



Offshore Wind measurement challenges

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45 Years
Hydro – Environment
1,1 Billion €
More 200 Projects
2010 R&D



Offshore Wind Industry Booming Market

1991: First Demo OWP, 10 million Euros

Vindeby, Denmark: 11 × 450 kW (4.95 MW)

25 years of Operation

1

2

2000: 0.12 bn Euros

36 MWatt

3

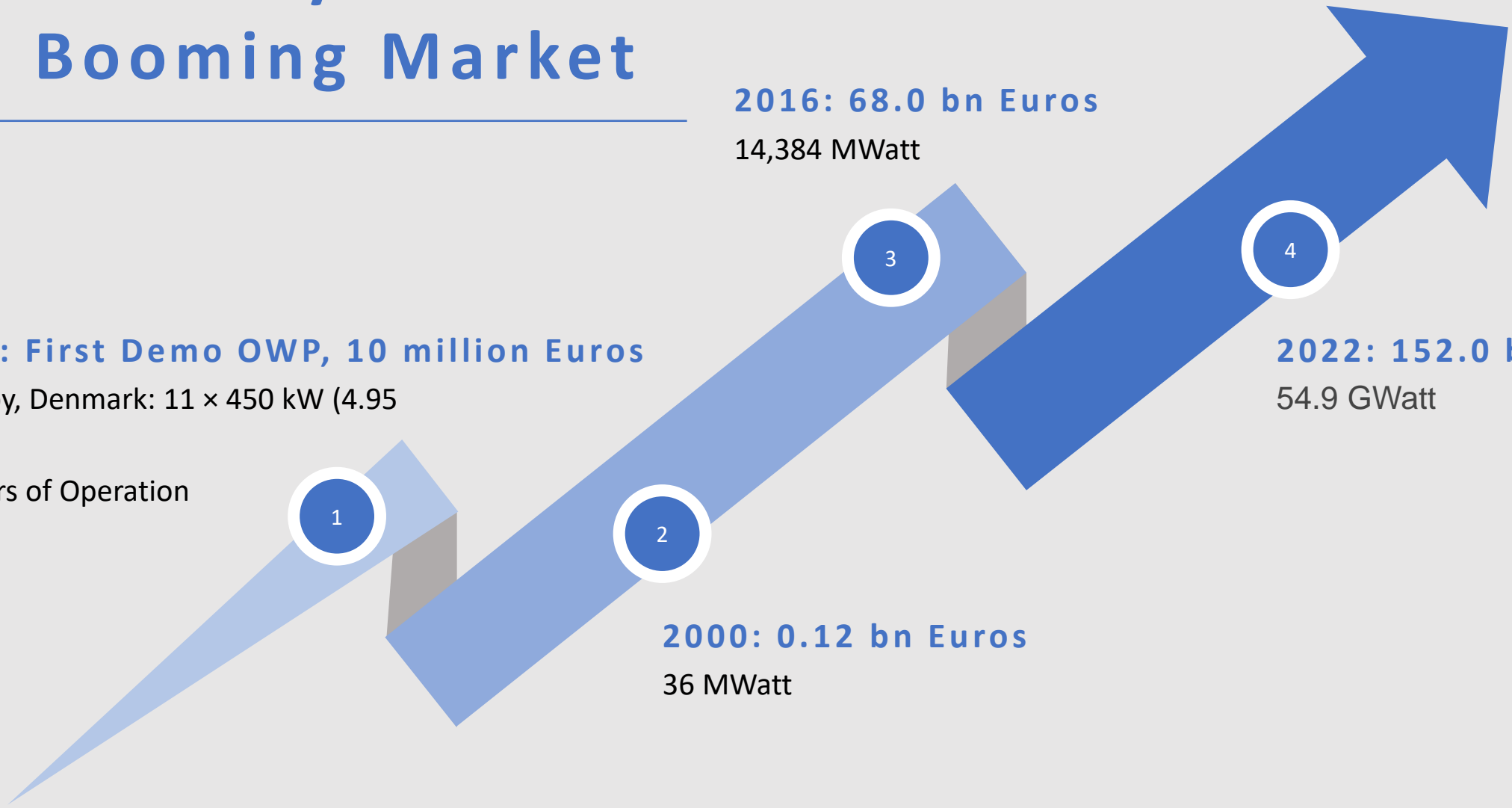
2016: 68.0 bn Euros

14,384 MWatt

4

2022: 152.0 bn Euros

54.9 GWatt



THE CHALLENGE



INDUSTRY NEED

Mathematical Models' uncertainty 12% - 18%

NEED for real in situ measurements

PROBLEM

WITHOUT WIND MEASUREMENTS ON SITE

FUTURE INCOME UNCERTAINTY IS AT:

430m Euros*

*For a 500 Mwatt Park, at 100 Euros/MWh,

at 9,0 m/s of a NREL 5 MW Turbine, at 15% uncertainty



Current Solutions



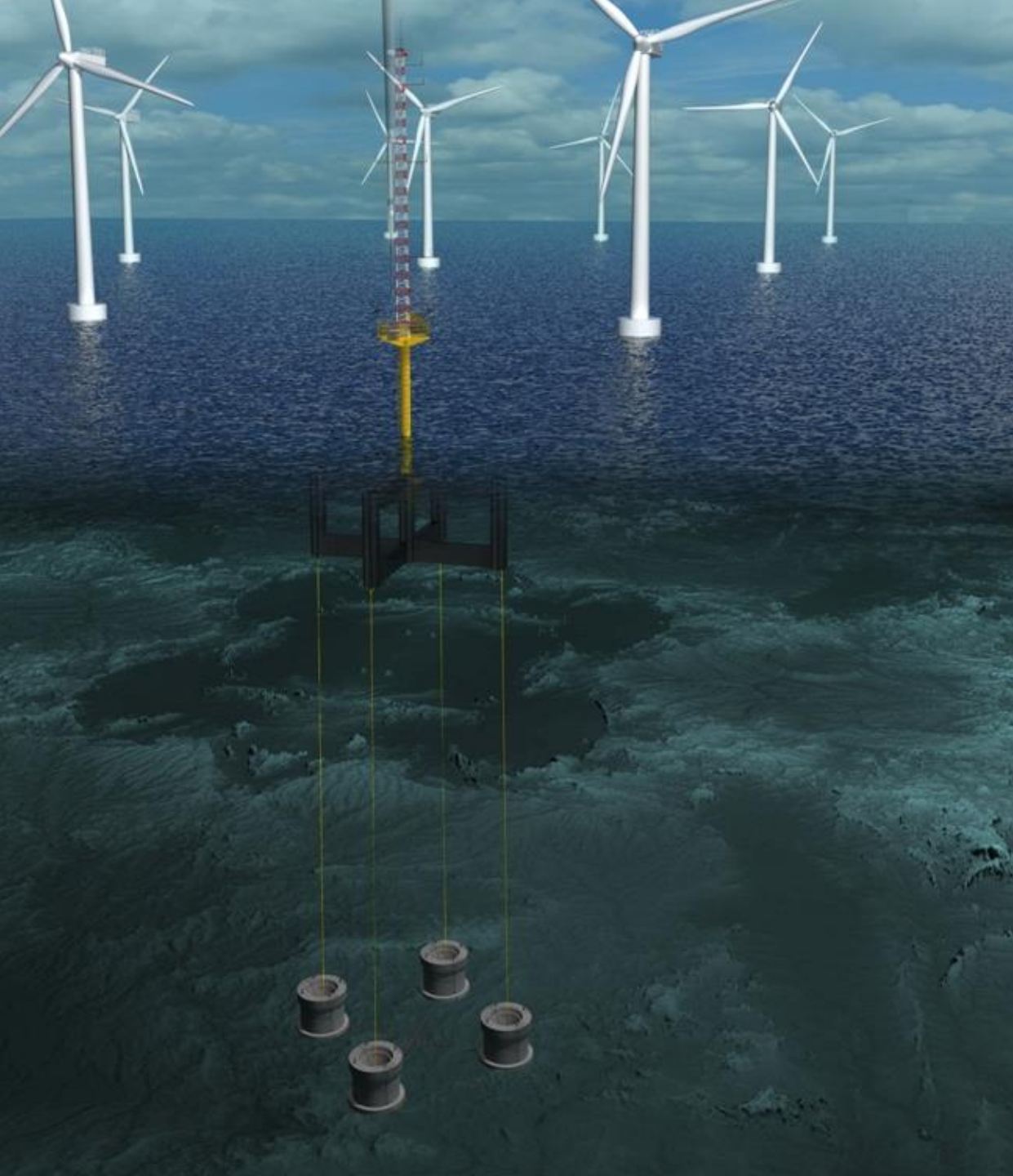
Fixed Met Mast

- ✓ High accuracy
- ❑ High costs between 9m-15m, limited to <60m
- ❑ Non-portable (22% of projects are no-go)
- ❑ Hard survivability

Floating Remote Sensing Devices

- ✓ Low cost
- ✓ Re-use
- ❑ Low accuracy, questionable availability
- ❑ No transparency
- ❑ Calibration against met mast





Solution:

Optimum Combination

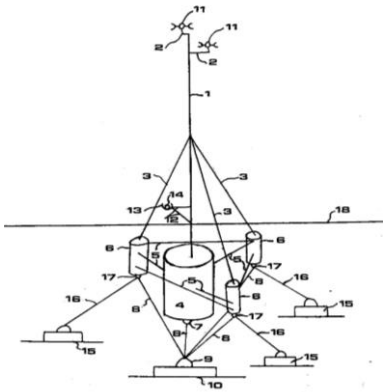
Met mast + Lidar (RSD)

- 70% lower cost & Redeployable
- Met mast (top) with high stability = quality data
- Wind Measurements according to IEC 61400-12-1:2022 Standards
- Certified by Classification Societies.



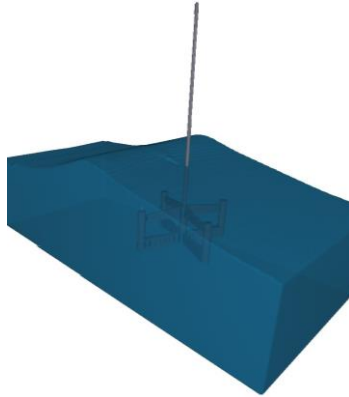
FloatMast Innovation Timeline

PATENT



2013

**Design Approval from
BV**



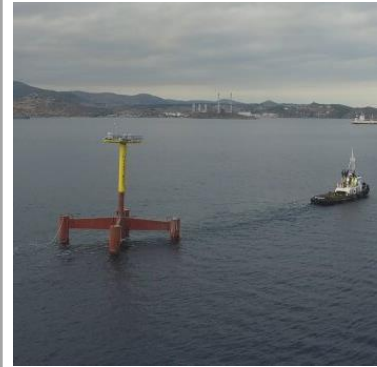
2014

Anchorage deployment



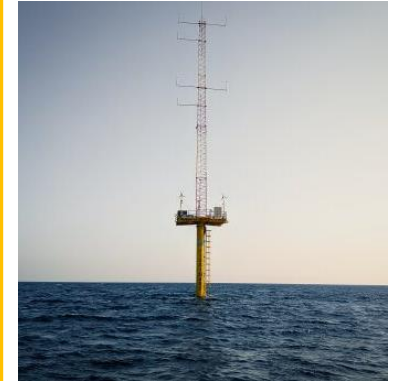
2015

Platform deployment



2019

**FloatMast 12 months
measurement
campaign completion**



2020



A DISRUPTIVE SOLUTION



METOCEAN MEASUREMENTS

- Wind measurements by IEC 61400-12-1:2017 combining cup, vane & sonic anemometers on a metmast 42 m AMSL
- LIDAR providing Wind measurements up to 300 m AMSL
- Wave Height and Wave Period measurements
- Pressure, Temperature and Humidity measurements

ENVIRONMENTAL ASSESMENT

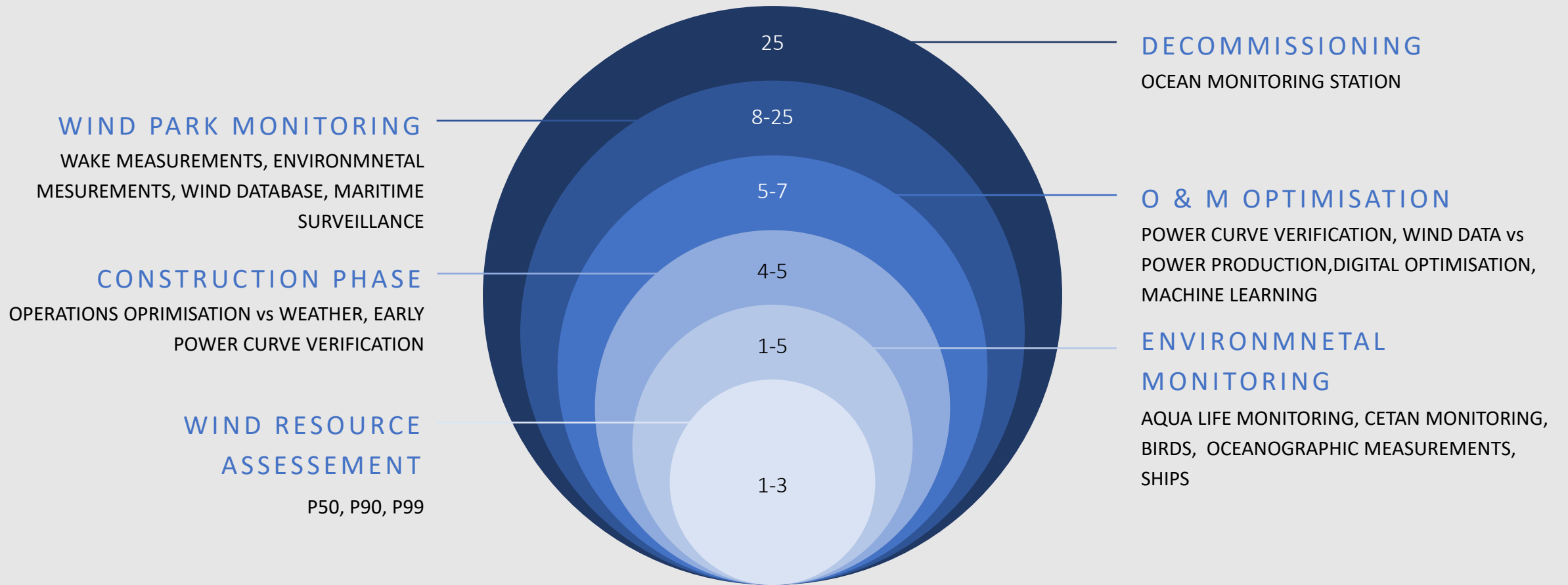
- Sea Conductivity, Temperature, Chlorophyll-A Dissolved O₂, Salinity and PH Measurements
- Aqua life monitoring
- Underwater Noise Measurements
- Birds Radar

SECURITY AND COMMUNICATION

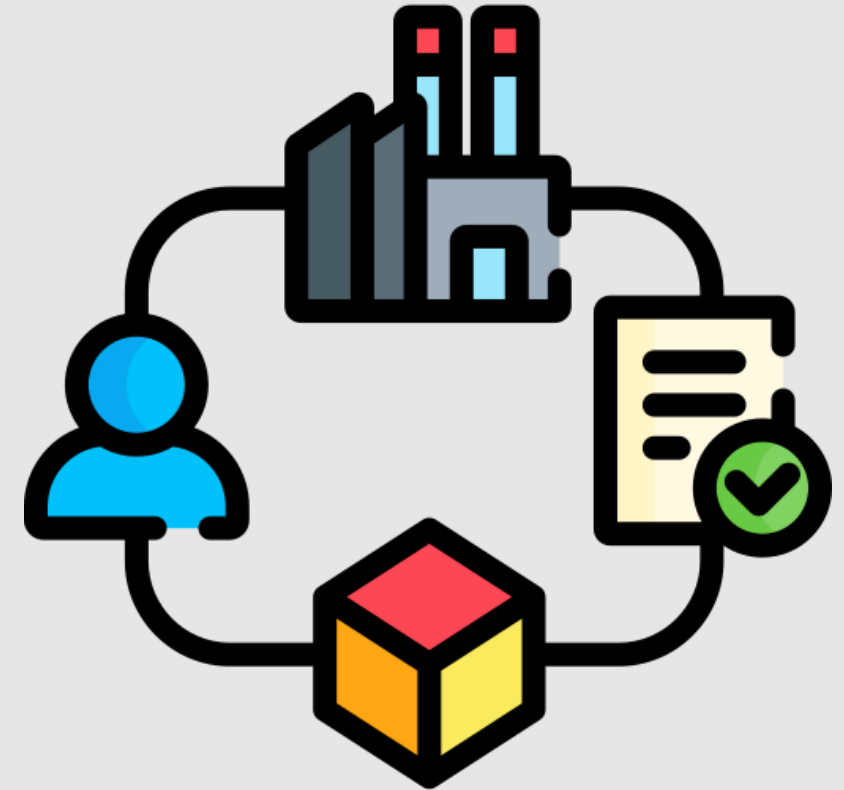
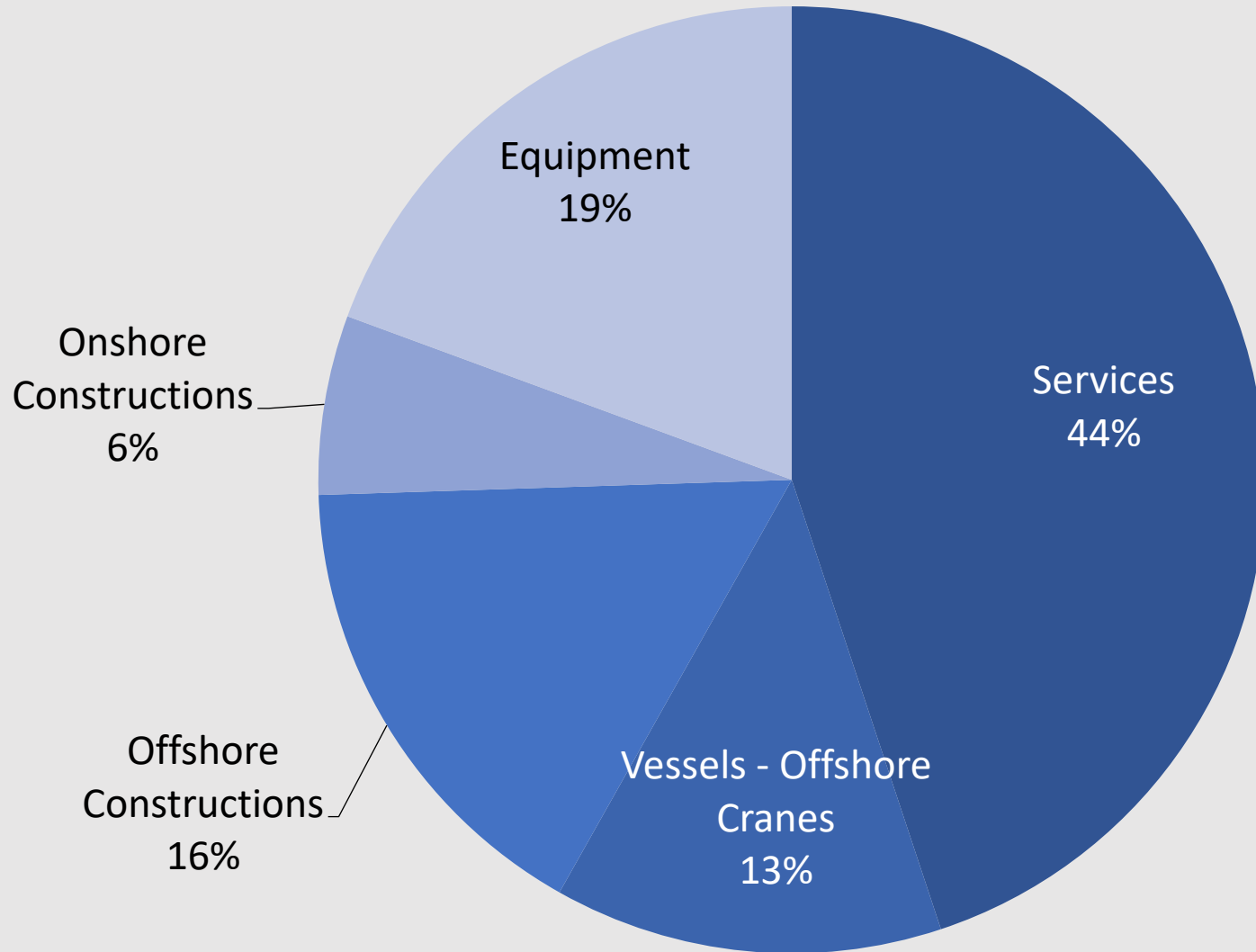
- Security Cameras on different heights AMSL
- Marine Radar & AIS for ship detection
- Point to point communication System & Relay



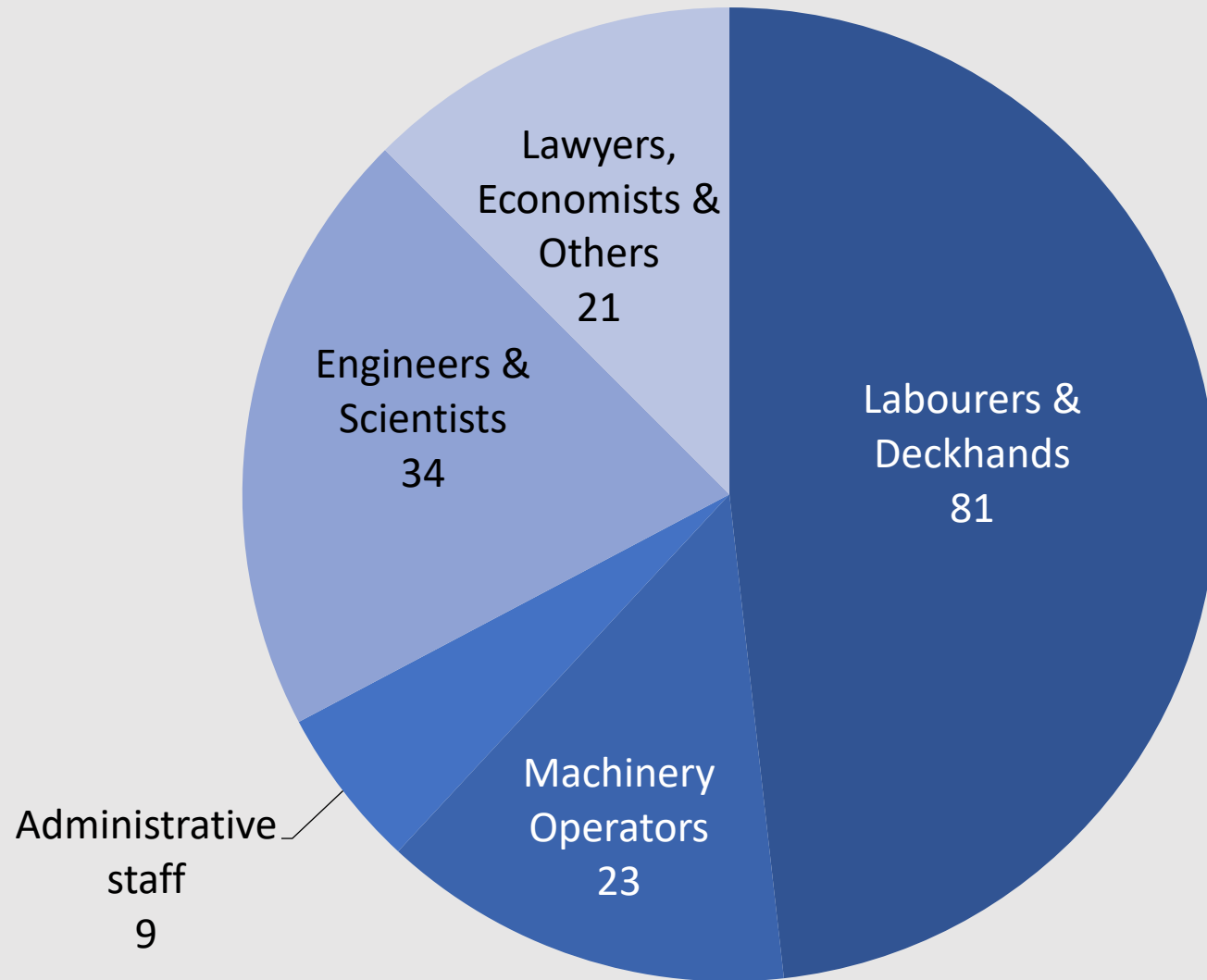
A LIFETIME ADDED VALUE



FloatMast Value Chain



FloatMast Persons Involved



Total Persons Involved: 168

FloatMast: A team work !



Float Mast Operation

2020-01-07 17:38:46

IP PTZ Camera

<https://www.youtube.com/watch?v=7H9jI4VpNeA>

Thank you

Any Questions?



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