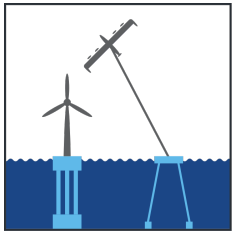
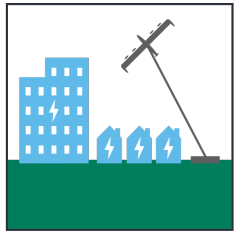
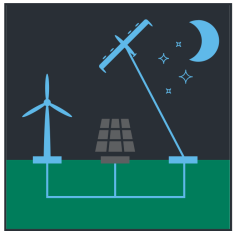
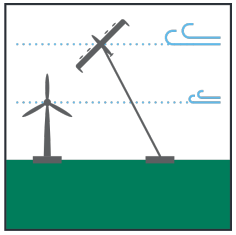
iea wind

Topical Expert Meeting TEM#102
Airborne Wind Energy

Introductory Session: Vision(s) for the Airborne Wind Energy Sector

23-24 September 2020

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Airborne wind energy in two sentences

The essence of airborne wind energy is to replace (passive) material constraints by (active) control algorithms. This is the great potential but at the same time also the challenge of the technology.

http://awesco.eu/awe-explained

What we want to achieve in the long run

- Based on its *resource availability* and *material savings* make AWE the *cheapest* form of energy.
- Based on its *low environmental footprint*, make AWE the *most acceptable* form of energy.
- Combine AWE with other renewable energy technologies to accelerate the transition to a *100% renewable energy system*.

What we want to achieve in the long run

But...

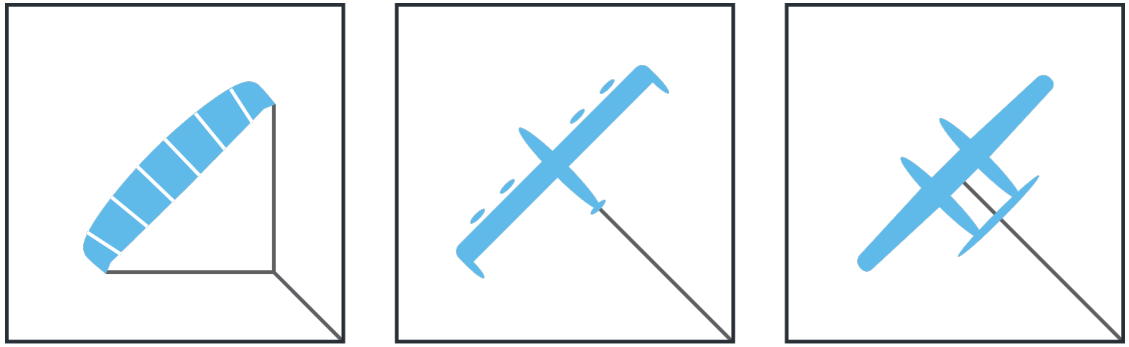
- Commercially developing AWE is *technologically ambitious*, *costly* and also *risky*.
- There are still many *obstacles* to surpass and development times are generally *much longer* than expected.
- Especially the pronounced *multidisciplinary character* of the pursued technologies requires a very systematic approach.
- We all know the *13 year story of Makani*, from startup, to a Google moonshot project and last years offshore demo.

What do we need to tackle these challenges

- Secure financing of R&D, as a combination of public and private sources.
- Societal and political support.
- A motivated, passionate and well educated workforce of researchers, engineers.
- A gated multi-stage development process.

Commercialization strategies: target different markets

- *Short-term commercialization* (1-3 years to market entry): Small-scale AWE systems (up to several 100 kW) that exploit the high mobility, low weight and rapid deployment features.
- *Longer-term commercialization* (5-15 years to market entry): Larger-scale AWE systems (MW range) that target massive deployment scenarios and exploit the full potential of AWE.



Flexible wing 100 kW
Kitepower

Rigid wing 500 kW
Kitemill/TwingTec/kiteKRAFT

Rigid wing 2 MW
Ampyx Power

What can a dedicated IEA Wind Task do for this?

- Create an international network of industry and academia
- Establish a systematic and global approach of collaboration
- Accelerate AWE development to commercialization and deployment
- Increase visibility, knowledge and awareness of AWE technology

Thank you for your attention!

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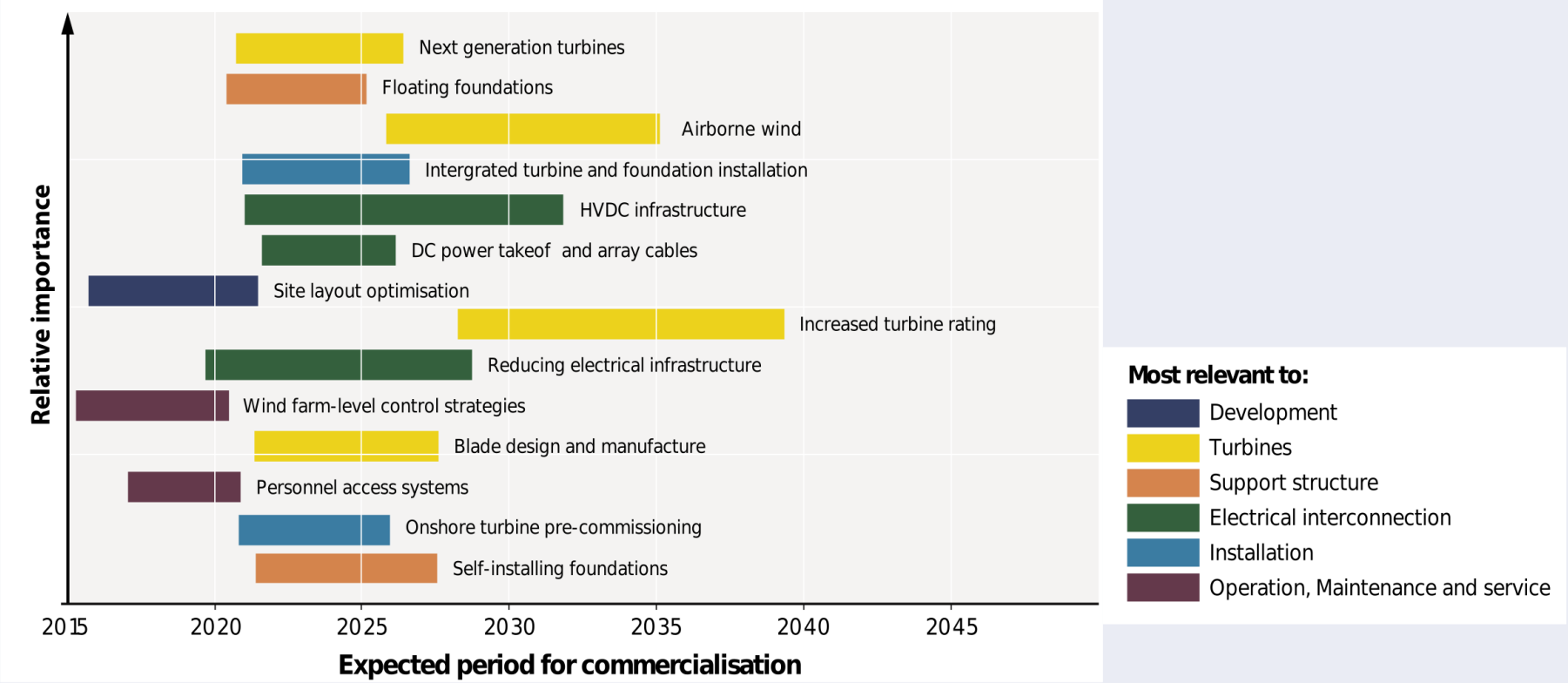
Discussion

Anticipated timing and importance of innovations in offshore wind technology 2016-2045

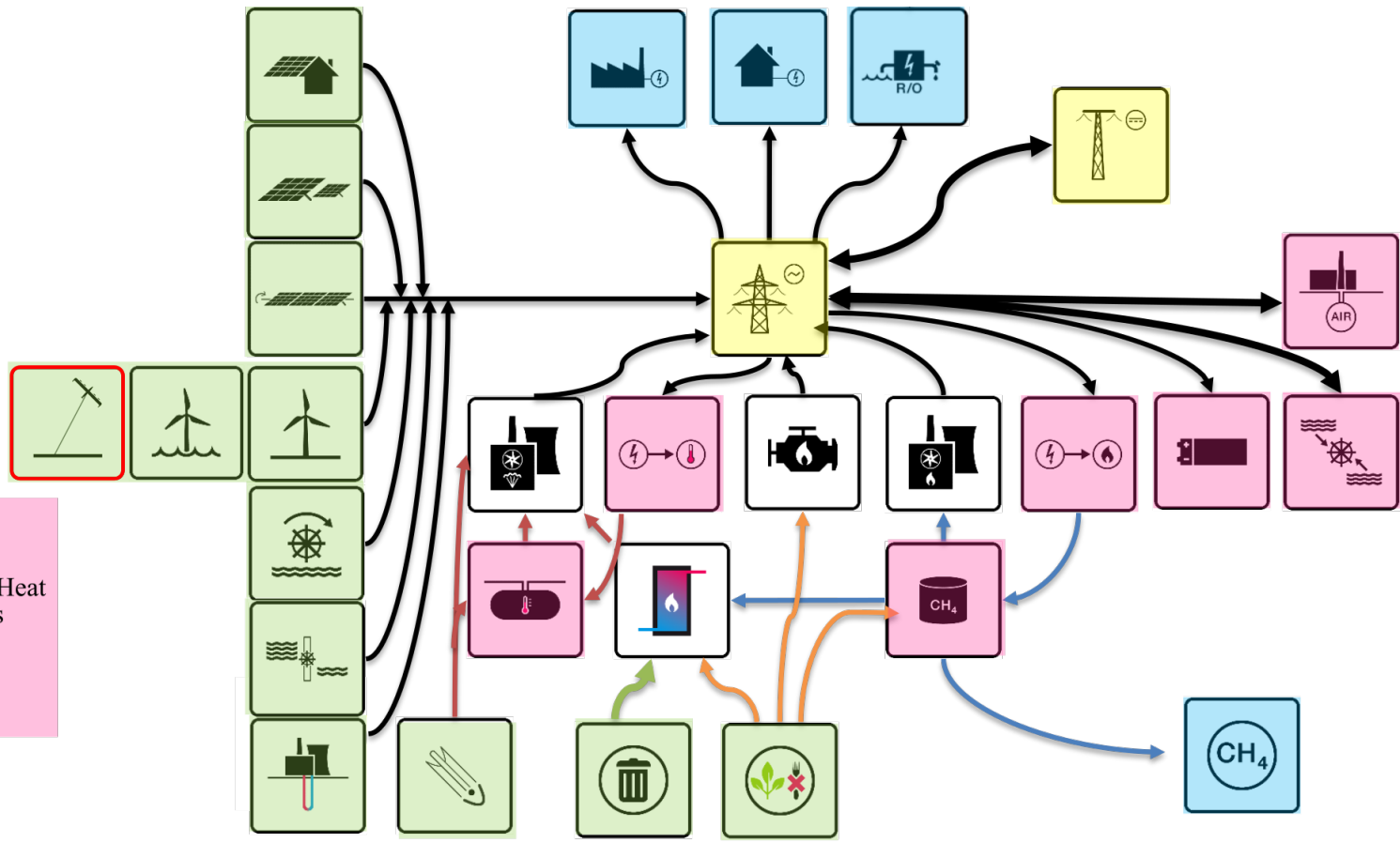


Source: IRENA Innovation Outlook: Off-shore Wind, International Renewable Energy Agency, Abu Dhabi, 2016.

LUT energy system model with integrated AWE component

Renewable energy sources
- PV rooftop
- PV ground-mounted
- PV single-axis tracking
- Wind onshore/ offshore
- **Airborne wind energy**
- Hydro run-of-river
- Hydro dam
- Geothermal energy
- CSP
- Waste-to-energy
- Biogas
- Biomass

Electricity transmission
- node-internal AC transmission
- interconnected by HVDC lines

Storage options
- Batteries
- Pumped hydro storage
- Adiabatic compressed air storage
- Thermal energy storage, Power-to-Heat
- Gas storage based on Power-to-Gas
  - Water electrolysis
  - Methanation
  - CO2 from air
  - Gas storage

Energy demand
- Electricity
- Water Desalination
- Industrial Gas