The Role of Standards and Certification in Wind Energy's Success

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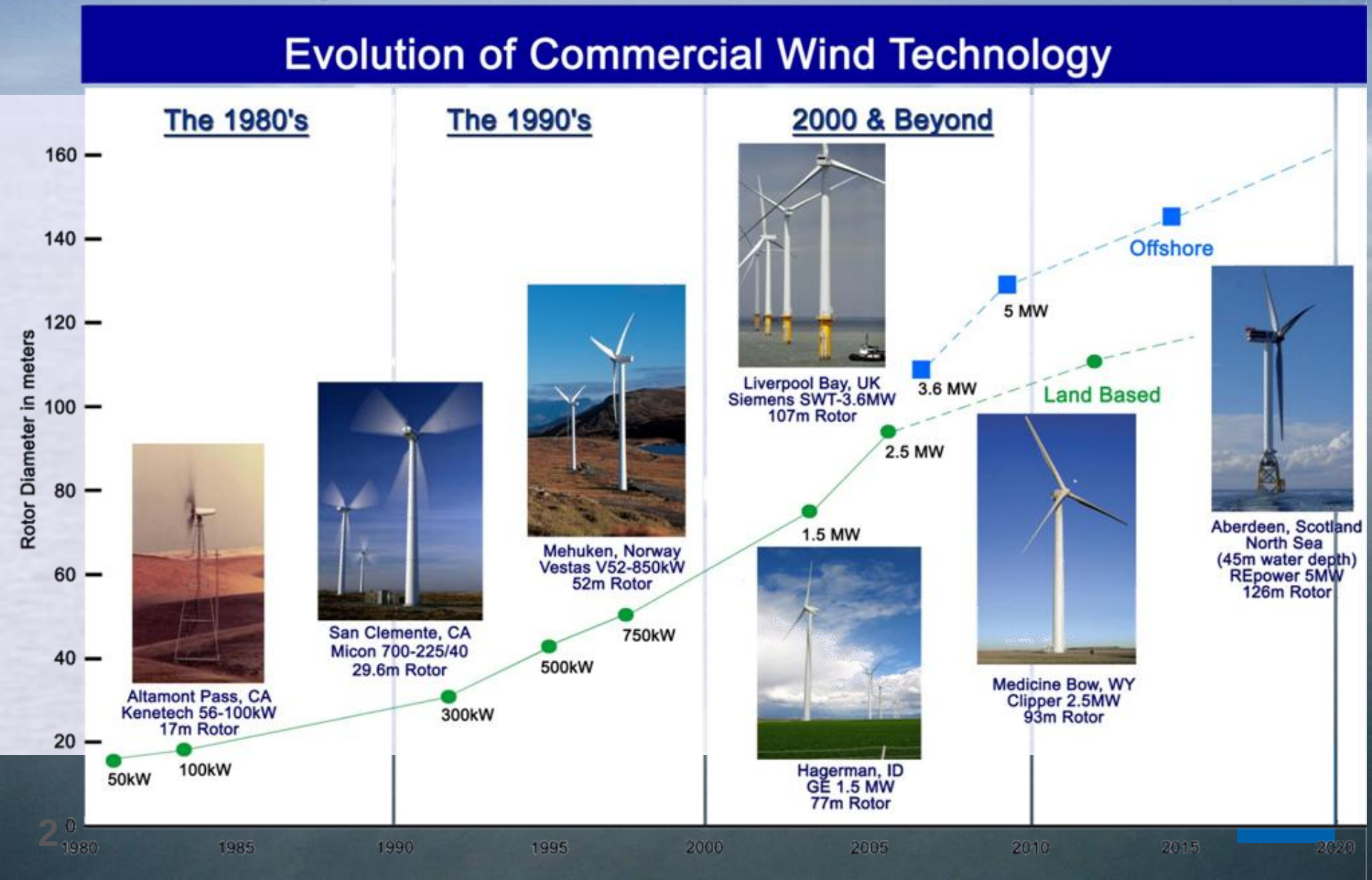
INTERNATIONAL ELECTROTECHNICAL COMMISSION

Standards Played Strong Role in Industry Maturation



IEC Wind Standards History

How did wind evolve over the past 25 years:

- Industry is born using borrowed aerospace technology
- Early success followed by poor reliability
- Grew an industry from nothing to $50B /yr
- Developed deeper understanding of wind tech. physics
- Developed sophisticated modeling capability
- Improved reliability dramatically
- Reduced COE to competitive with fossil fuel
- Grew a new supply chain

What has IEC TC88 accomplished:

- Codified design process
- Established a common vocabulary
- Developed a comprehensive suite of standards
- Addressed industry & regulator needs for emerging phase
- Developed system oriented certification framework

The Future

Where does IEC Wind want to be in 20 years:

- Provide a level commercial playing field
- Be competitive with all other forms of energy
- Common technical criteria
- Provide a common international vocabulary
- Harmonize international requirements and CA
- Harmonize expectations from OEMs to End Users

How do we want to use IEC to benefit wind industry:

- Provide forum for harmonized requirements
- Provide transparent framework for achieving agreements
- Promote harmonized standards
- Provide forum for discussing harmonized expectations
- Facilitate stable commercial environment

What's Working in WT-CAC

1. For the first time key stakeholder groups are discussing their common needs
2. Broad stakeholder input to current certification practice
3. Active participation from multiple international stakeholders
4. Certification bodies are discussing:
   - how to harmonize their interpretations of IEC standards
   - How to meet the commercial needs of broader industry
5. **IEC is providing a unique forum for:**
   1. **Industry to discuss immediate needs**
   2. **Certification bodies to evolve towards harmonization**
   3. **Evolution towards a formal system**
6. **Must anticipate industry needs to successfully compete with a well established energy industry.**

Conformity Assessment: RE Needs System Approach

CAB - Conformity Assessment Board

IECEE
System for Conformity Testing and Certification of Electrotechnical Equipment and Components

IECEx
System for Certification to Standards Relating to Equipment for use in Explosive Atmospheres

IECQ
Quality Assessment System for Electronic Components

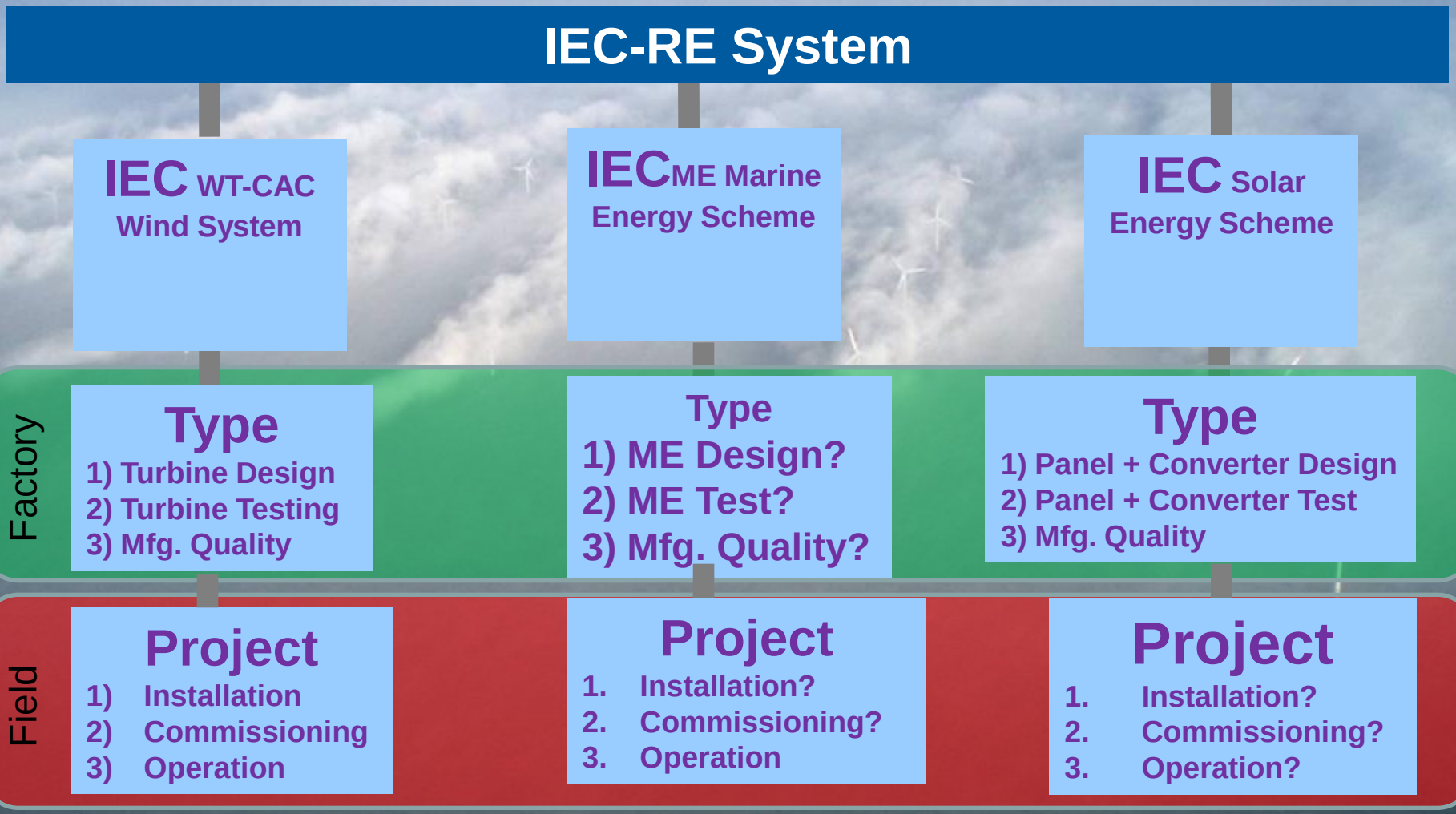
IEC RE
IEC General System for Certification to Standards relating to plant, equipment and services associated with Renewable Energy Systems

IEC Wind Systems WT-CAC

IEC Solar Energy Scheme

IEC Marine Energy Scheme

RE System Approach



Lets' Play to Win

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Backup Slides

What's Working in TC88

1. Effective & transparent standards development process
2. Multiple effective standards addressing *most* industry needs
3. Design process and external conditions framework
4. Testing standards (mostly)
5. OEM, test lab & supply chain engagement
6. International engagement

What could work better:

1. International harmonization
2. Organic evolution of interrelated standards
3. Anticipating gaps in current suite of standards
4. Broader industry stakeholder engagement
5. Anticipating broad industry needs to successfully compete in a well established energy industry.

What Does TC88 Need To Do (next 10 - 20 years)

1. Facilitate maturing commercialization process
   - OEMs and component suppliers (supply chain)
   - End Users (regulators, developers, financial, utilities, public)
2. Value to broader industry base (supply chain & End Users)
3. Better communication = Broader stakeholder engagement
4. Internal consistency (how do TC88 standards work together)
5. Internal re-harmonization of standards (e.g. -1, -2, -3)?
6. Anticipate future industry sector needs
7. Anticipate gaps in current suite of standards
8. International harmonization