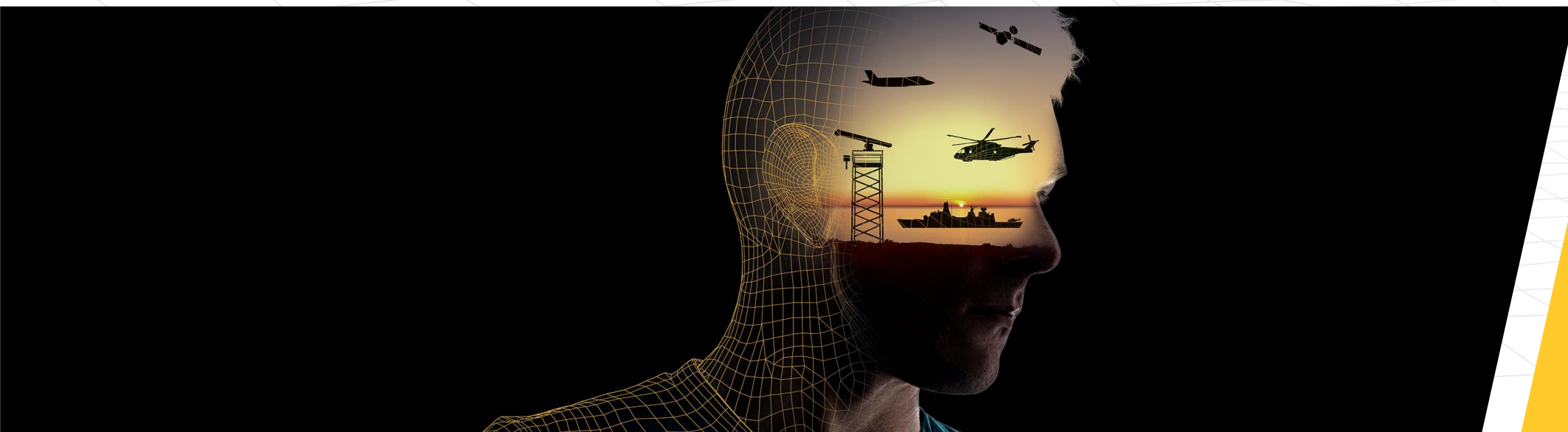




Wind Energy and Radars

Wind Turbine Radar Interference Mitigation

Wind Europe Offshore 2019
Copenhagen



Michael Agergaard Riis
29 November 2019

Terma



Space (SPA)

- Star Tracker
- Electronics
- Software
- Services



Aeronautics (AER)

- Electronics
- Aerostructures



Surveillance & Mission Systems (SMS)

- Radar systems
- Command & Control systems
- Critical infrastructure protection

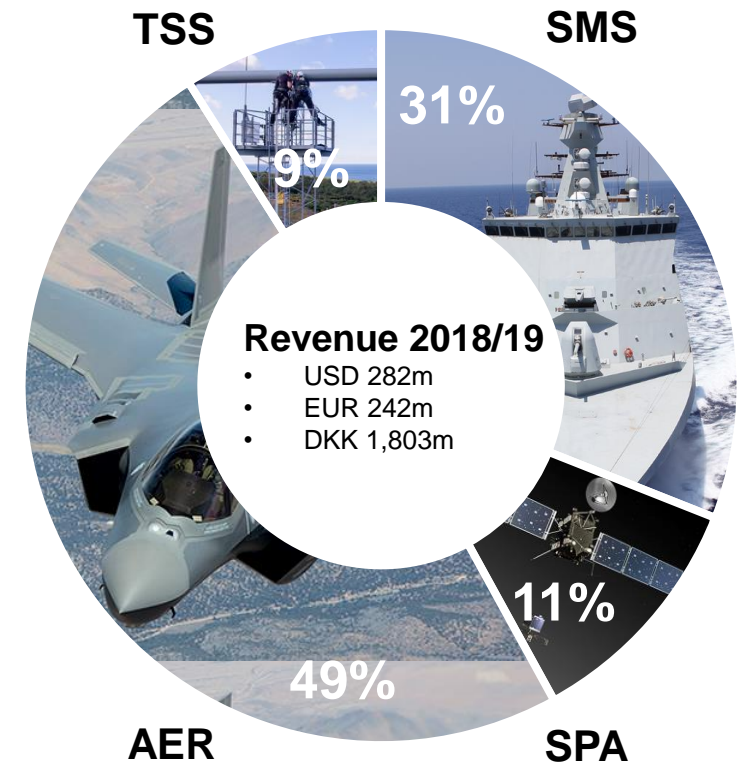


Support & Services (TSS)



- Maintenance
- Through Life Support

Revenue per Business Area

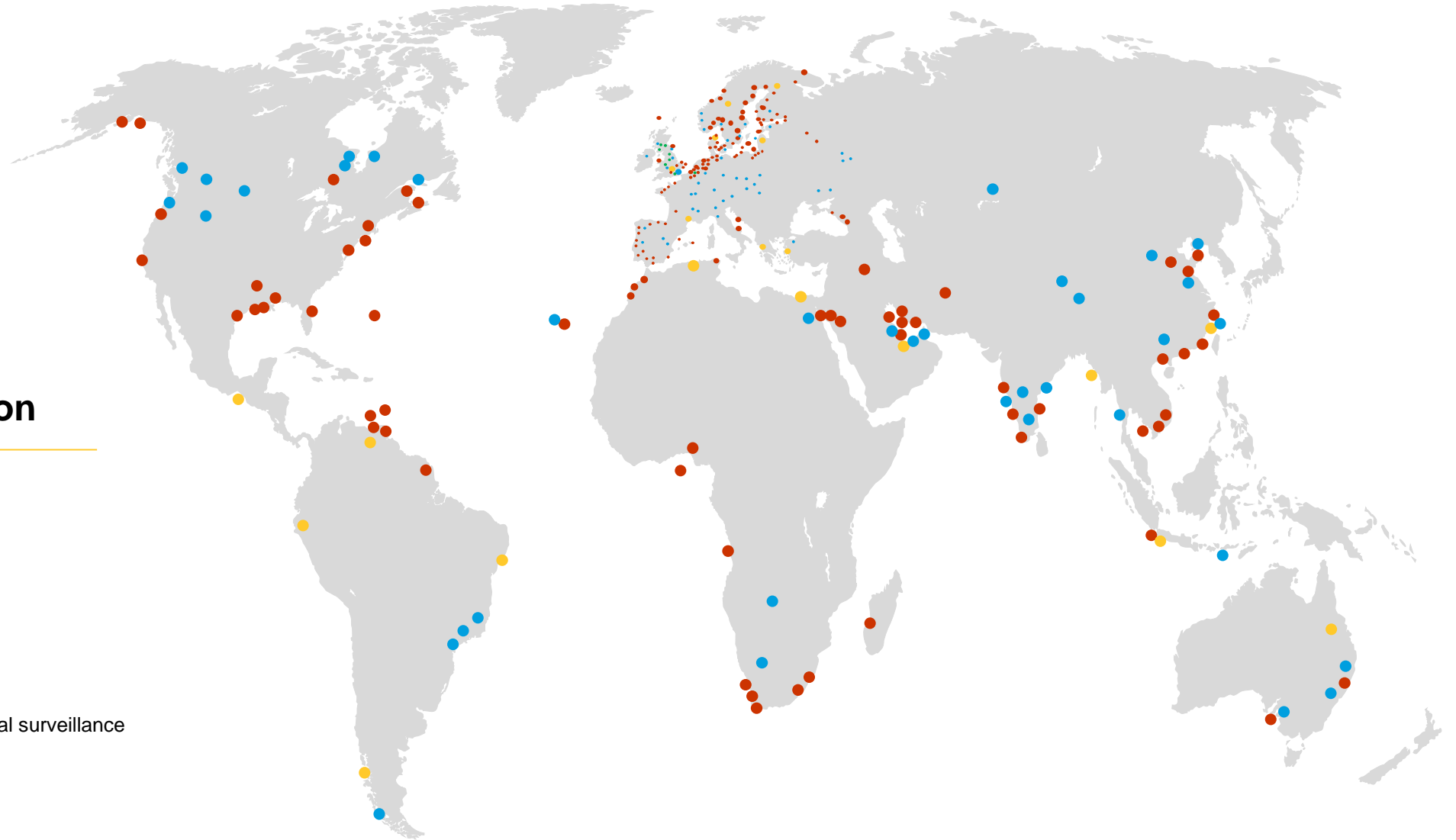


Terma Radars

3,000+
systems in operation

- 90+ naval systems
- 140+ airports
- 70 years' experience

- Naval references
- Vessel Traffic Services and coastal surveillance
- Airport Surface Movement radar
- Air Traffic Control radars



Wind Turbine impact on Radar performance

Surface Surveillance

- Shadowing
 - Ghost targets
 - Side lobes
 - Increased clutter levels
-



Courtesy of MHI Vestas Offshore Wind

Costal surveillance radars



Offshore surface mitigation

- London Array (UK)
- Galloper (UK)
- Burbo Banks (UK)
- Borssele (NL)
- Great Belt (DK)



Wind turbine impact on aviation radar

Increased Clutter (noise)

- Turbine reflection (RCS)
- Turbine tip speed (Doppler)

Reduced Sensitivity

- Increased clutter suppression
- “Shadowing”



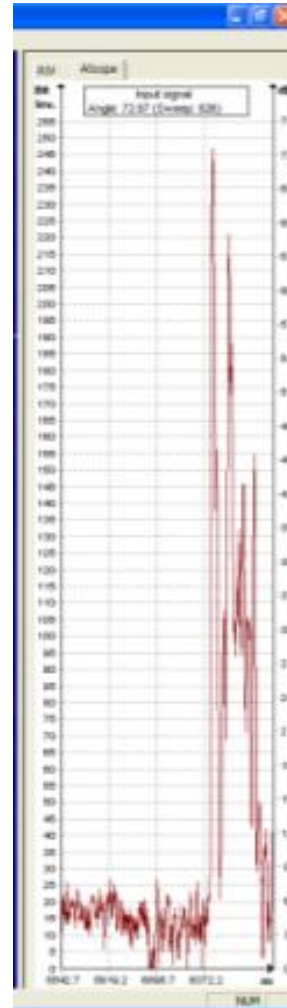
SCANTER 4002 Radar mitigation



- 360° coverage
- Range up to 40 nautical miles (74 km)
- Based on existing product
- Multiple systems in operation



SCANTER 4002 Radar mitigation



Mitigation technique

- High resolution
- High dynamic range
- Advanced tracker capability
- Adaptive clutter maps
- Adaptive CFAR

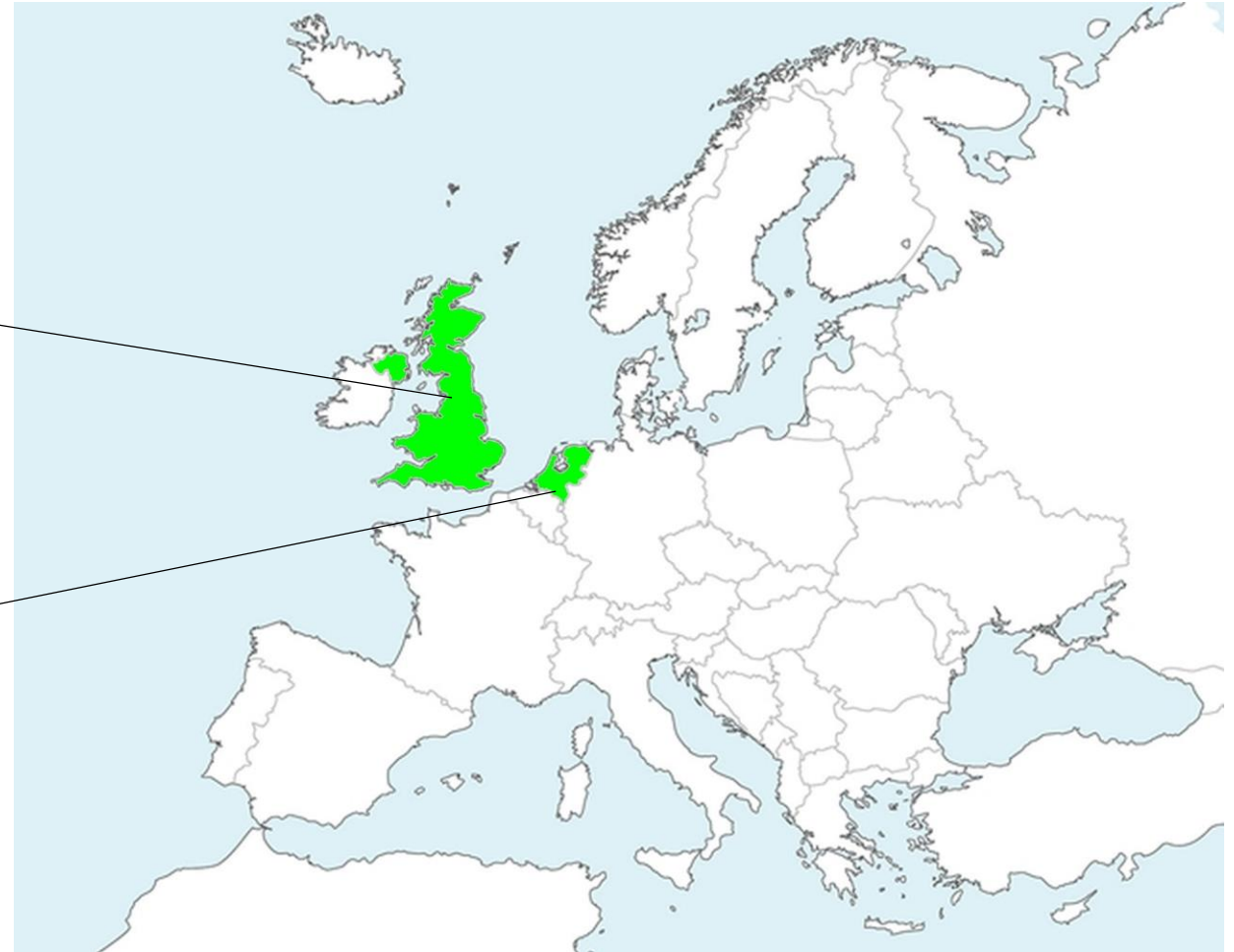
SCANTER 4002 Locations

United Kingdom:

- Chester Hawarden Airport
- Newcastle Airport
- Edinburgh Airport
- Prestwick Airport
- Glasgow Airport
- Durham Tee's Valley Airport
- Southampton Airport

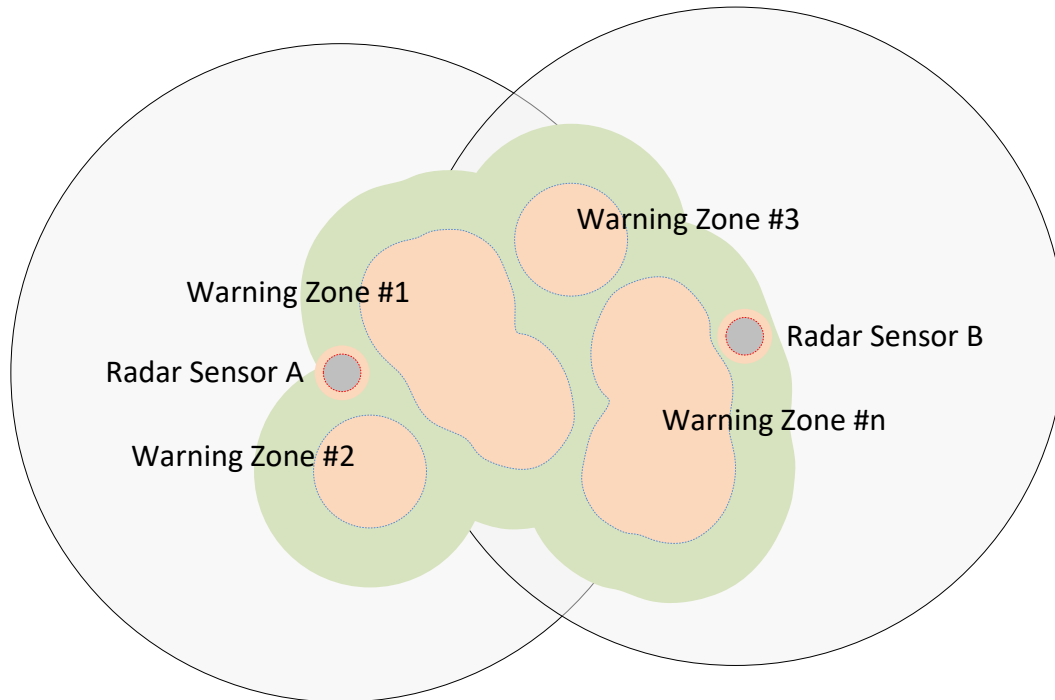
The Netherlands:

- Wemeldinge
(Woensdrecht Air Force Base)



Obstruction Light Control

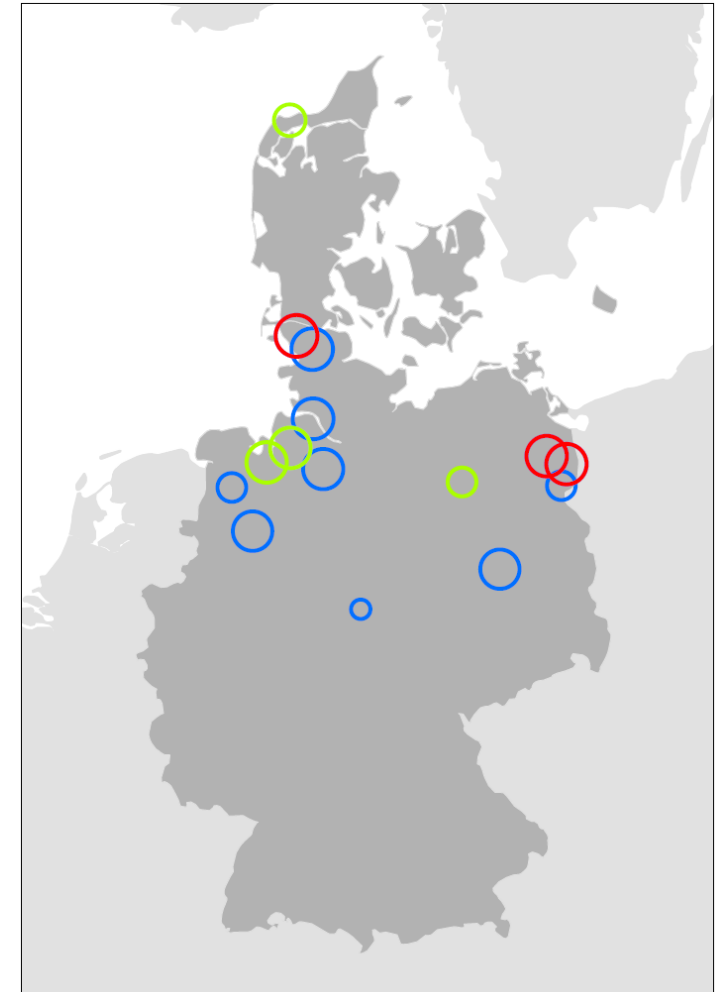
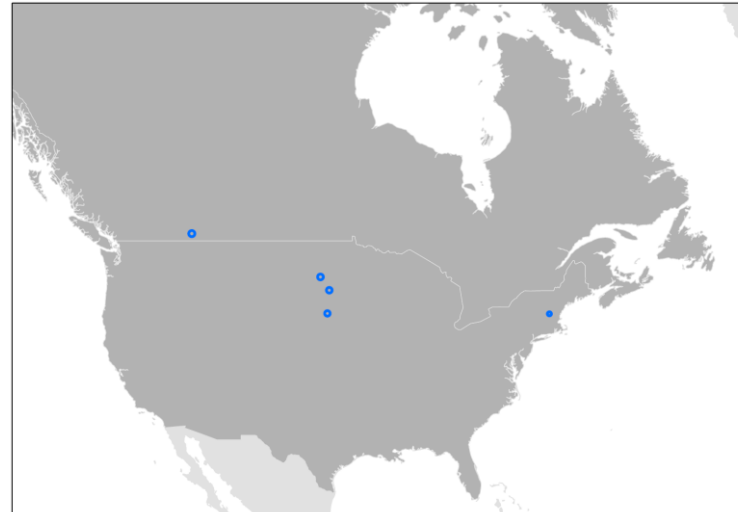
- OLC can contribute to:
 - Increase public acceptance of wind energy
 - Project enabler for wind farm developers



Terma Obstruction Light Control references

Status September 2019

- 4 systems in operation
- 0 systems awaiting approval
- 4 systems under commissioning
- 13 systems ordered



Challenges

- Different regulations (different countries)
 - Different requirements (Civil / Military)
 - Individual requirements (user/site specific)
 - Creating shared/common interest among stakeholders
-



Lessons learned / Key takeaways



- Technical solutions are here
 - Importance of getting stakeholders together
 - Importance of including all stakeholders
 - Importance of keep pushing
 - Importance of political interest/engagement
-

Thank you for your time

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