IEA Wind TCP – Floating Offshore Wind

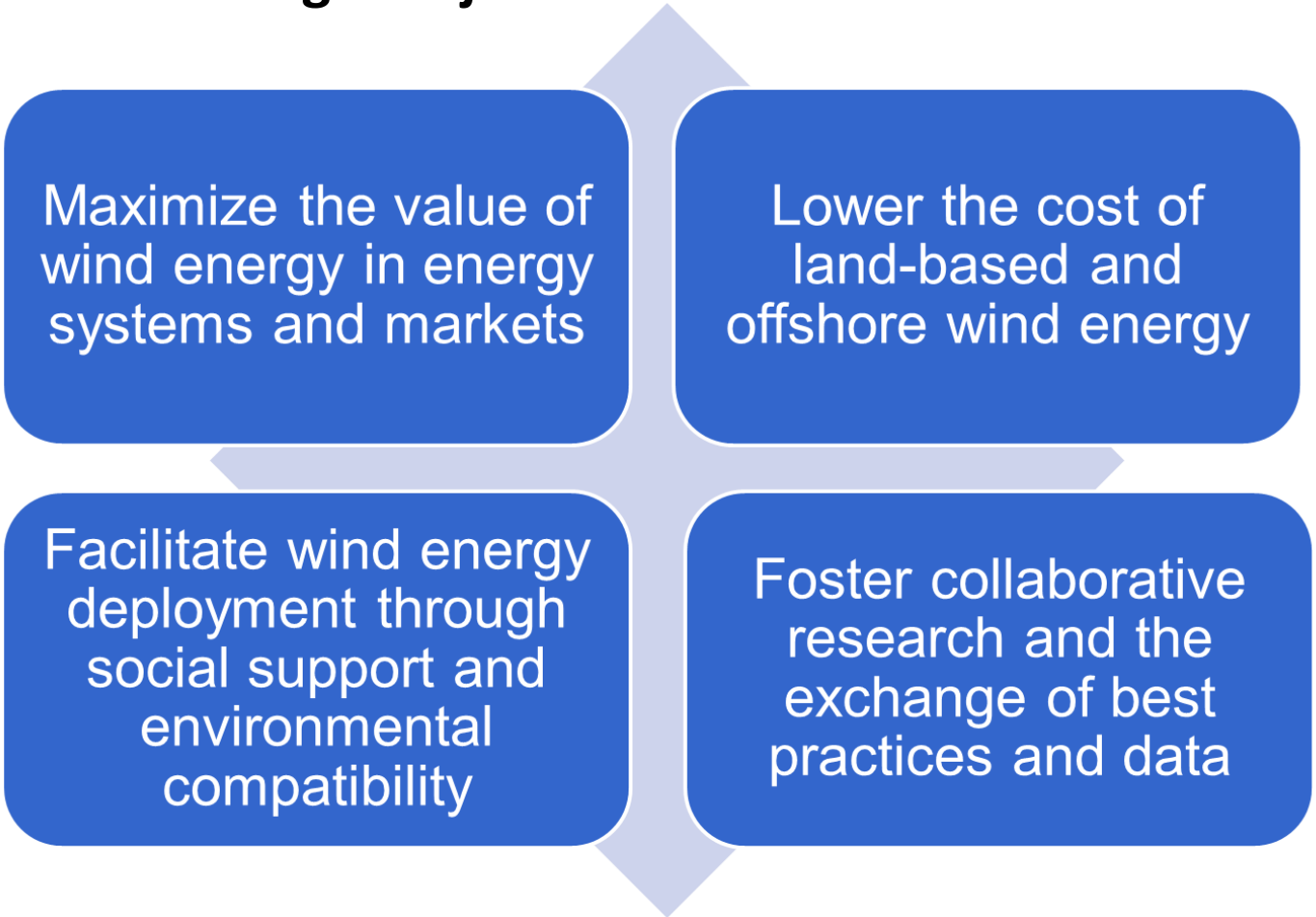
Technology Foundations for Ireland UK
Floating Wind

John Mc Cann

Chair, ExCo Member Ireland

12/3/2021

IEA Wind TCP Strategic Objectives 2019-2024



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Research Priorities 2019-2024

Resource and Site Characterization

Advanced Technology

Energy Systems with High Amounts of Wind

Social, Environmental, and Economic Impacts

Communication, Education, and Engagement

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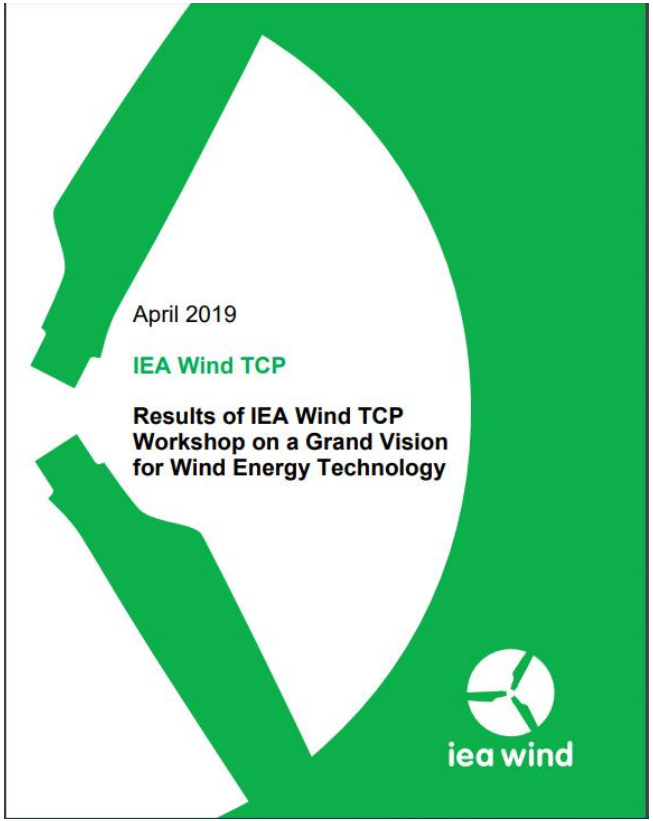
Research Priorities 2019-2024



Science Contents News Careers Journals

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REVIEW

Grand challenges in the science of wind energy

Paul Veers[1,*], Katherine Dykes[2,*], Eric Lantz[1,*], Stephan Barth[3], Carlo L. Bottasso[4], Ola Carlson[5], Andr…

+ See all authors and affiliations

Science 25 Oct 2019:
Vol. 366, Issue 6464, eaau2027
DOI: 10.1126/science.aau2027

Article Figures & Data Info & Metrics eLetters PDF

A multifaceted future for wind power

Modern wind turbines already represent a tightly optimized confluence of materials science and aerodynamic engineering. Veers *et al.* review the challenges and opportunities for further expanding this technology, with an emphasis on the need for interdisciplinary collaboration. They highlight the need to better understand atmospheric physics in the regions where taller turbines will operate as well as the materials constraints associated with the scale-up. The mutual interaction of turbine sites with one another and with the evolving features of the overall electricity grid will furthermore necessitate a systems approach to future development.

Science, this issue p. eaau2027

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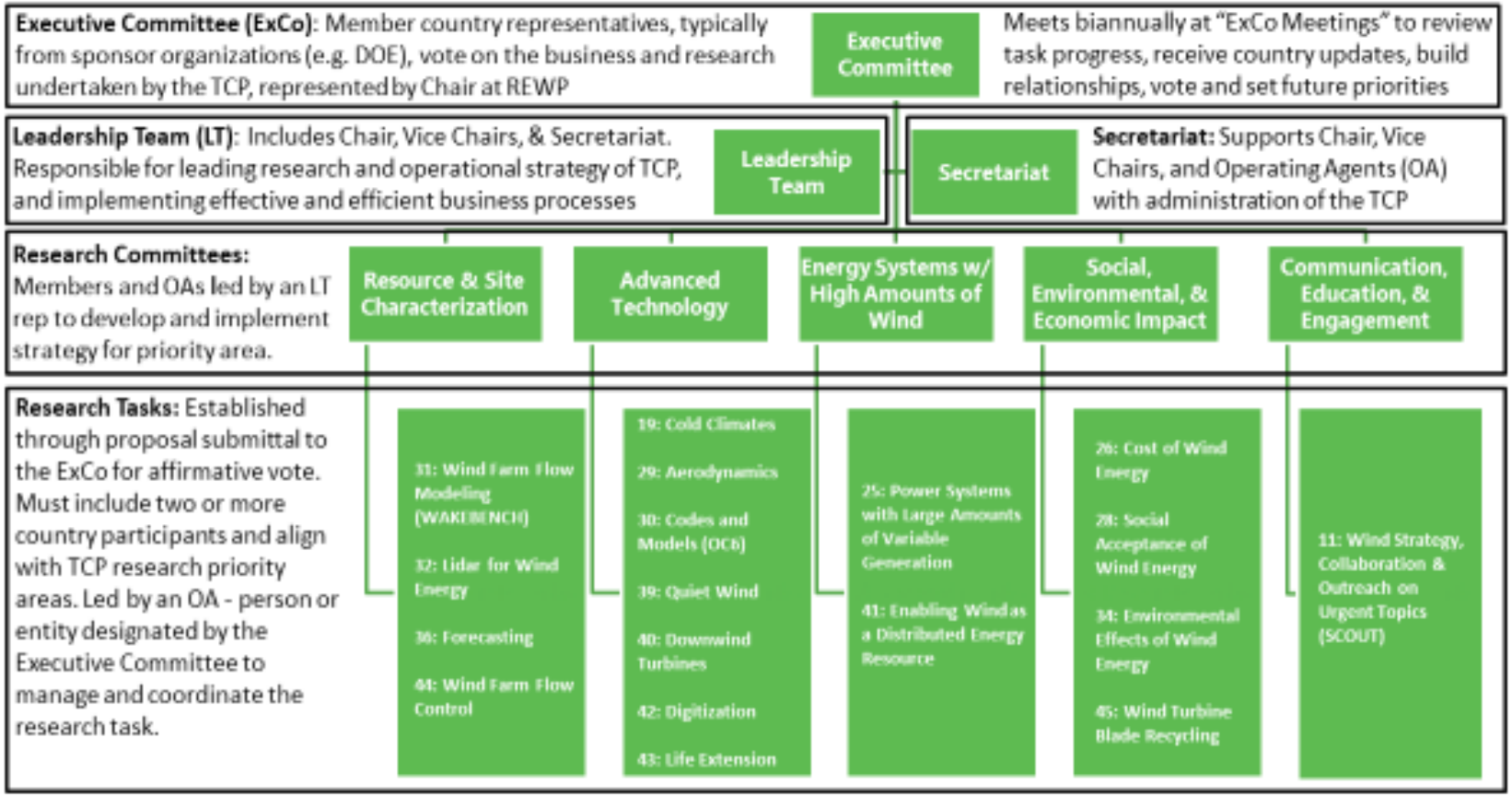
Wind TCP – Organizational Structure & Roles



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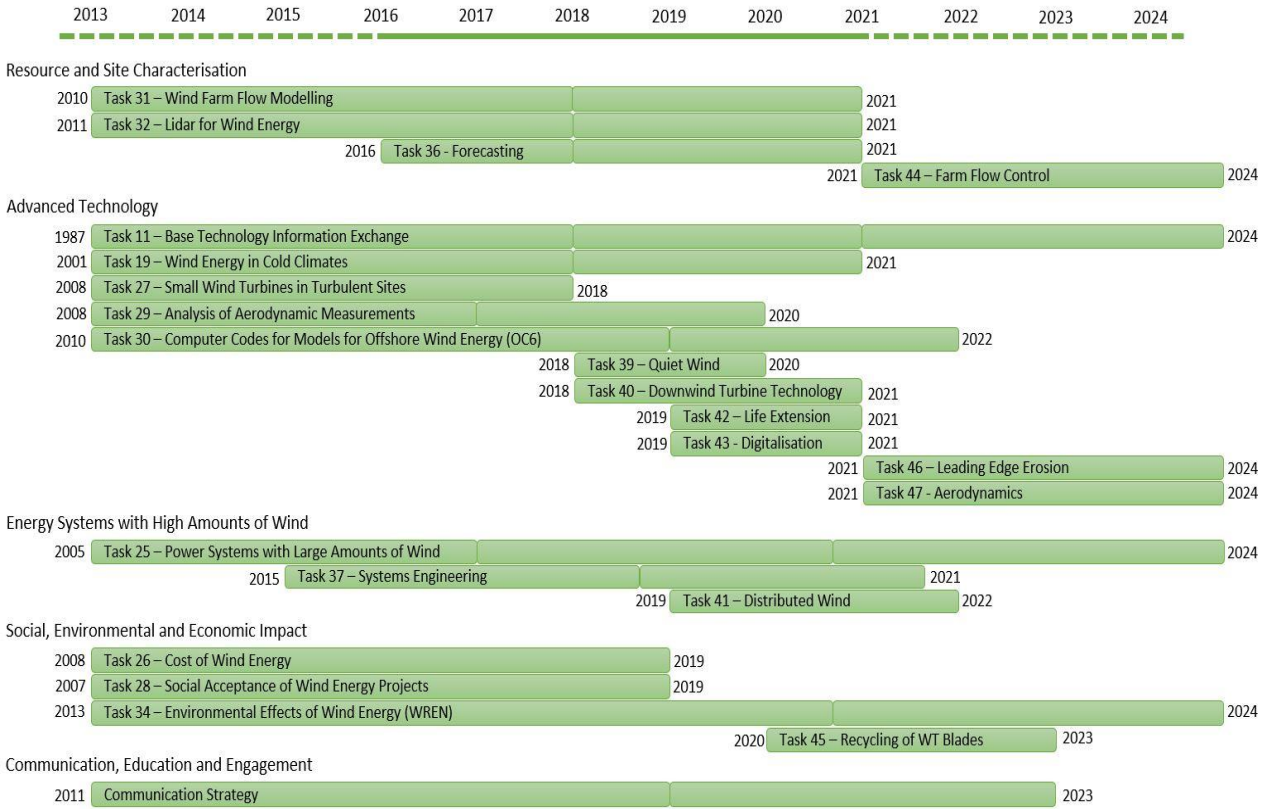
IEA Wind R,D&D Tasks Overview



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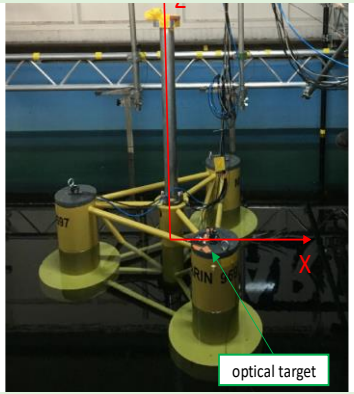
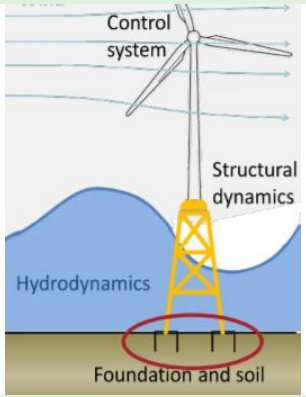
Task 30 OC6 Objectives, Expected Results

- Computer Codes for Models for Offshore Wind Energy
- Objectives and Outcomes: Verify and validate offshore wind design tools
  - Assess simulation accuracy & reliability
  - Train new analysts on how to run codes correctly
  - Investigate capabilities of implemented theories
  - Improve design tools; identify further R&D needs
- Current Term:
  - Primary group focused on Phase II
  - Subgroup focused on CFD – Phase I

Phase I:
Nonlinear Hydrodynamics
Jan 2019 – Dec 2019
(OWN TESTING)



Phase II:
Soil/Structure Interaction
Jan 2020 – June 2020
(REDWIN)



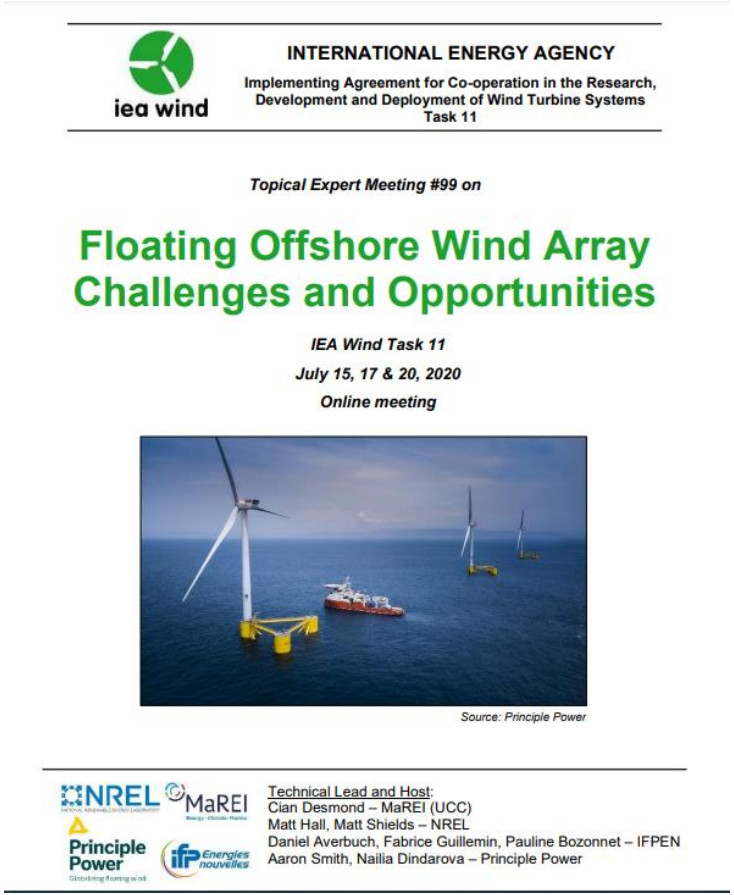
Phase III:
Aerodynamics under Motion
July 2020 – June 2021
(UNAFLOW)

Phase IV:
Hydrodynamic Challenges
July 2021 – June 2022
(STIESDAL)

TEM 99 Floating Offshore Wind Arrays

Topical Expert Meeting #99 July 2020

- Session 1: Anchoring & Moorings
- Session 2: Cabling & Export
- Session 3: Metocean Assessment
- Session 4: Control of Floating Farms
- Session 5: Installation, Operations & Maintenance (Marine Logistics)
- Session 6: Being a Good Neighbour



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INTERNATIONAL ENERGY AGENCY

Implementing Agreement for Co-operation in the Research, Development and Deployment of Wind Turbine Systems Task 11

Topical Expert Meeting #99 on

Floating Offshore Wind Array Challenges and Opportunities

IEA Wind Task 11

July 15, 17 & 20, 2020

Online meeting

Source: Principle Power

NREL MaREI Principle Power IFP Energies nouvelles

Technical Lead and Host:
Cian Desmond – MaREI (UCC)
Matt Hall, Matt Shields – NREL
Daniel Averbuch, Fabrice Guillemin, Pauline Bozonnet – IFPEN
Aaron Smith, Nailia Dindarova – Principle Power

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New Task Floating Offshore Wind Arrays

Proposed Operating Agents:

NREL, U.S.A. Matt Shields, (matt.shields@nrel.gov)

IFPEN, France, Pauline Bozonnet, (pauline.bozonnet@ifpen.fr)

GDG, Ireland, Cian Desmond, (cdesmond@gdgeo.com)

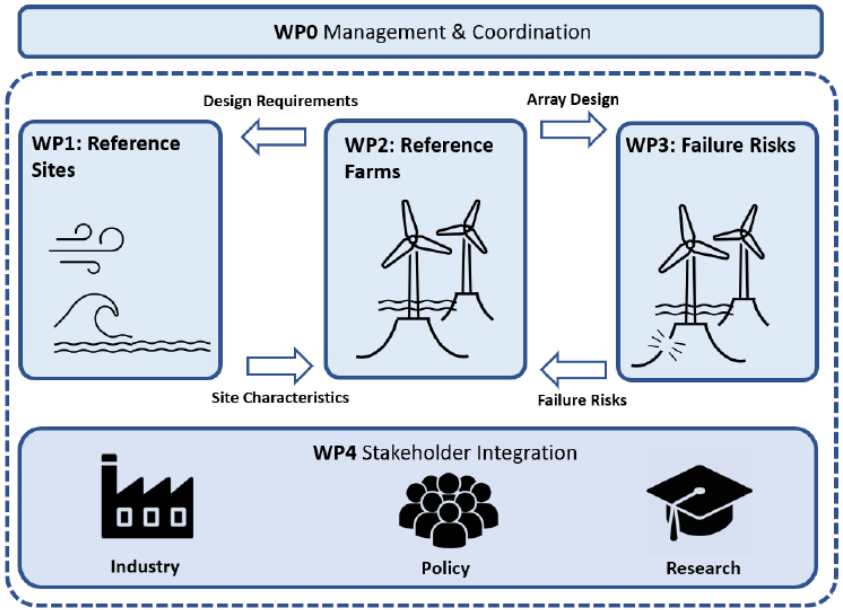

Figure 3: Task organization and Work Packages interactions

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International Energy Agency (IEA)
Implementing Agreement for Co-operation in the Research and Development of Wind Energy Systems (IEA Wind)

IEA Task Proposal

IDEA

Integrated DEsign of floating wind Arrays

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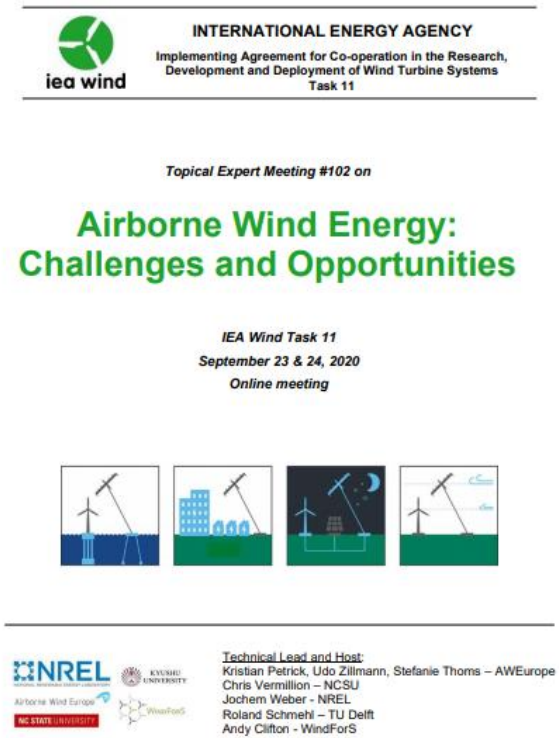
TEM 102 – Airborne Wind Energy

Topical Expert Meeting #102 Sept 2020

- Session 1: Resource potential & Environmental and social integration
- Session 2: Safety aspects and regulation & Common design tools, reference models
- Session 3: Functional requirements & Electrical system
- Session 4: Educational needs & Road mapping



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INTERNATIONAL ENERGY AGENCY

Implementing Agreement for Co-operation in the Research, Development and Deployment of Wind Turbine Systems
Task 11

Topical Expert Meeting #102 on

Airborne Wind Energy: Challenges and Opportunities

IEA Wind Task 11
September 23 & 24, 2020
Online meeting

Technical Lead and Host:
Kristian Petrick, Udo Zillmann, Stefanie Thoms – AWEurope
Chris Vermillion – NCSU
Jochem Weber - NREL
Roland Schmehl – TU Delft
Andy Clifton - WindForS

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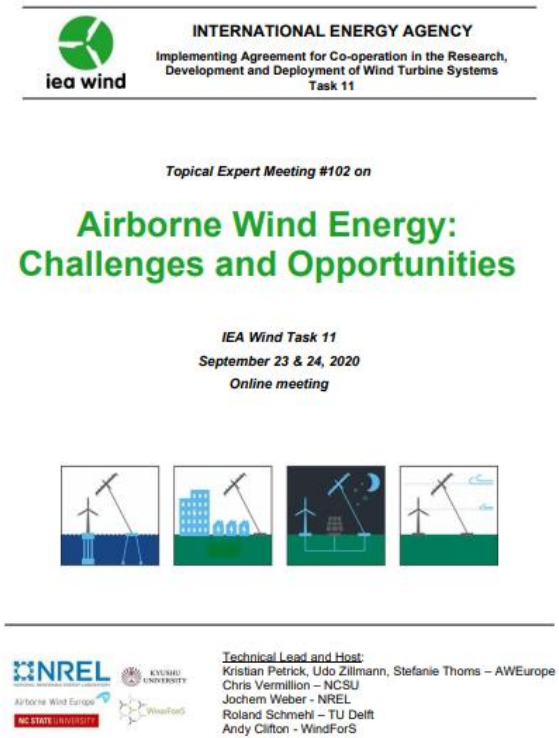

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New Task Proposal– Airborne Wind Energy

IEA Wind – Task Proposal
Airborne Wind Energy

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IEA Wind TCP ExCo Meeting
14 October 2020

Kristian Petrick, Airborne Wind Europe
Jochem Weber, NREL

TUDelft · 九州大学 KYUSHU UNIVERSITY · NC STATE UNIVERSITY · Airborne Wind Europe · NREL · WindForS

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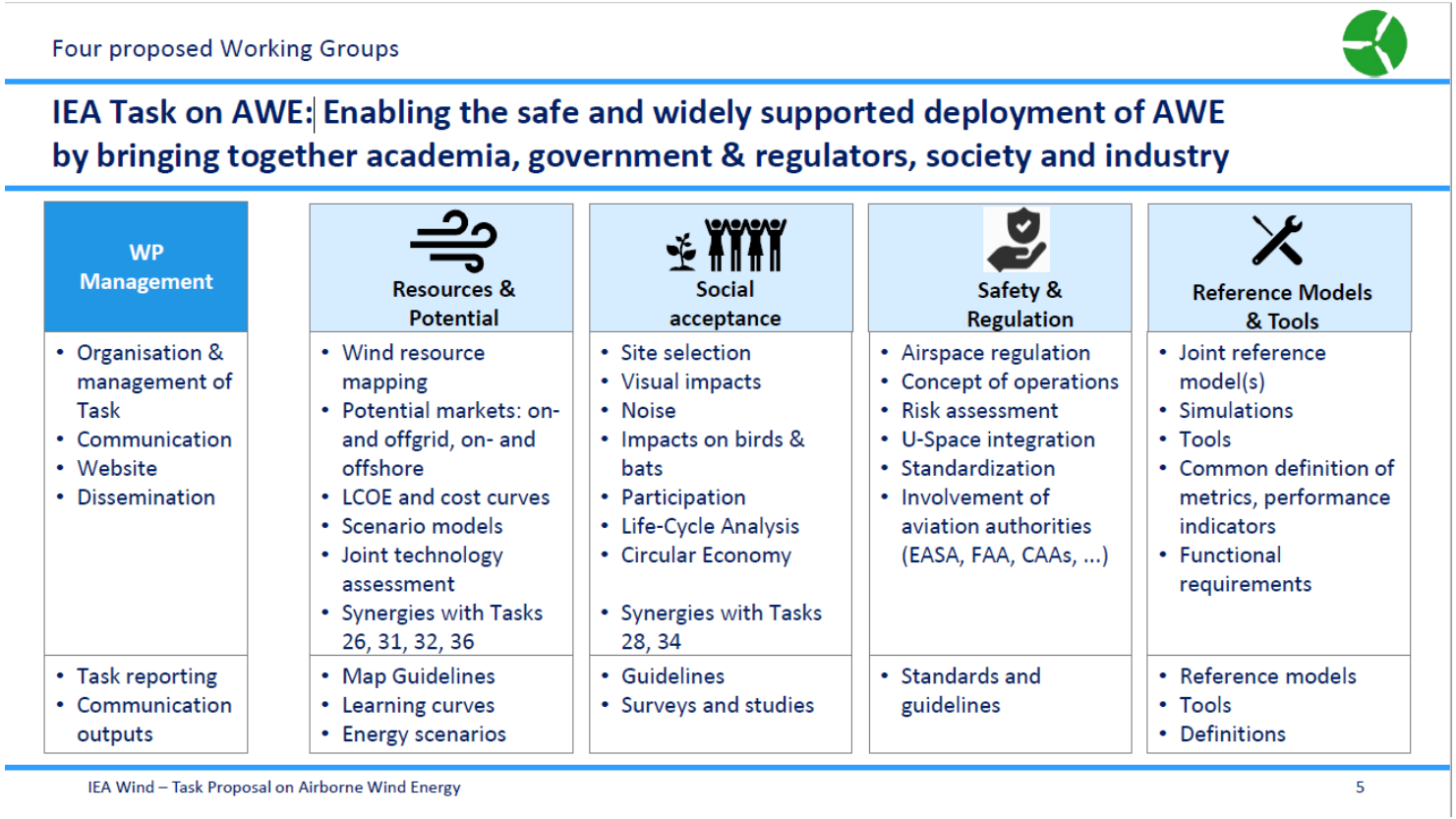
New Task Proposal– Airborne Wind Energy



Four proposed Working Groups

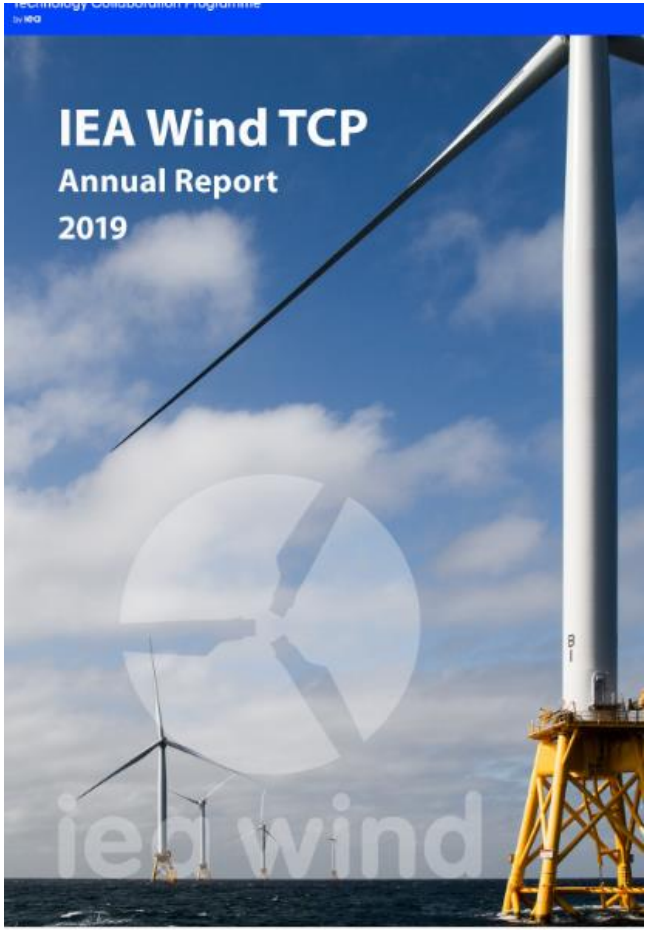
IEA Task on AWE: Enabling the safe and widely supported deployment of AWE by bringing together academia, government & regulators, society and industry

WP Management	Resources & Potential	Social acceptance	Safety & Regulation	Reference Models & Tools
• Organisation & management of Task • Communication • Website • Dissemination	• Wind resource mapping • Potential markets: on- and offgrid, on- and offshore • LCOE and cost curves • Scenario models • Joint technology assessment • Synergies with Tasks 26, 31, 32, 36	• Site selection • Visual impacts • Noise • Impacts on birds & bats • Participation • Life-Cycle Analysis • Circular Economy • Synergies with Tasks 28, 34	• Airspace regulation • Concept of operations • Risk assessment • U-Space integration • Standardization • Involvement of aviation authorities (EASA, FAA, CAAs, ...)	• Joint reference model(s) • Simulations • Tools • Common definition of metrics, performance indicators • Functional requirements
• Task reporting • Communication outputs	• Map Guidelines • Learning curves • Energy scenarios	• Guidelines • Surveys and studies	• Standards and guidelines	• Reference models • Tools • Definitions

IEA Wind – Task Proposal on Airborne Wind Energy 5

IEA Wind Annual Report

- Global Overview and Statistics
  - Deployment, R,D&D
- IEA Wind Research Tasks
  - Objectives, Progress, Outputs
- Country Reports
  - Wind Power deployment - Production and share of electricity
  - Policy Updates – Highlights
  - Environmental and socio economic highlights
  - R,D&D Highlights



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John Mc Cann john.mccann@seai.ie

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Technology Foundations for Ireland UK Floating Wind

John Mc Cann 12/3/2021

Overview

Wind Energy in Ireland and SEAI Role

Wind Energy Roadmap 2011

SEAI R,D&D Call 2021 Floating Offshore Wind Topics

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Wind Energy in Ireland & SEAI Role

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Key Statistics and Key Targets

Peak Electricity Demand to Date:	5,357 MW
Installed Wind Capacity @ Feb 2021:	4,309 MW
Maximum Wind Output to Date:	3,347 MW
Wind's Contribution to Electricity in 2020:	36.4%* (33.6%**)
Renewable Contribution to Electricity in 2020:	42.2%* (38.9%**)
Wind TWh 2020:	11.13 TWh

2020 Targets

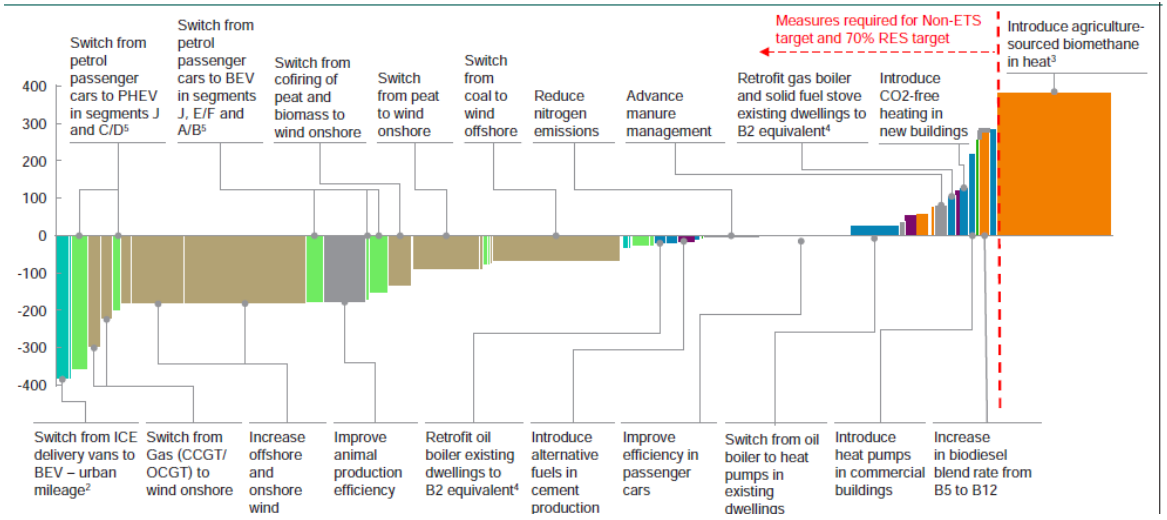
EU RES Directive Target – Total Energy	16%
RES-E	40%

* Preliminary Estimate Actual gross contribution (non-normalised)
** Normalised contribution according to EC methodology

Sources: EirGrid & SEAI

New 2030 Renewable Energy Targets

- 55% RES-E Target Initially Proposed in RESS and NECP
- 70% RES-E Target Announced in Climate Action Plan
  - at least 3.5 GW of offshore renewable energy (increased to 5GW in PfG)
  - up to 8.2 GW total of increased onshore wind capacity
- 183 Actions in Climate Action Plan – 15 Renewable Electricity Actions



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SEAI Role

- Energy Authority for Ireland
- Renewable Energy and Energy Efficiency
  - Operate Government Schemes
  - Fund RD&D
- Energy Statistics
- Arrange IEA TCP Participation

Test Facilities

SmartBay Galway Bay Marine Energy Test Site

- Consent Obtained for ¼ Scale Floating Wind Test

Atlantic Marine Energy Test Site

- EU Funding for Floating Wind Demonstration

Wave Tank Test Facilities in Cork

EU Funded Project AFLOWT

- €31M funding award
- Partners: European Marine Energy Centre (EMEC), SEAI, SAIPEM SA, Cable Life Cycle Assurance (CaLiCyA) France, Maritime Research Institute Netherlands (MARIN), Fraunhofer Institute for Wind Energy Systems (IWES) Germany, University College Cork and ESB E&MP
- Testing AMETS 2022

SEAI Wind Energy Roadmap 2011

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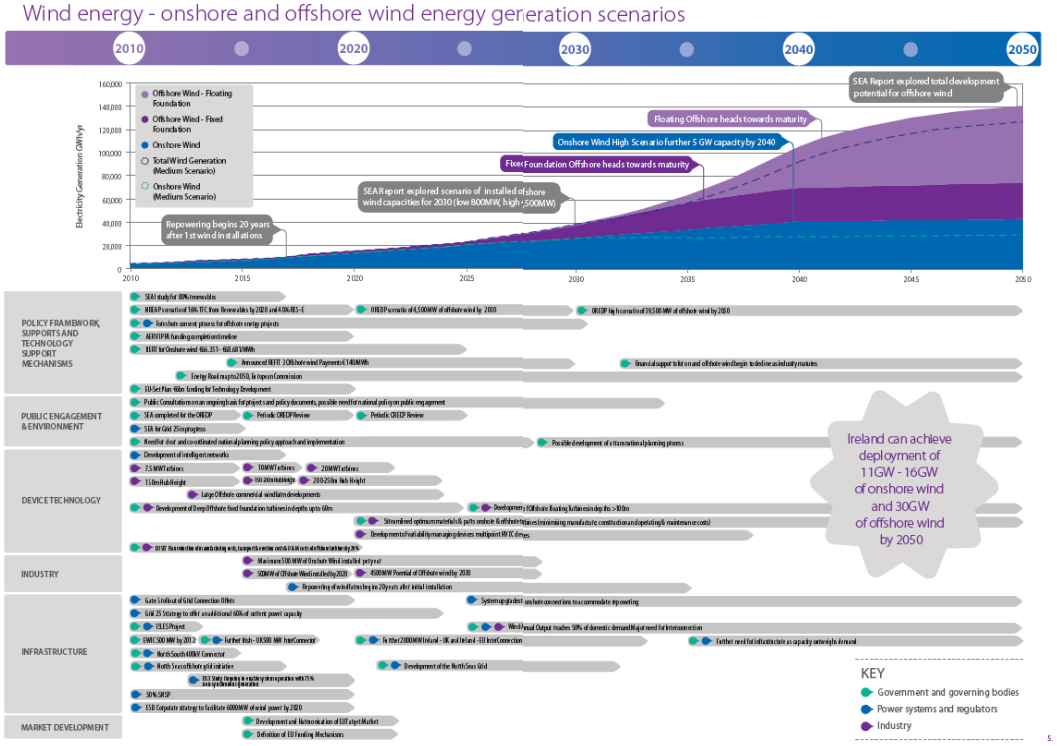
Wind Energy Roadmap for Ireland 2011



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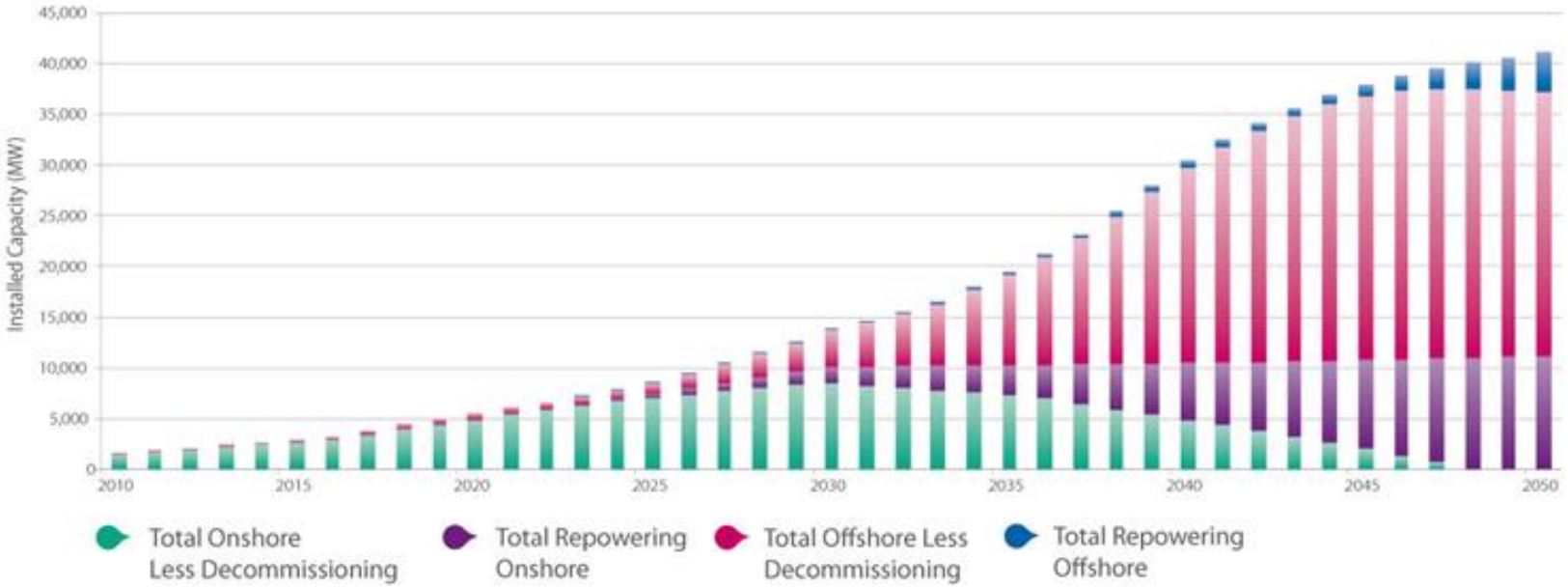
Wind Energy Roadmap for Ireland 2011

Cumulative Capacity with Repowering of Onshore and Offshore Wind Installations to 2050



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SEAI R,D&D Call 2021 Floating Offshore Wind Topics

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SEAI 2021 RD&D Call for Proposals

Project specifications relevant to floating offshore wind energy:

- **Topic 20** Floating offshore wind development
- **Topic 23** Collection of data to inform policy development and consenting for offshore renewable technologies
- **Topic 24** Development of emerging ocean energy and offshore renewable technologies

Related topics:

- **Topic 5** Green hydrogen production from Irish onshore and offshore wind resources
- **Topic 11** Establishing an energy self-sufficient coastal community in practice: Feasibility, development, pilot demonstration
- **Topic 9** Airborne wind energy
- **Topic 15** Remote and autonomous inspection and maintenance of onshore and offshore wind turbines

Deadline for Applications March 29th!

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Topic 20 Floating Offshore Wind Development

Project Objectives & Expected Outputs:

- Definition of reference site conditions for floating wind arrays
  - Curating a set of site conditions representative of the global floating wind deployment pipeline
- Development of reference floating wind array designs
  - Developing reference array designs for typical site conditions and technology types.
- Array-level failure risks and mitigation
  - Cataloguing array-level failure risks and mitigation strategies with particular consideration of Irish conditions
- Stakeholder integration
  - Identifying critical innovation opportunities and marine spatial planning requirements that will affect floating wind array design and deployment
- Route to market opportunities
  - Identifying practical options and critical path to unlock connection challenges, route to market and export potential
- Examination of pathway to 2030 and parameters and timelines required for scaling
  - Identifying possible demonstration opportunities pre- 2030, opportunities to build supply chain, appropriate support level pre-2030 and post-2030.

Thank you.

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