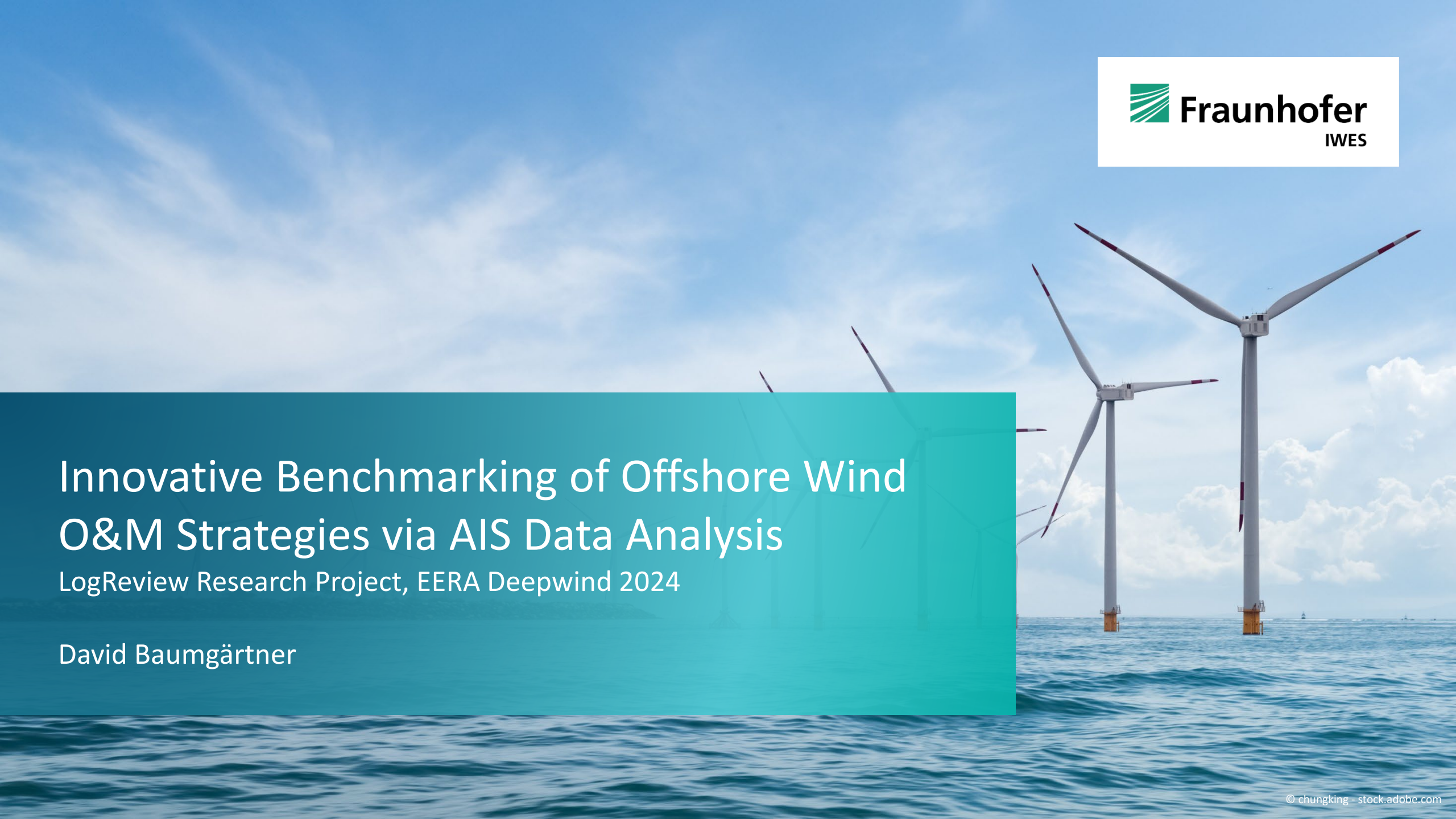


Innovative Benchmarking of Offshore Wind O&M Strategies via AIS Data Analysis

LogReview Research Project, EERA Deepwind 2024

David Baumgärtner

What is AIS Data?

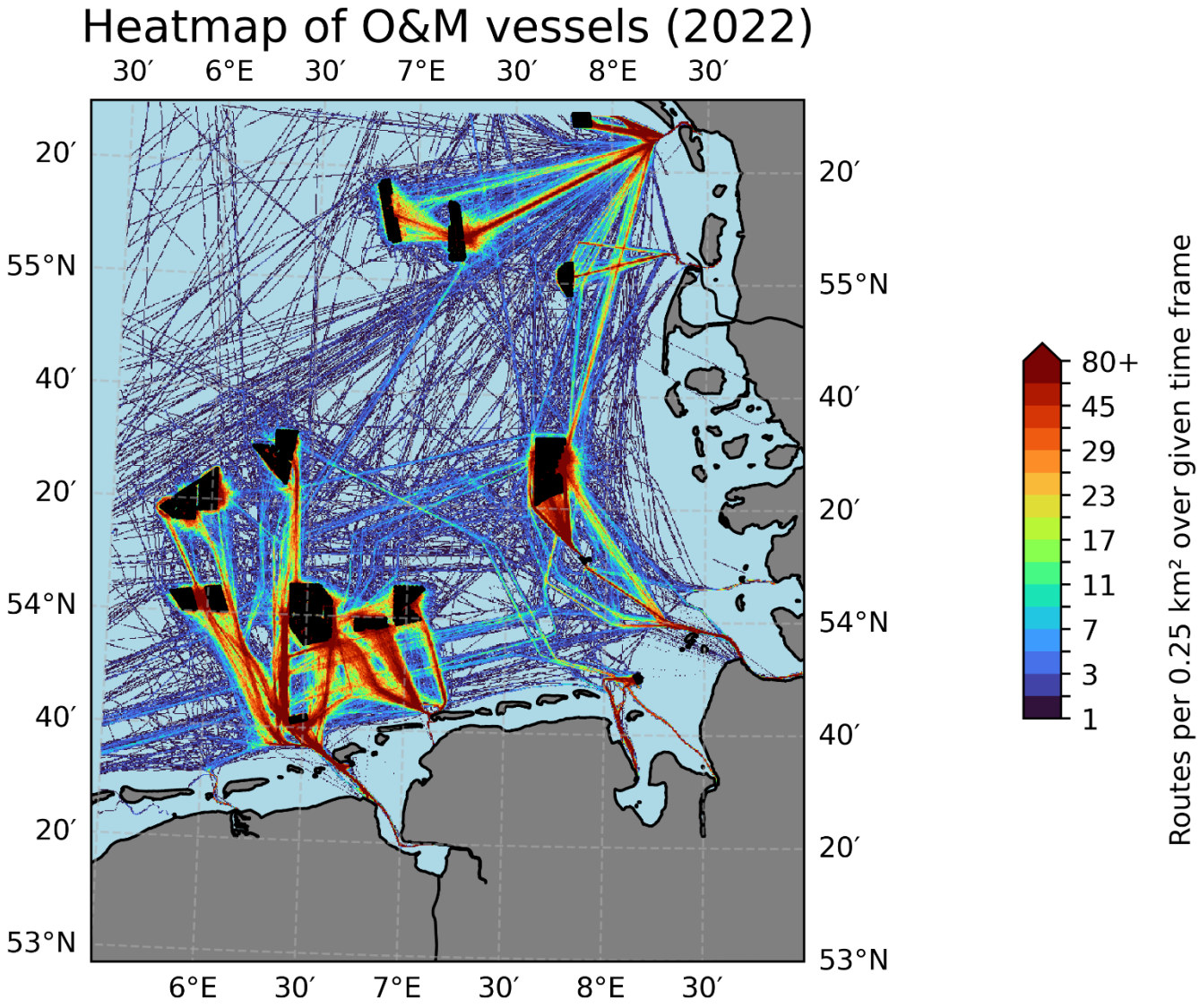
Introduction

What is AIS data

- Positional data transmitted by every vessel for navigational safety reasons
- `Free´ to be recorded by anyone

Insights

- Vessels that are used for O&M in wind farms
- Detailed time and path taken by all vessel



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Introduction

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- Positional data transmitted by every vessel for navigational safety reasons
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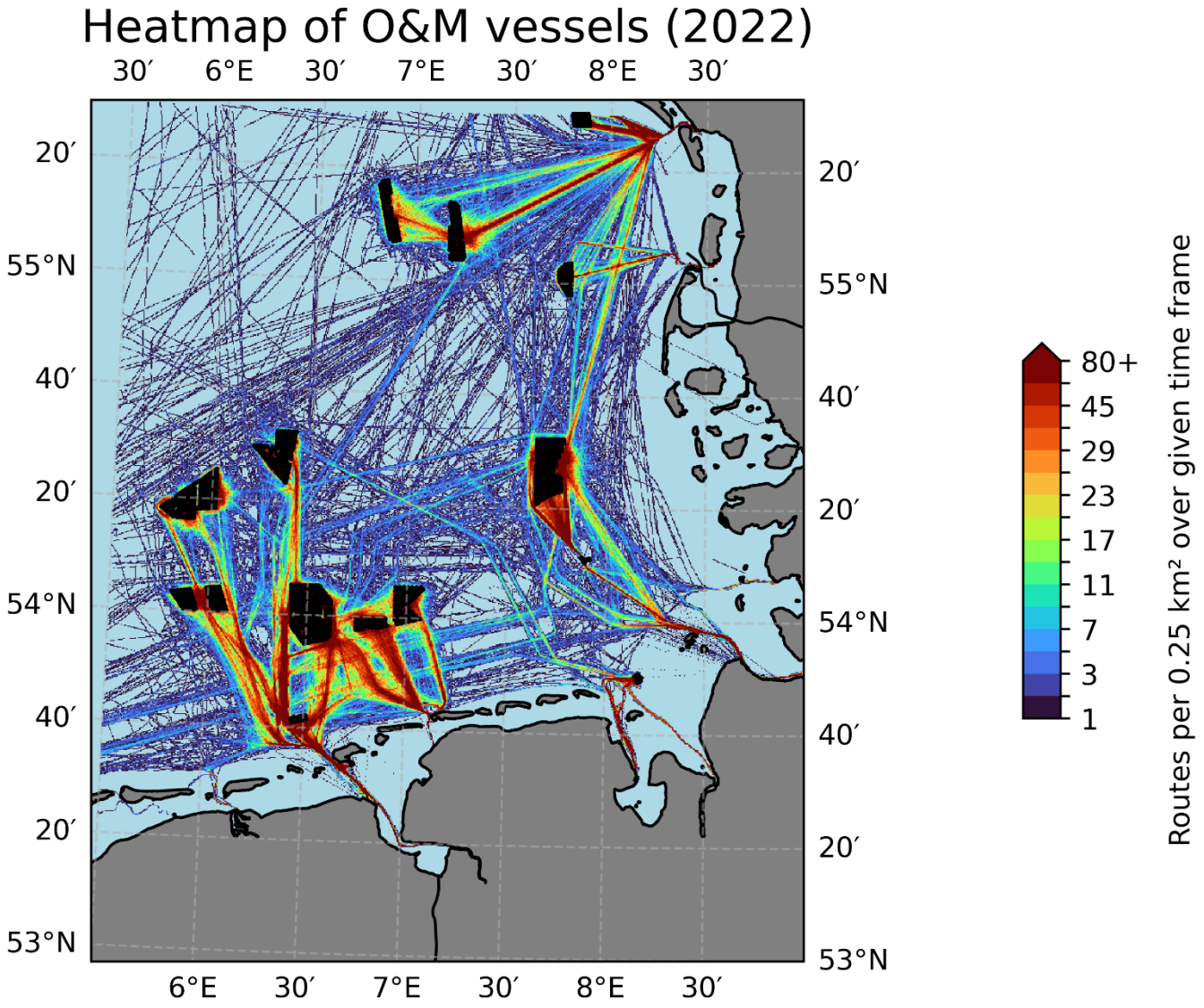
- Vessels that are used for O&M in wind farms
- Detailed time and path taken by all vessel

Can we use AIS data to independently benchmark the logistic concepts of different offshore wind farms?



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AIS Measurement Infrastructure

Installation of the Measurement Infrastructure for AIS and ADS-B

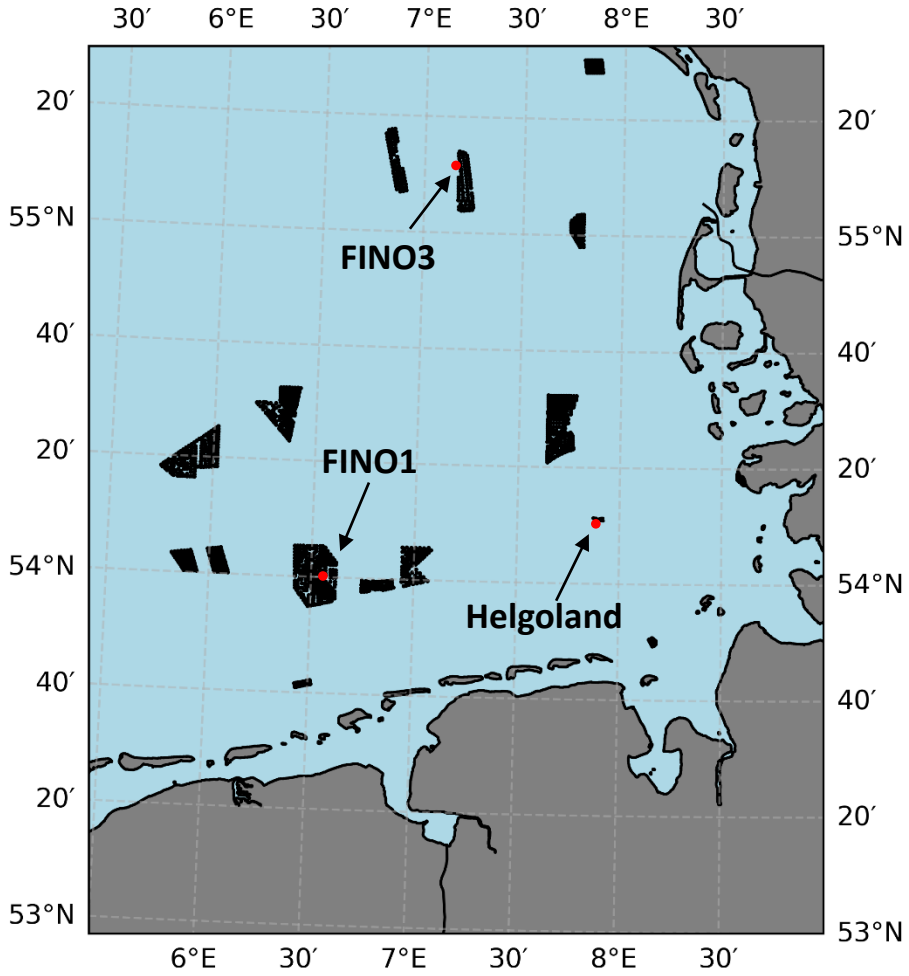
Independent High-Resolution Data

Helgoland

- Commissioning at the beginning of October ‘22
- Installation at the harbour site located on the lower part of the island

FINO 1 / 3

- Installation in March ’23 / April ‘23
- Antennas are installed at 60 meters above the platform

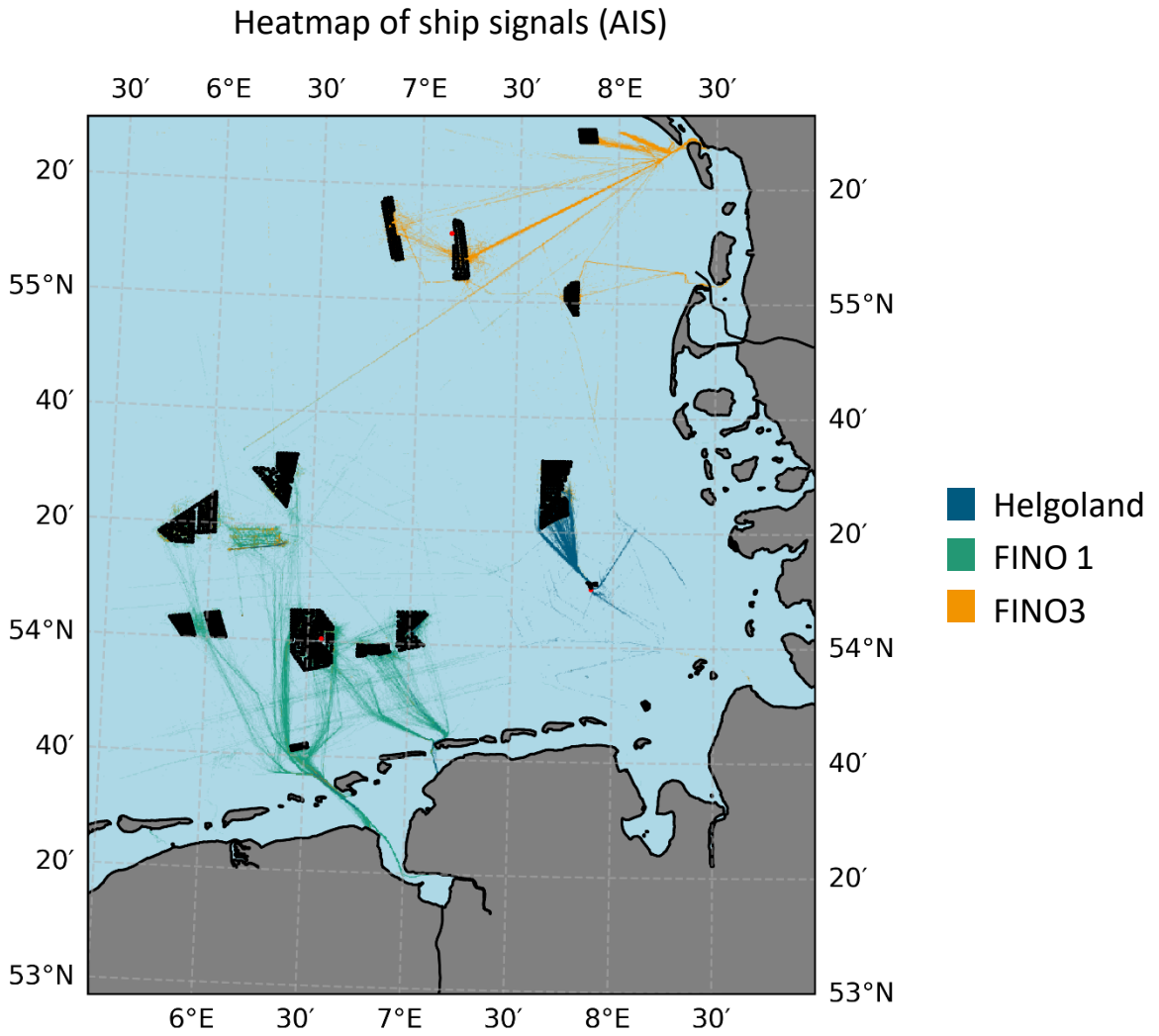


Installation of the Measurement Infrastructure for AIS and ADS-B

Range of measurements

AIS signals of O&M vessels over one month (May 2023)

- The logistic O&M activities in German offshore wind farms are covered by setup



Data Processing

Data storage and cleaning

Reducing the data

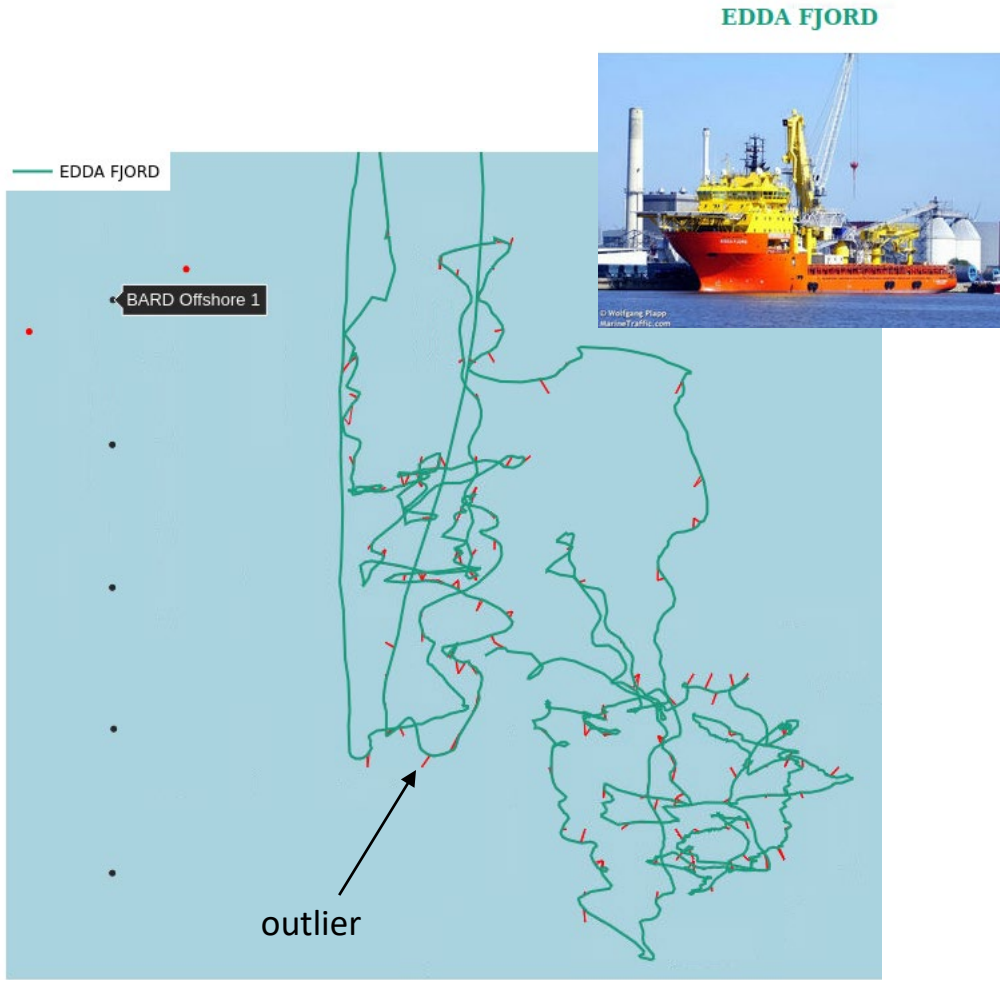
- Store all static ship data in vessel database
- Create individual databases per vessel with time, position, speed and course

Remove outliers

- Compare submitted speed with speed based on positional change

Overlay with additional data

- Add weather data (ERA5)
- Compare against operational data from Wind farm operators



Data analysis

Automatic identification of key events

Identify wind farm visits

- Time spent in the closed proximity of any wind turbine of OWP
- Vessel speed below threshold

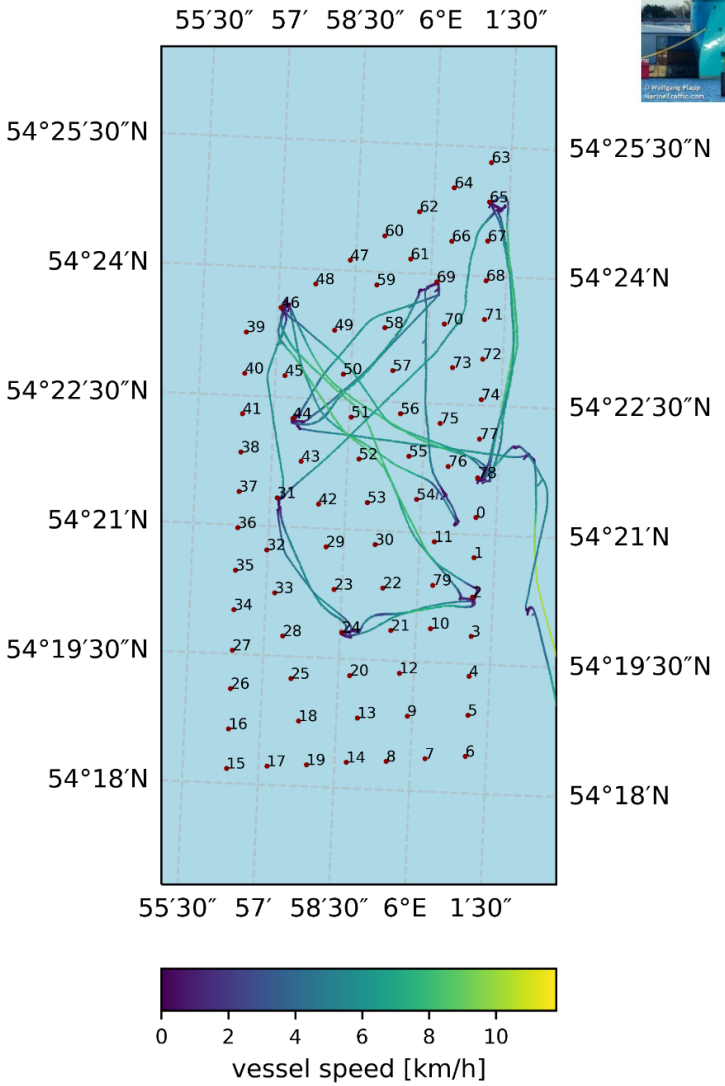
Identify wind turbine visits

- Time spent in closed proximity of specific turbine
- Vessel speed below threshold
- Distance to turbine follows distinct path

Identify port visits

- Same process as wind farm visits

ACTA AURIGA is type Offshore Supply Ship (Other)



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Individual vs Cluster OWP

Individual vs Cluster OWP

Key figures of individual OWP

Butendiek

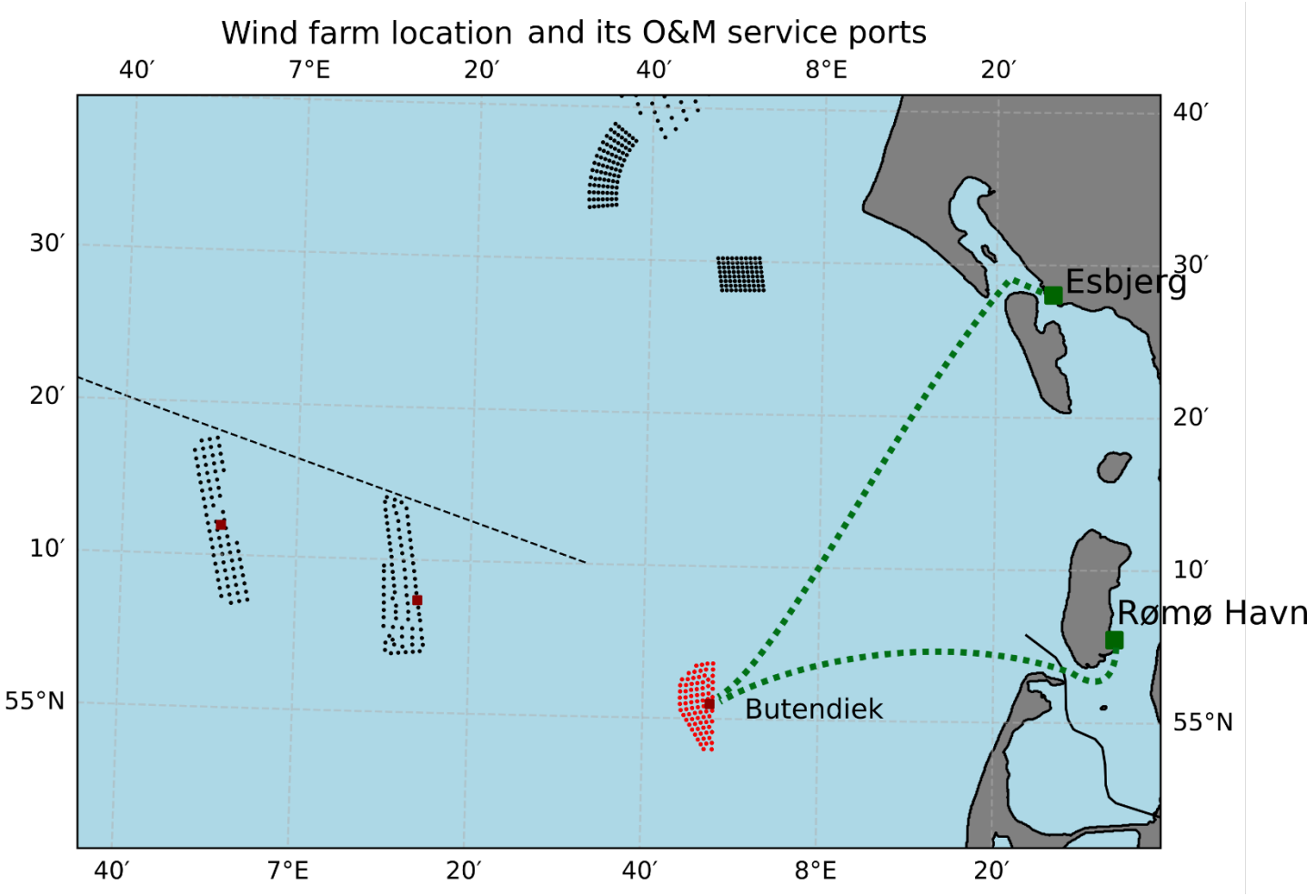
- Full commissioning August 2015
- 80 x SWT 3.6 (total: 288 MW)

Service port

- Rømø Havn (51 km)
- Esbjerg (65 km)

Vessels

- SOV + daughter crafts
- 2 CTVs



Individual vs Cluster OWP

Key figures of OWP cluster

DanTysk

- Full commissioning April 2015
- 80 x SWT 3.6 (total: 288 MW)

Sandbank

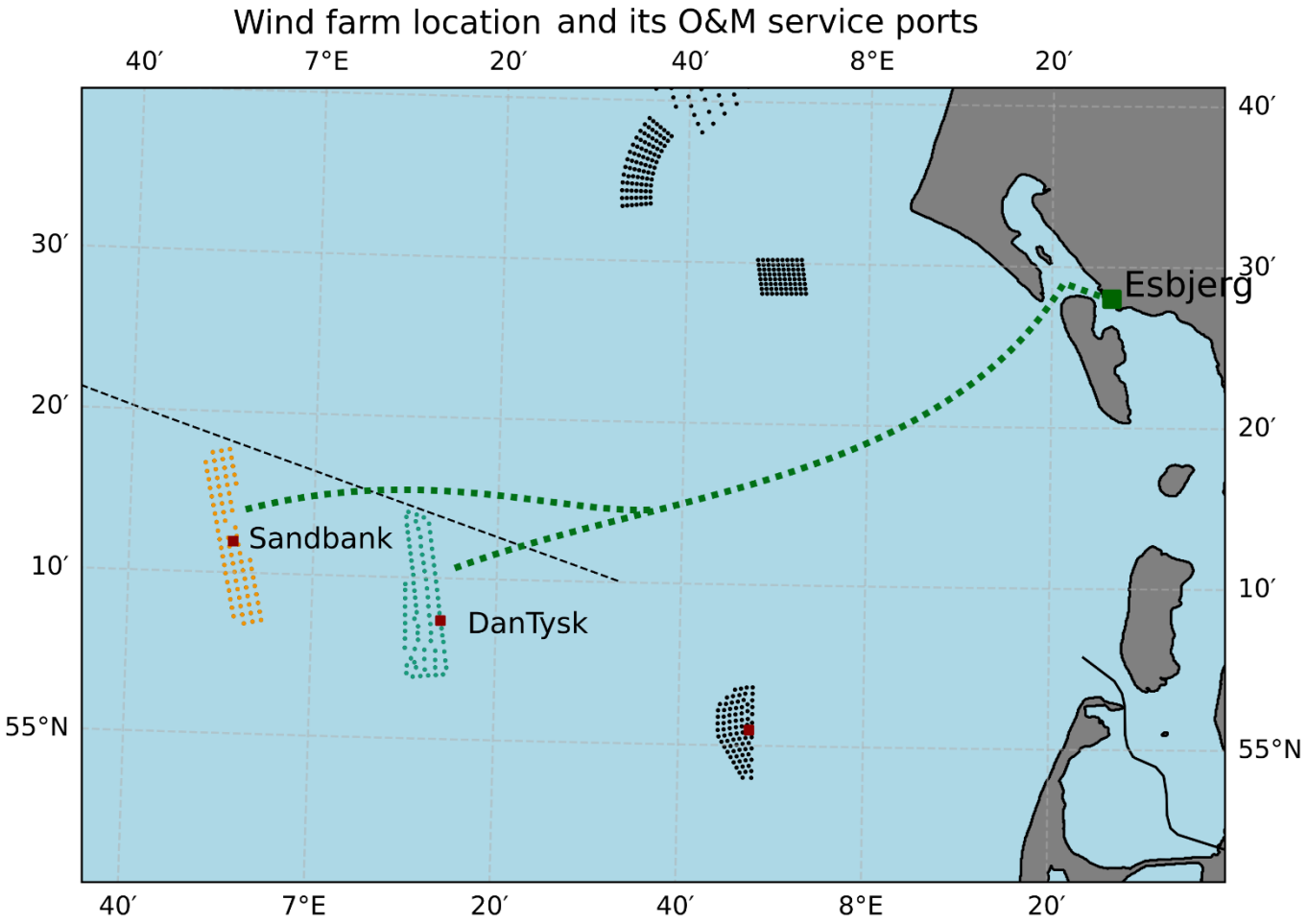
- Full commissioning January 2017
- 72 x SWT 4.0 (total: 288 MW)

Service port

- Esbjerg (86 / 105 km)

Vessels

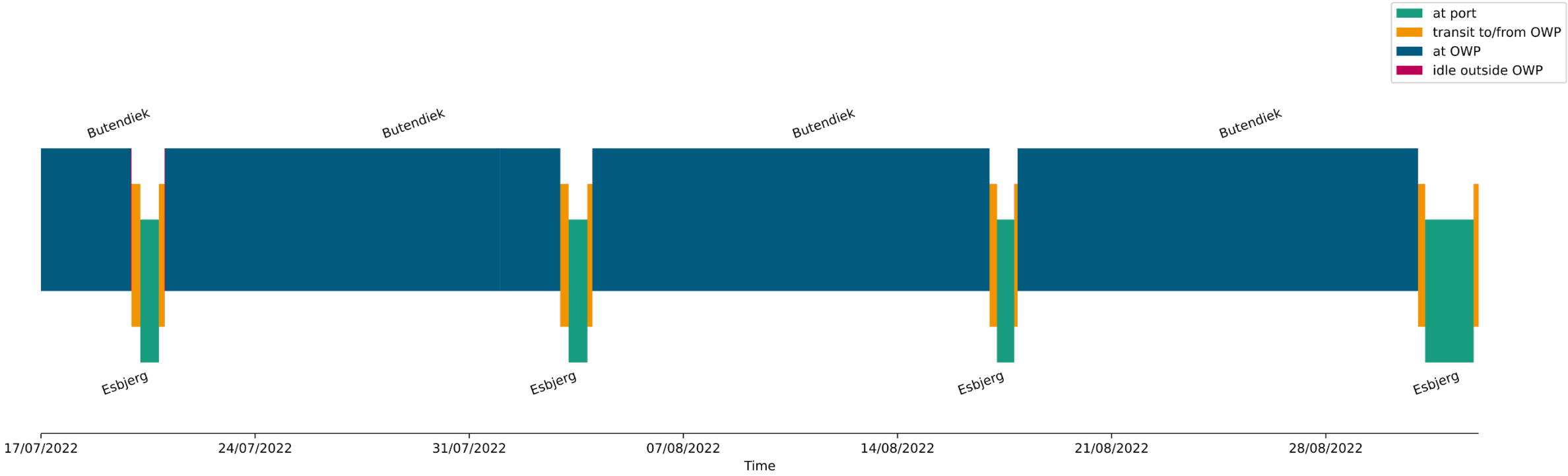
- SOV
- 7 CTVS



Individual OWP

Usage of Service Operating Vessel – Summer months

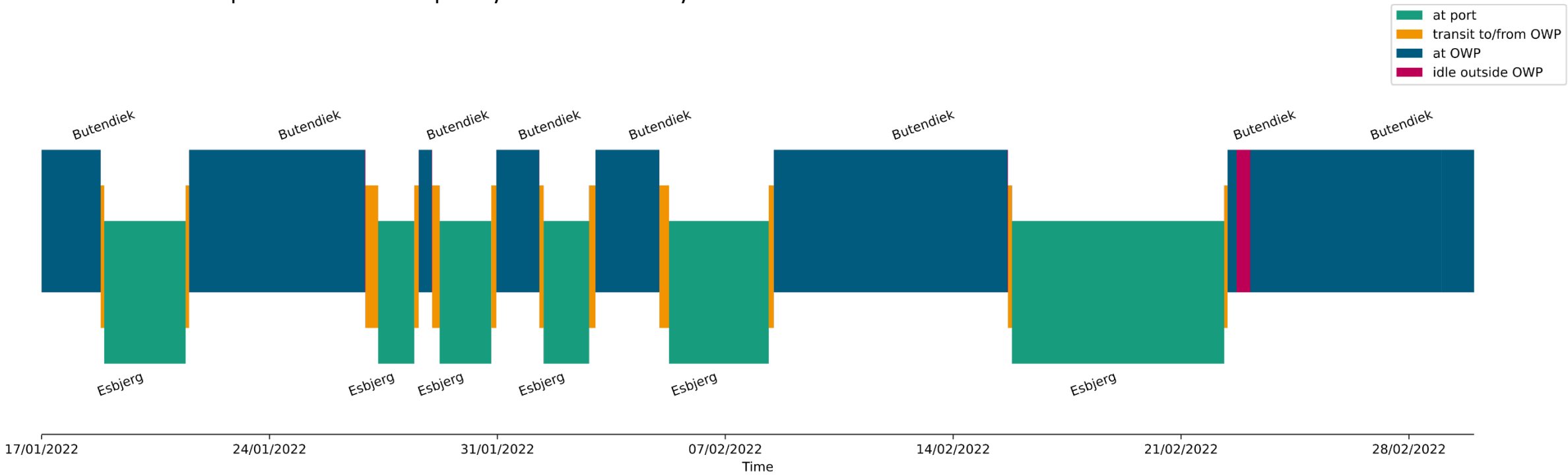
- Performs scheduled inspection campaign
- SOV stays offshore at the wind farm for about 2 weeks



Individual OWP

Usage of Service Operating Vessel – Winter months

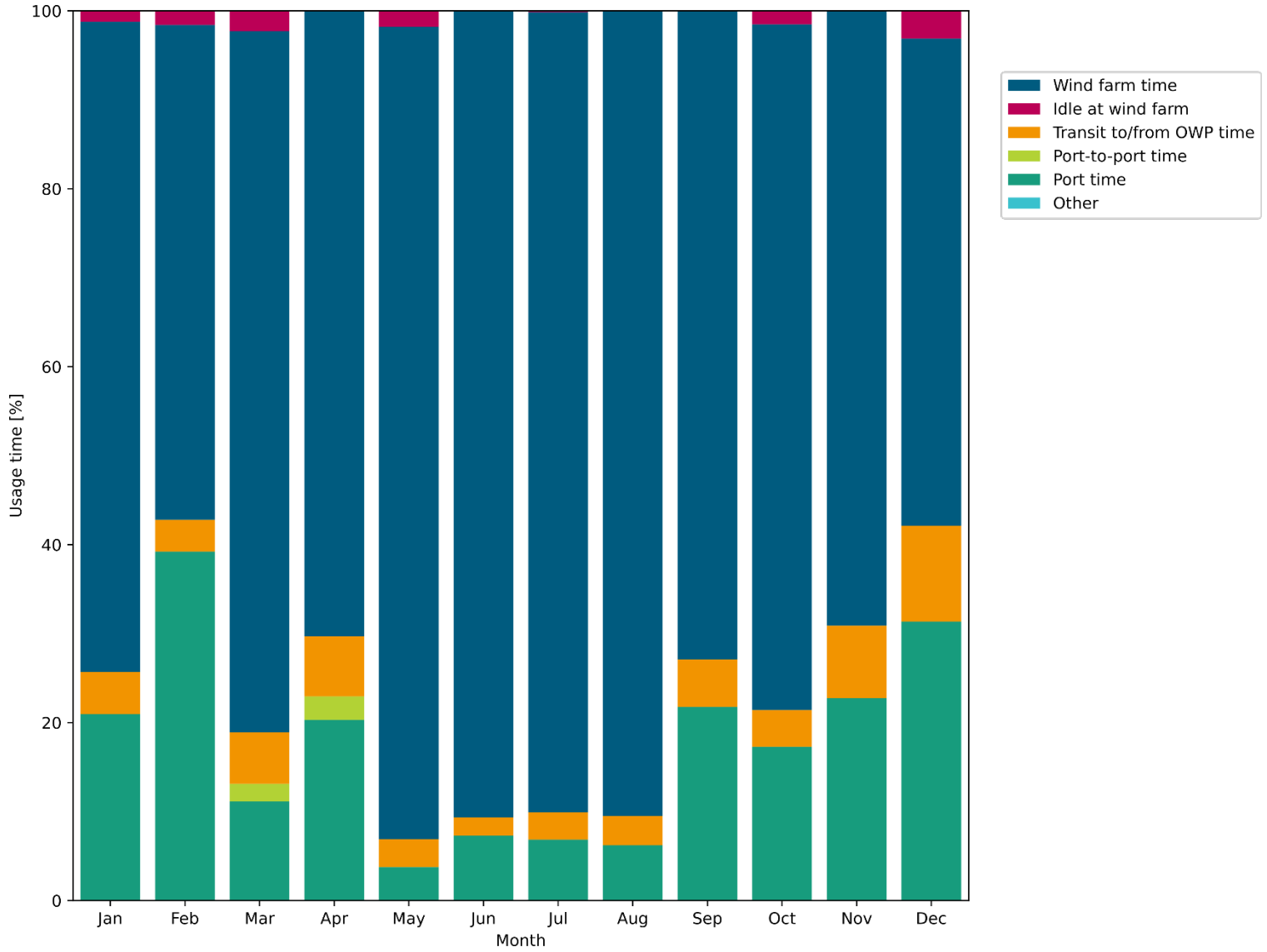
- Performs trouble shooting tasks, especially when CTVs cannot be used due to rough sea state
- SOV returns to port much more frequently and inconsistently



Individual OWP

Usage of Service Operating Vessel

- Average time spent at OWP: 78%
- Average transit time to port: 4.5%
- Average time spend at port: 16%



Individual OWP

Usage of Service Operating Vessel at OWP

Stationary Time

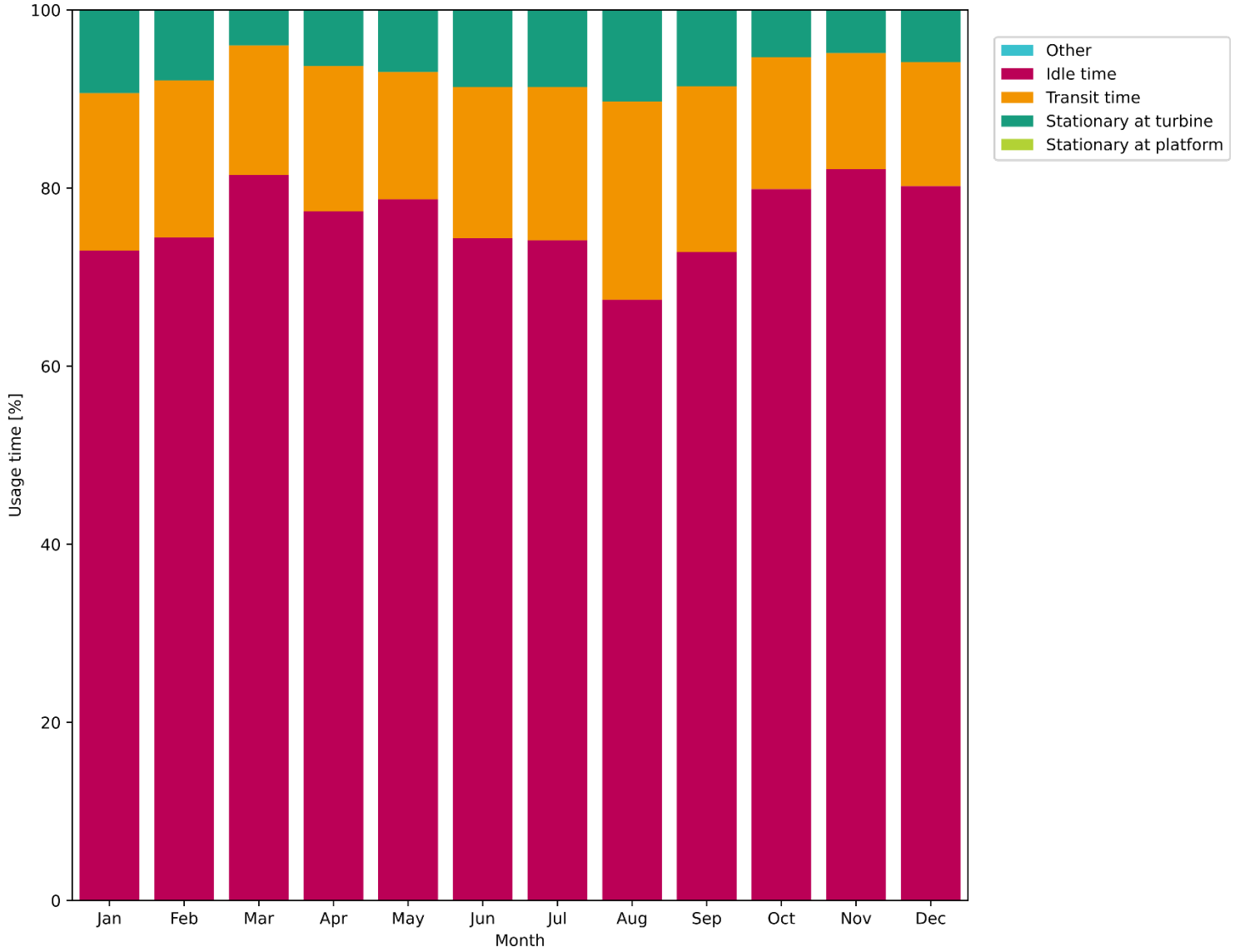
- Transfer of workers and material at turbine
- 7% of time

Transit Time

- Vessel speed > 1.5 knots
- 17% of time

Idle Time

- Vessel speed < 1.5 knots
- 76% of time



Cluster OWP

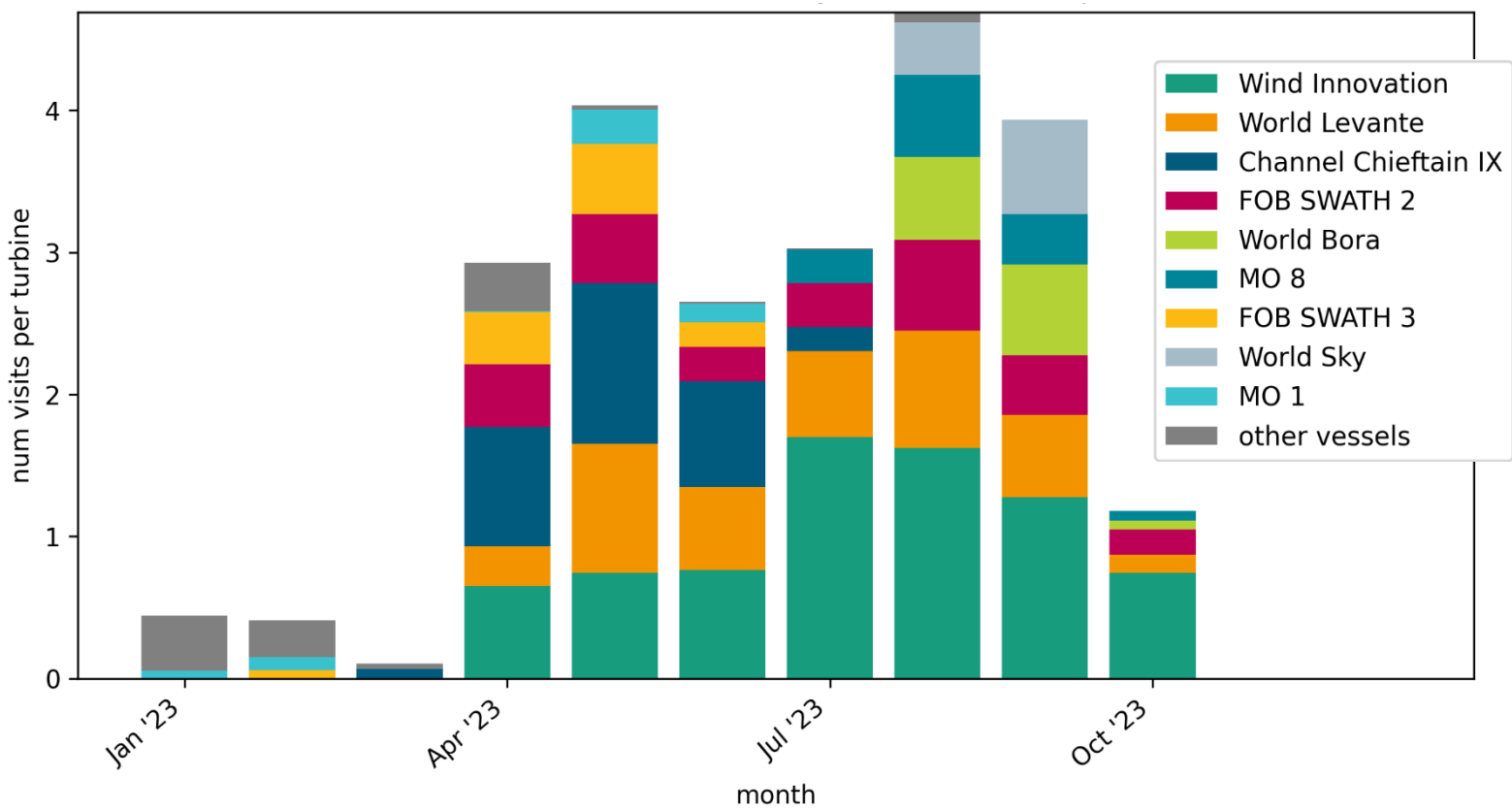
Usage of Service Vessels

SOV

- Only employed during summer months (April – October)
- Works in one wind farm at a time

CTVs

- Use the DanTysk platform for accommodation
- Remain in wind farm for about a week, if the weather allows it



Performance of different logistic concepts

Individual OWP vs. OWP cluster (Jan-Oct. ‘23)

KPI	individual OWP	OWP cluster	unit
turbine visit	42.5	**23.4**	visits per turbine
service / repair time	119	**66**	hours per turbine
shift length SOV	**12.7**	**12.7**	hours
shift length CTVs	7	**9**	hours
h_s max SOV	**2.7**	2.5	meters
h_s max CTVs	**1.7**	**1.7**	meters
transit to / from OWP	**19‘000**	60‘700	km (all vessels)
transit within wind farms	**9‘300**	29‘800	km (all vessels)

→ Despite the reduced needed or planned maintenance work, the logistic concept of the OWP cluster is less efficient

Outlook

Combination with inhouse O&M model (Offshore TIMES)

- Feed in vessel characteristics
- Virtual optimization of logistic concepts based on `real demand´

Including ADS-B Data

- Extend entire methodology to include helicopter data

Including Operational Data

- Validate methodology against operational data

Extend methodology on T&I

- Benchmarking of turbine installation processes

Thank you for your attention !

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