fixed steel offshore structures***
6. **ISO 19903, *Petroleum and natural gas industries—Fixed concrete offshore structures***
7. **ACI357R, *Guide for the design and construction of fixed offshore concrete structures***
8. **API RP 2A-WSD, *Recommended practice for planning, designing and constructing fixed offshore steel platforms—Working stress design***

Different Standards Govern Wind Turbine And Support Structure Designs



JIP sponsored by BOEM and DOE/NREL between 2006 and 2009 confirmed that API and IEC delivered approximately the same level of structural reliability

Dolan, D.; Jha, A.; Gur, T.; Soyoz, S.; Alpdogan, C.; Camp, T. (July 2009). *Comparative Study of Offshore Wind Turbine Generators (OWTG) Standards – Phase I*. Oakland, CA: MMI Engineering.

Jha, A.; Dolan, D.; Gur, T.; Soyoz, S.; and Alpdogan, C. *Comparison of API & IEC Standards for Offshore Wind Turbine Applications in the U.S. Atlantic Ocean: Phase II*. MMI Engineering September 9, 2009. National Renewable Energy Laboratory, Golden, CO. NREL/SR-5000-49688; <http://www.nrel.gov/docs/fy13osti/49688.pdf>

Design Conclusions

- **Equivalent safety should be maintained for turbine and support structure using different codes**
- **Recommendation L-2 Exposure Category for unmanned wind turbine structures**
- **Higher safety over L-3 is recommended to account for possible serial failure consequences due possible replication of design or manufacturing flaws**



Siemens 2.3 MW Turbines at Baltic I Offshore Wind Project Photo Walt Musial

Hierarchy of Standards Recommended for Design of Electric Service Platform and Other Structures

1. AWEA OCRP 2012
2. API RP 2A-WSD, *Recommended practice for planning, designing and constructing fixed offshore steel platforms—Working stress design*
3. ISO 19903, *Petroleum and natural gas industries –Fixed concrete offshore structures*
4. ACI357R, *Guide for the design and construction of fixed offshore concrete structures*



Photo: Walt Musial NREL

Manufacturing Requirements

- **Quality management system requirements (ISO 9001)**
- **Electrical distribution system (CIGRE)**
- **Submarine cable (array and export) (ANSI/ICEA – IEC)**
- **Support structure (API)**
- **Electric Service Platform (structural and electrical) (API/CIGRE)**
- **Welding requirements (API RP 2A WSD)**
- **Transportation of components to staging area (API RP 2A WSD)**
- **Storage at port**

Offshore Wind Facility Installation

- **Planning and documentation (API, ISO, USCG, IEC, 30 CFR 585)**
- **Sea Transport (API, USCG, IEC, 30 CFR 585)**
- **Wind Turbine (IEC)**
- **Support Structure (API, ISO)**
- **Submarine Cable (ISO 13628-5, ICPC, IMCASEL, ISO, IMCA, ADCI)**
- **Electric Service Platform (API RP 2A WSD)**
- **Scour Protection (API RP 2A WSD)**

Facility Qualification: Testing and Inspection

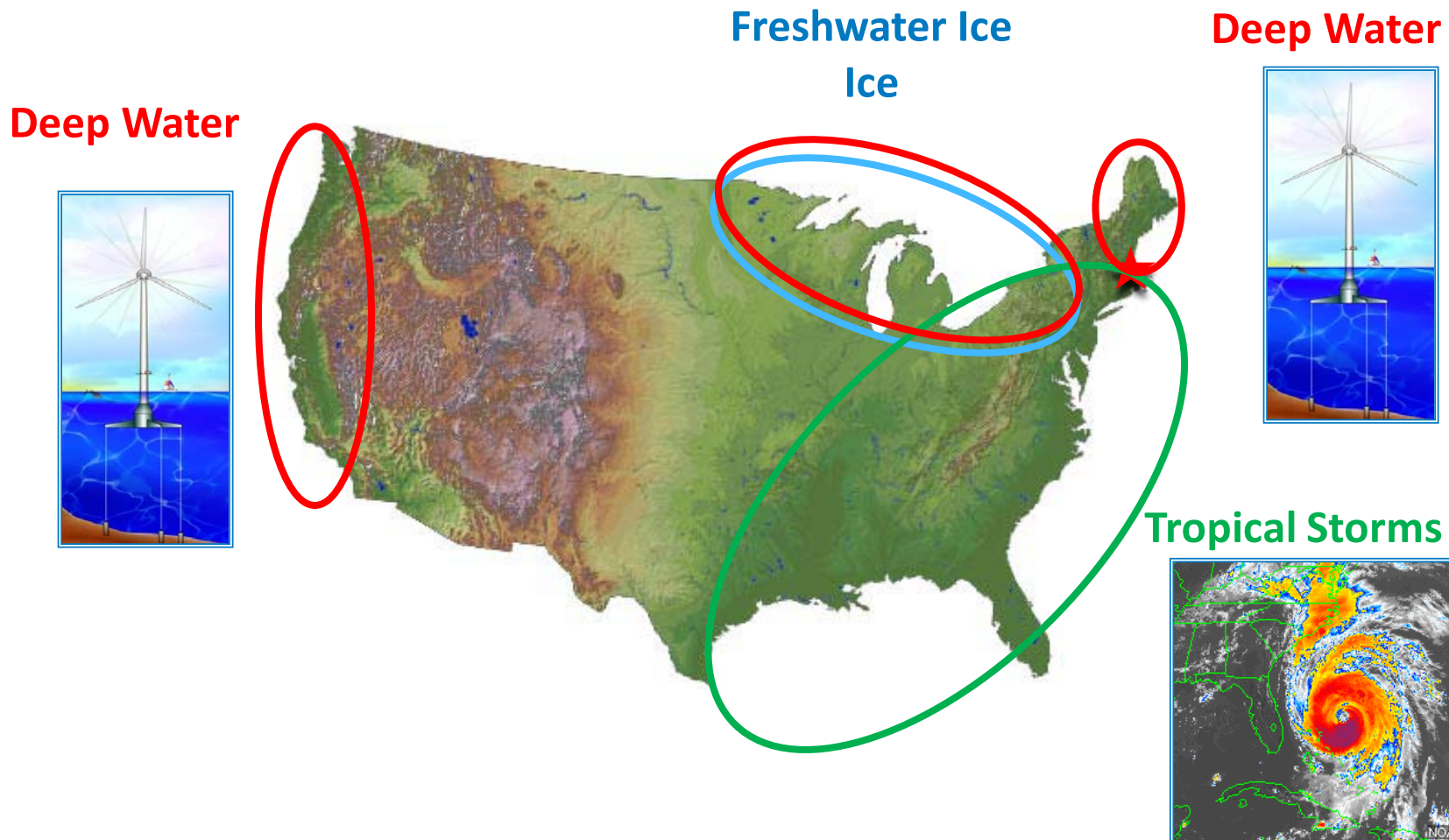
- **Inspection requirements (API RP 2A WSD)**
- **Inspection personnel (API RP 2A WSD)**
- **Fabrication inspection (API RP 2A WSD)**
- **Load out, sea fastening, and transportation inspection (API RP 2A WSD)**
- **Installation Inspection (API RP 2A WSD)**
- **Inspection Documentation (API RP 2A WSD)**
- **Electrical System Inspection (API, IEC, ICEA/NEMA)**
- **Turbine and Wind Plant Commissioning (IEC 61400-3)**

Operation and Decommissioning

- **Safety Management System, Safety Equipment, and Navigational Aids**
- **Worker Health and Safety Guidance (not covered in AWEA OCRP 2012, see new AWEA guideline)**
- **Superseded by existing U.S. Regulations (29 CFR, 30 CFR, 33 CFR, FAA, IALA, IEC)**
- **Navigational Warning Devices and Marking Information (33 CFR, FAA)**
- **Operations and In-Service Inspections (30 CFR (BOEM), ABS, GL, ISO, BSEE, ASCE, API, IEC, EN)**
- **Re-use of Facilities/ repowering (API/ISO)**
- **Decommissioning (BOEM 30 CFR 585)**

Limitations and Addressing Gaps

IEC standards are being updated to address U.S. issues.



Summary and Conclusions

- A well defined compliance pathway is needed for certification and standards for offshore wind development in the United States
- BOEM 30 CFR 585 rule does not specify standards yet but future updates would help industry mature.
- AWEA Offshore Compliance Recommended Practice (AWEA OCRP) is an industry-based consensus guideline intended to clarify the requirements for offshore wind turbines
- Maturing and defining the standards requirements for offshore wind compliance will reduce project uncertainty and risk and help lower cost.

Next Steps – Standard Conversion

- The AWEA Standards Development Board (SDB) voted to convert the AWEA OCRP 2012 recommended practices into an AWEA national standard.
- The committee will be re-established and the AWEA OCRP will be submitted as a draft standard for comment.
- Conversion to a standard is necessary to strengthen the impact of AWEA OCRP so it can be recognized as the primary standard for the design, installation, and operation of offshore turbines in the United States.

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Thank You for your Attention!

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