



Converting RAW Data to actionable Intelligence

a decarbonization approach

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SHIPPING

An industry that never settles

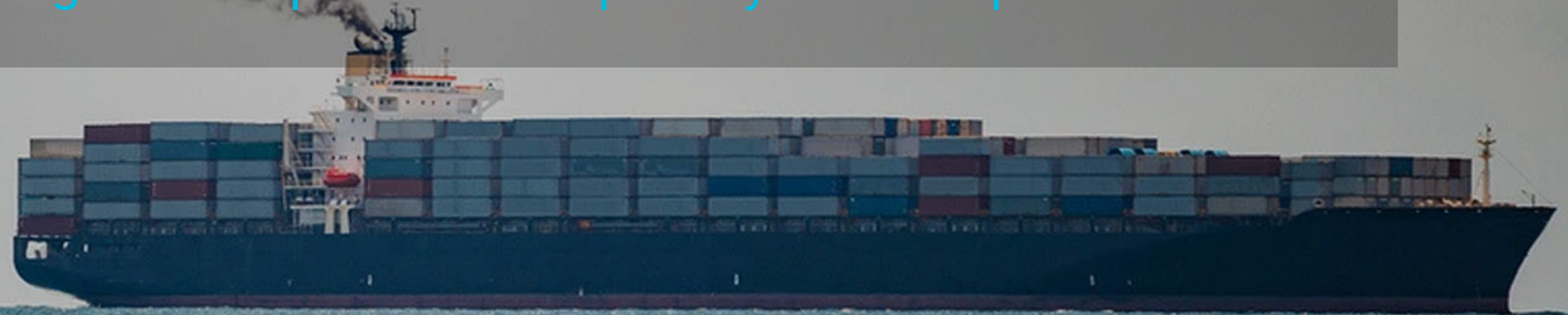
Facing huge Uncertainties & Challenges

- Market demand & Supply
- Financial fluctuations
- Global Trade & Geopolitical environment
- Human Resources
- Fuels
- Tightening Regulatory framework

EMISSIONS

emission regulations drive important changes in the Maritime ecosystem, challenging the sustainability of companies across the board.

CII is a KPI affecting vessel operational capability and competitiveness.



CII

- What is the current CII?
- Which are the factors that affect the CII and in which way?
- What are the proper actions?

CI is an operational Index



Factors Affecting the CII

Operational Profile	Hull Condition	Propulsion System Condition	Energy Consumers
<ul style="list-style-type: none">• Speed• Route• Drafts and Trim• Sailing Ratio• Weather Conditions	<ul style="list-style-type: none">• Hull Fouling• Propeller Condition	<ul style="list-style-type: none">• Fuel Type• Main Engine Efficiency• Shaft Condition	<ul style="list-style-type: none">• Other Fuel Oil Consumers• Electrical Energy Consumers

A unique challenge for each and every vessel

In-depth **Data Analysis** reveals the **correlation** of each factor with vessel performance and **CII rate**.

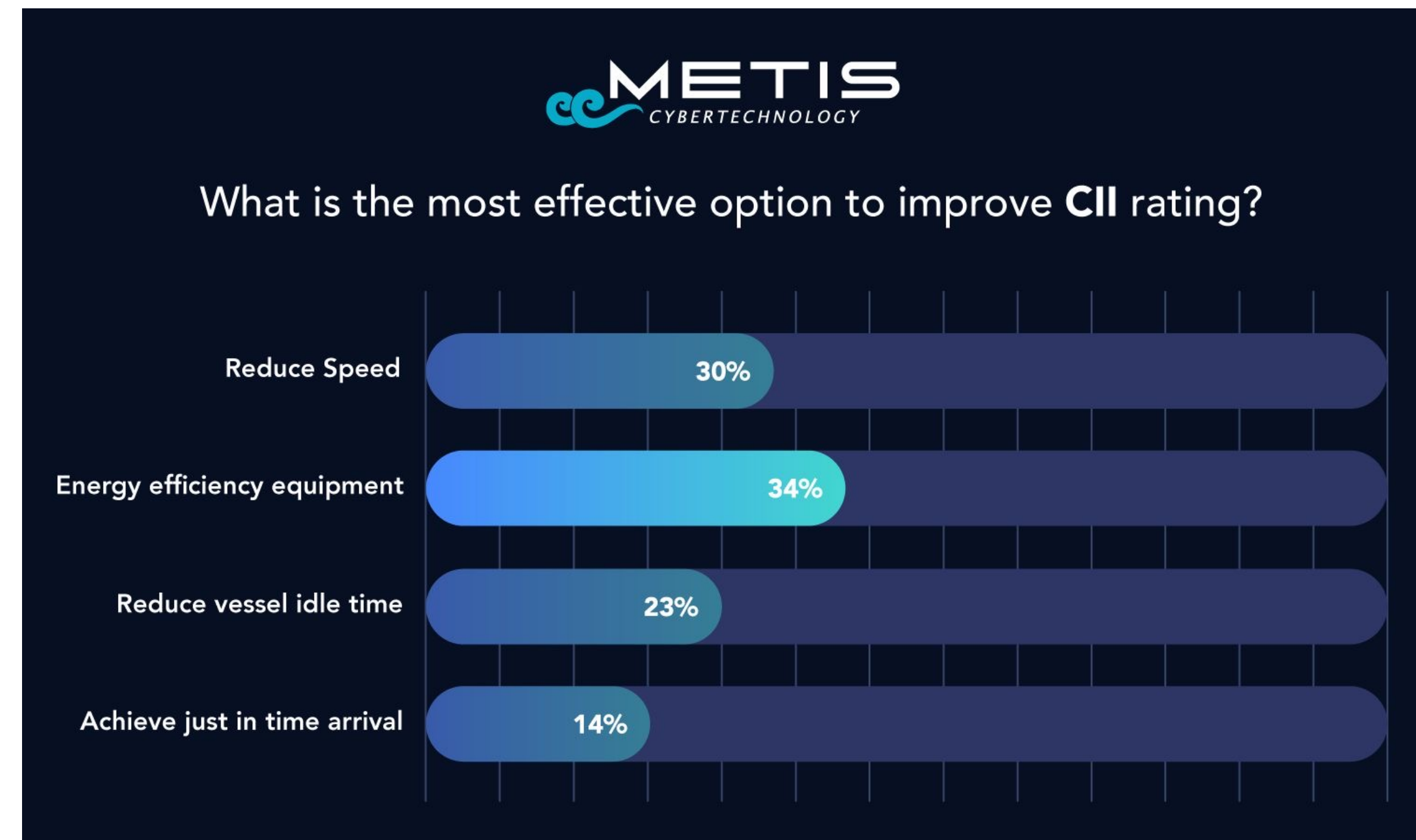
CII Compliance

The role of data analytics

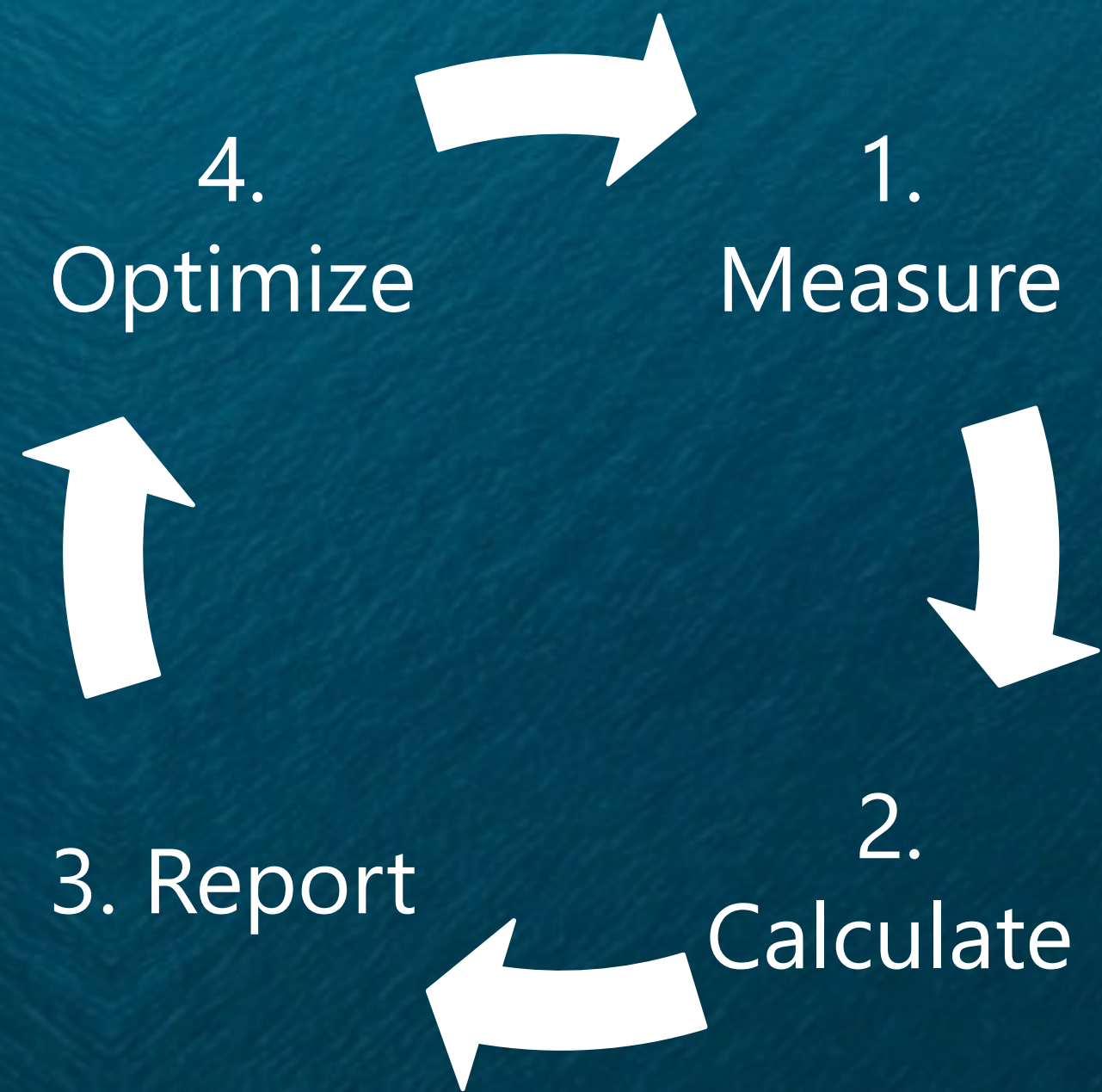
- >92% Container vessels
- >86% Bulk Carriers
- >74% Tankers
- >80% Gas Carriers
- >59% LNG Carriers

would require modification and operational changes of some kind to achieve A, B or C energy efficiency rating..

ABS Report

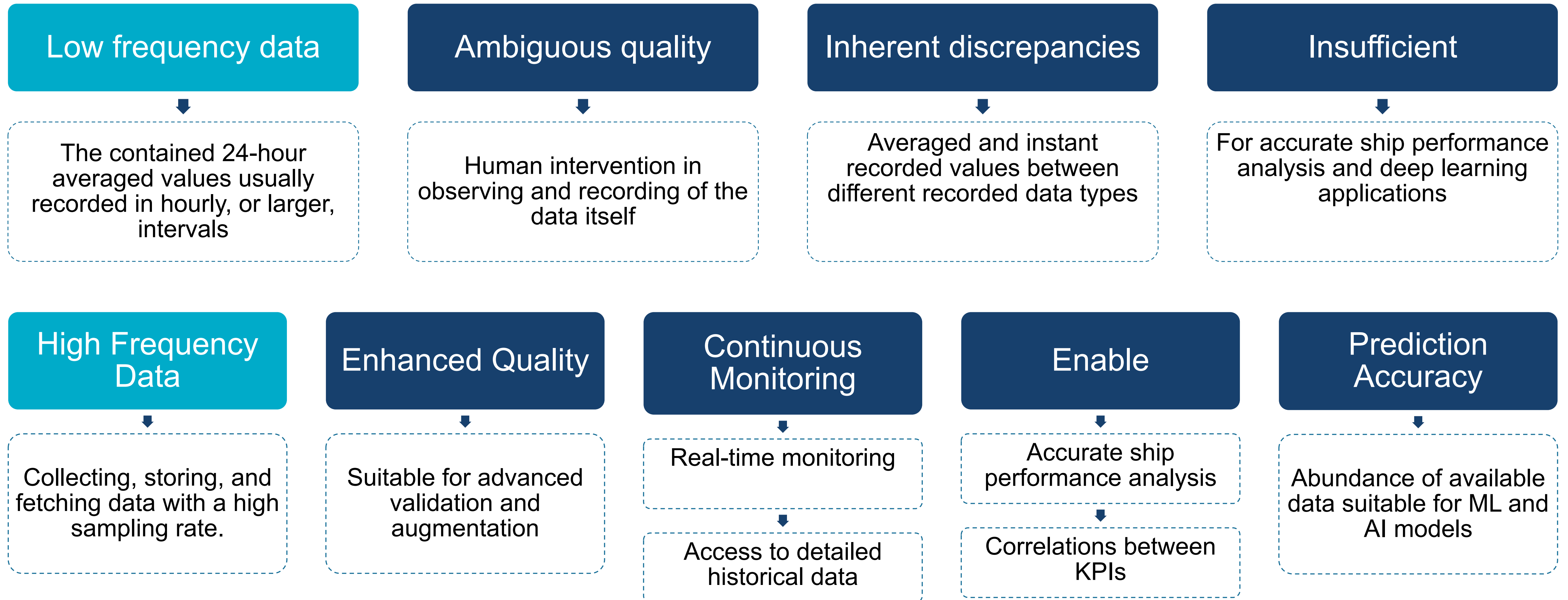


Continuous PROCESS



Data monitoring on ships

Noon reports or high frequency data?



Why Digitalization is important?

Automated data Collection & Data analytics



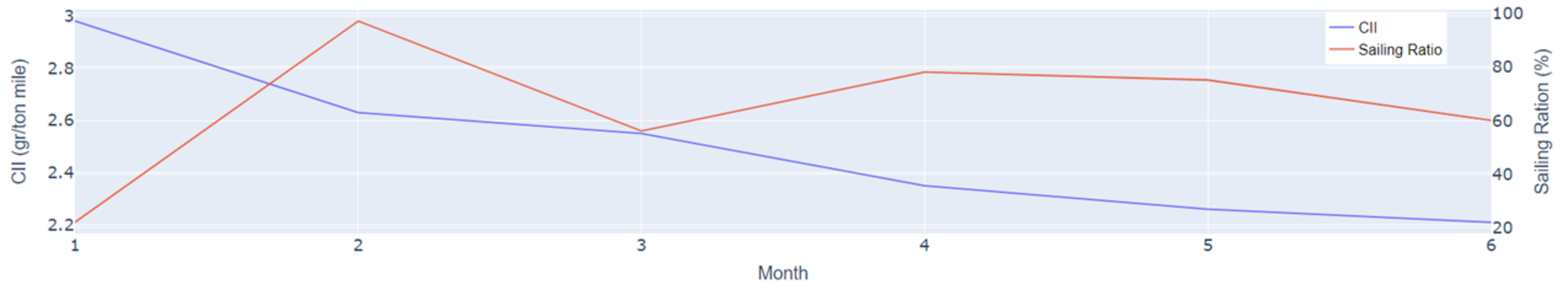
Implications

- Limit vessel availability, particularly in the spot market
- Boost market demand for vessels with lower CII ratings to cater more challenging routes
- Affect vessel routing (if fuel prices are low) as longer routes can improve the CII rating
- Extended port stays are penalizing the CII rating
- Increasing the length of ballast voyages will yield a better CII rating even if it increases net emissions.
- Generate new clauses in charter contracts to involve charterers too

Sailing ratio & CII

Crude Oil Tanker, 17004GT, YOB 2010

CII and Sailing Ratio

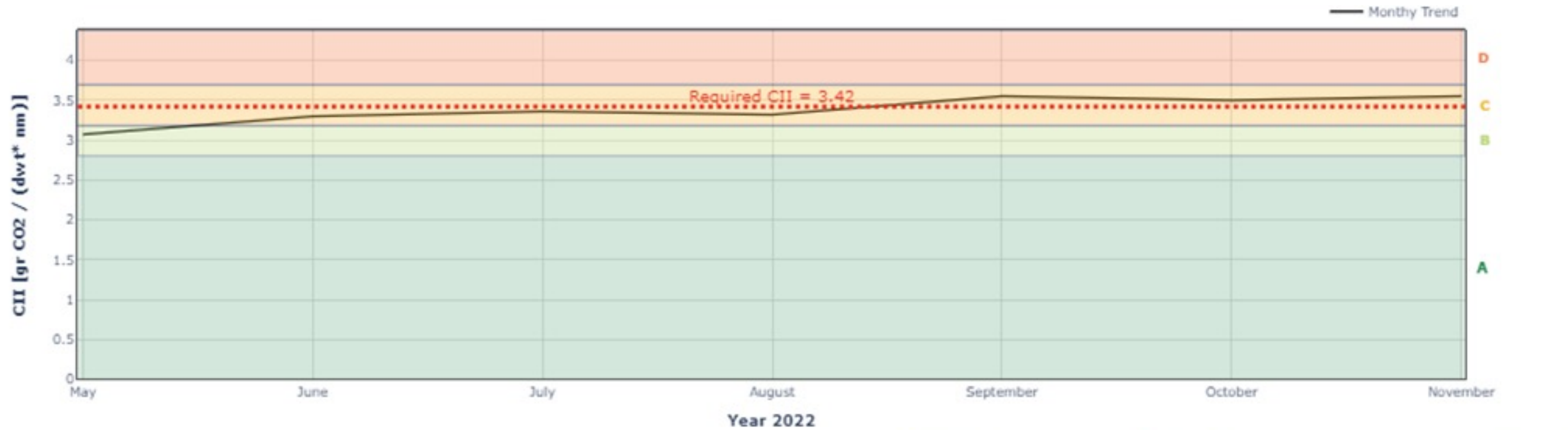


Fuel Consumed and Operational Speed



Distance sailed & CII

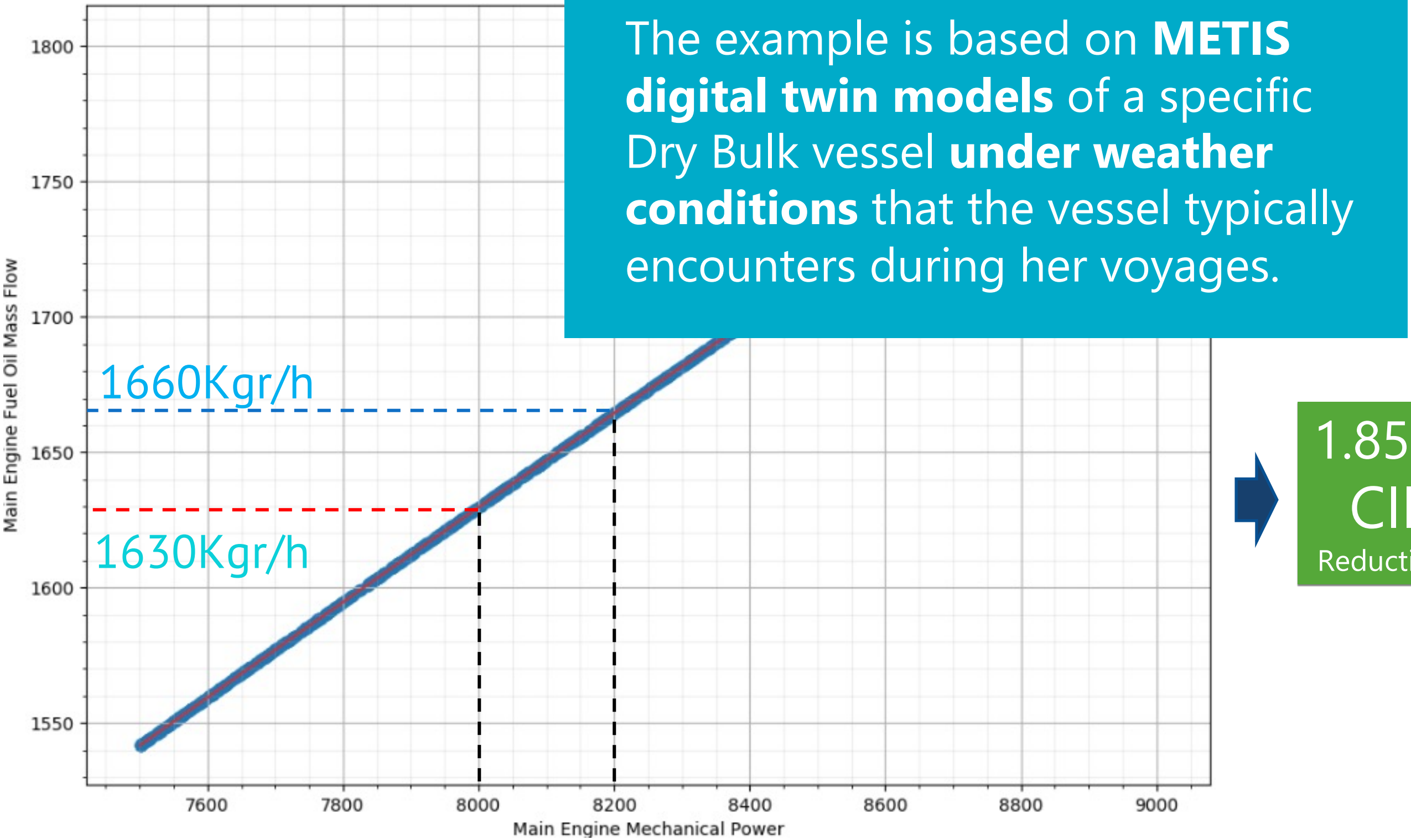
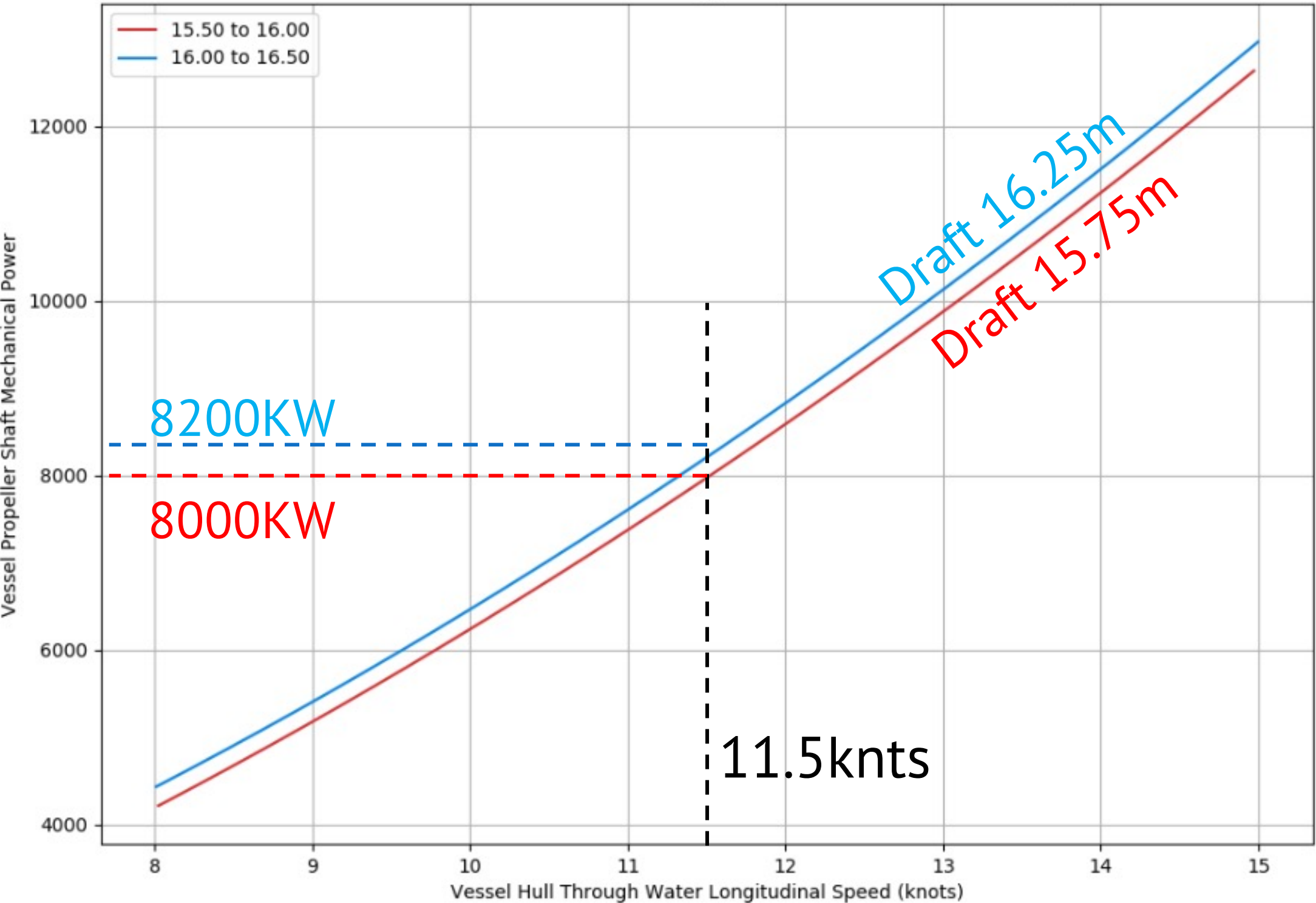
Crude Oil Tanker, 81502GT, YOB 2009



Draft & CII

METIS is researching ways to model the relation of operational profile indicators with the CII aiming to reveal all the alternatives for controlling and reducing emissions by proper operational adjustments. Examples include the Sailing Ratio, Drafts and Trim.

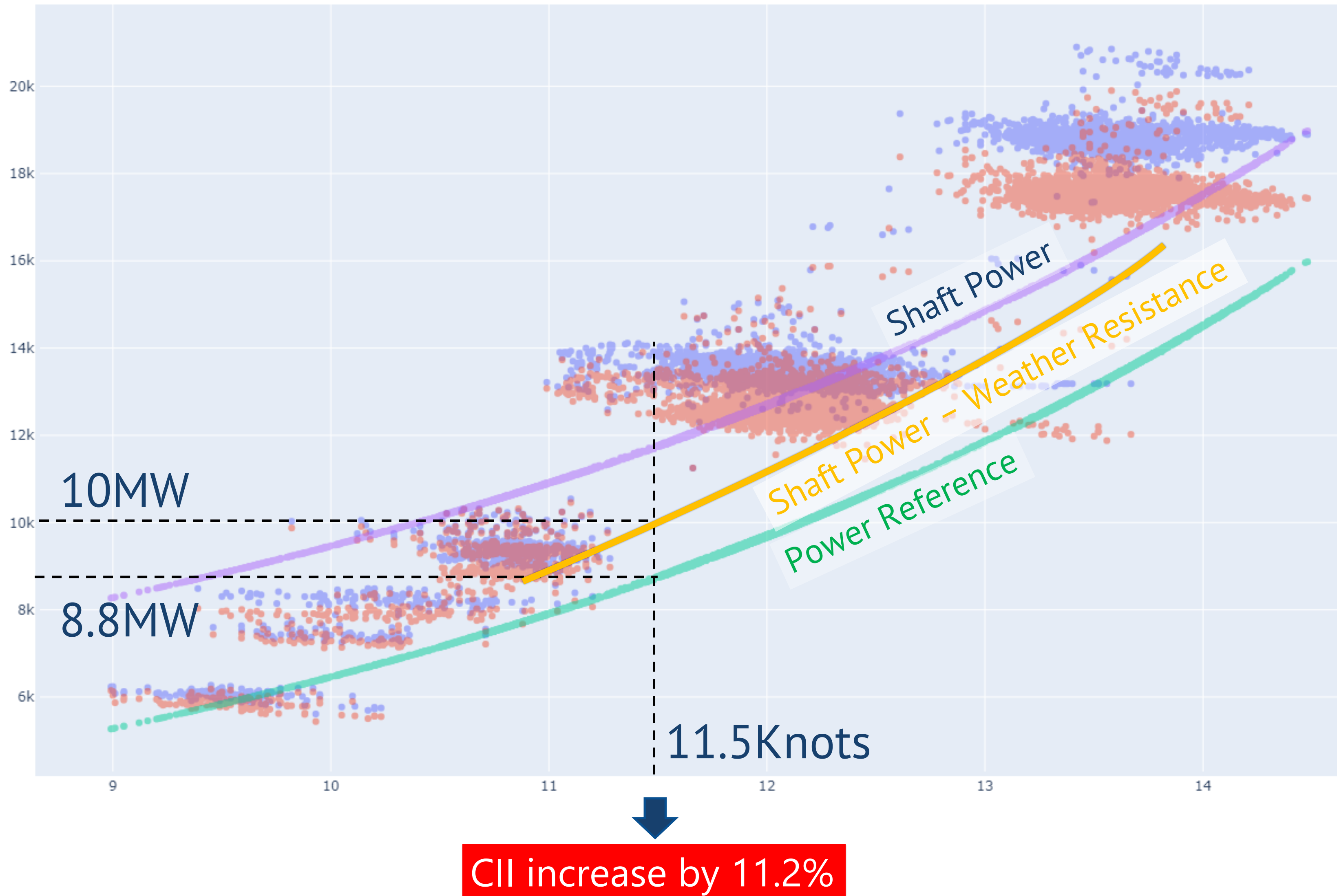
Minor change in vessel's draft can reduce the consumption and the CII.



The example is based on **METIS digital twin models** of a specific Dry Bulk vessel **under weather conditions** that the vessel typically encounters during her voyages.

1.85%
CII
Reduction

Hull Condition & CII

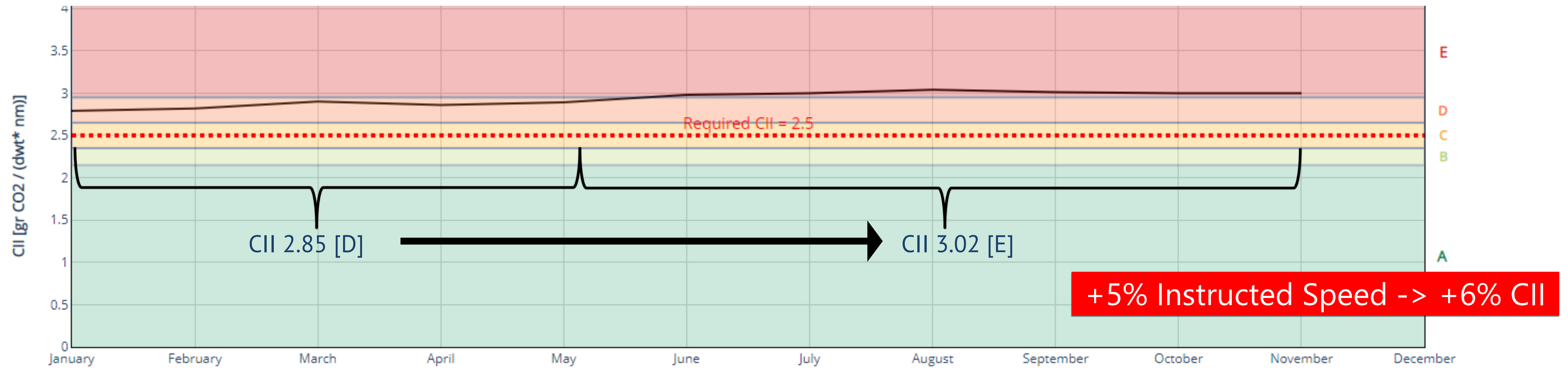


The condition of the hull has a major impact on vessel performance and CII rate. ISO 19030 was an important step towards a widely accepted method for estimating Hull Fouling. However, there are several aspects in the methodology that either approach the subject in a simplified way or are applicable only under specific conditions.



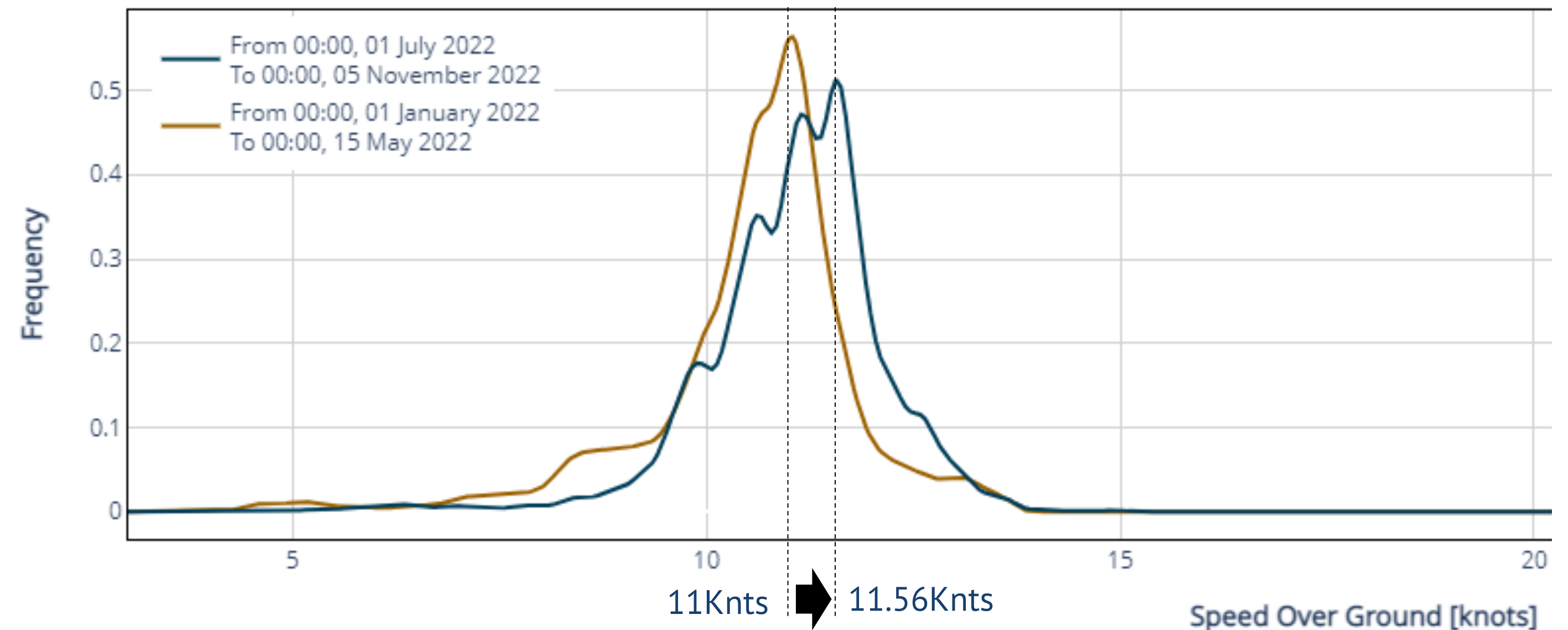
In METIS we invest in applying new techniques based on statistics and machine learning for improving existing methodologies, and for enhancing our approach to the challenge of evaluating Hull performance under any sailing condition.

Speed Profile & CII



The instructed speed by the Charterers is a major factor affecting CII performance.

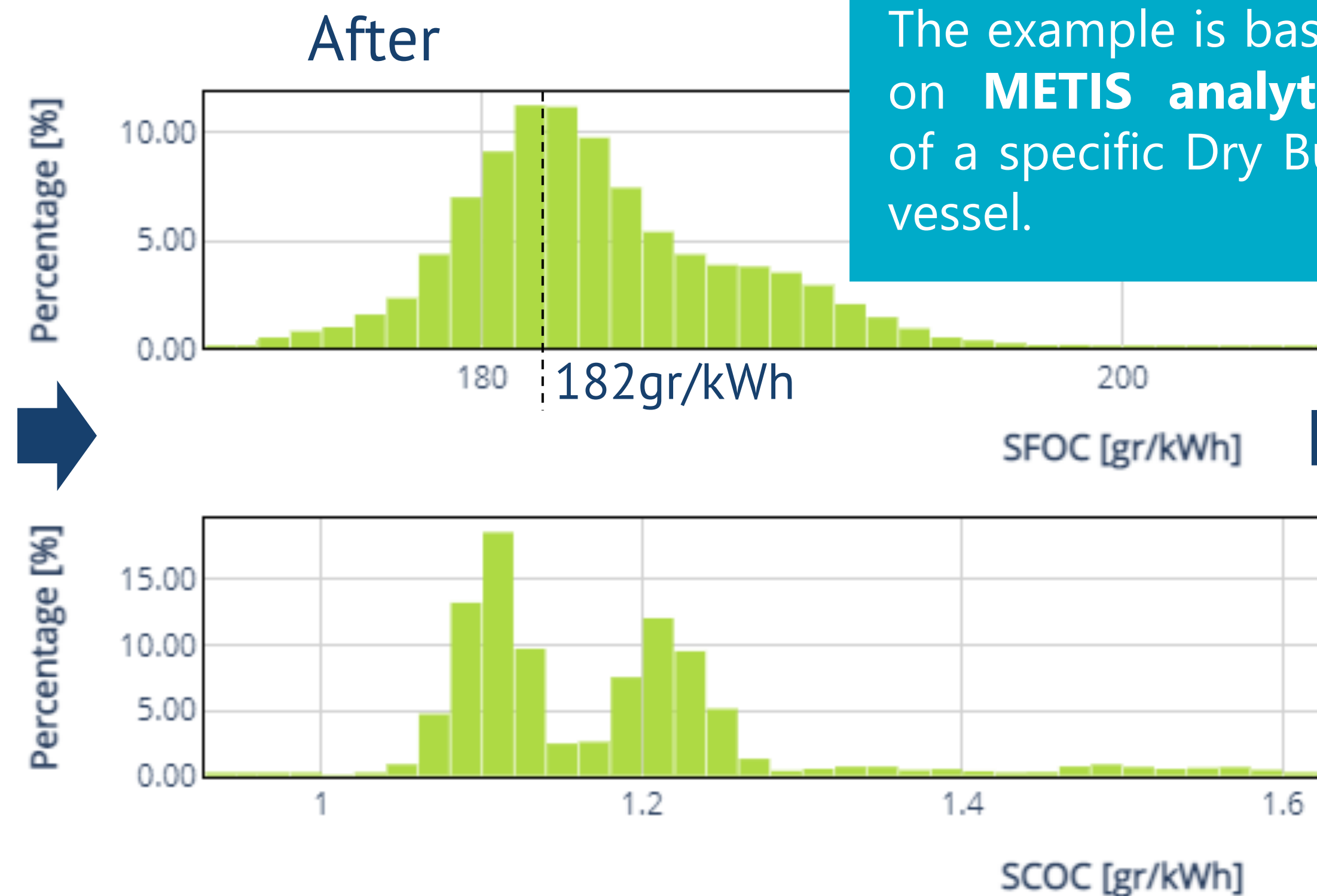
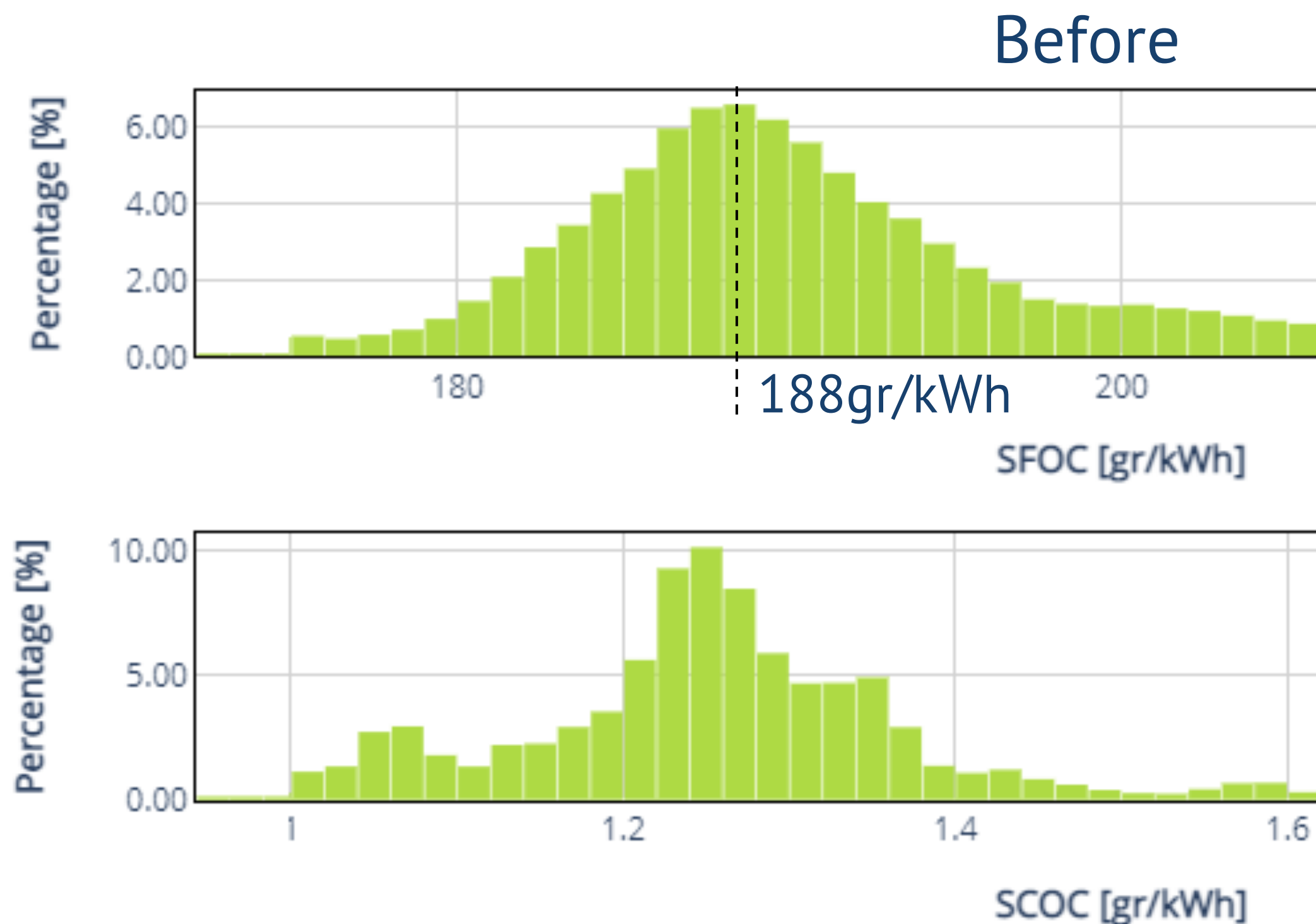
The existence of undisputable data is key in establishing collaboration among charterers and owners.



M/E Efficiency & CII

The SFOC is another important factor affecting the CII rating. Operating engines in slow steaming conditions makes close monitoring to finetune maintenance and improve performance an important necessity.

Engine maintenance can significantly improve both SFOC and SCOC at actual operating rates



The example is based on **METIS analytics** of a specific Dry Bulk vessel.

3.2%
SFOC
Reduction

2.1%
CII
Reduction

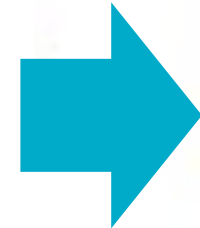
Multiple Scenario Analysis (Pred.)

Crude Oil Tanker of DWT 170,000mt

Digital Twin for Voyage Optimization

SCENARIO	DURATION	DISTANCE [NM]	FOC [TN]	FOC PER NM	VOYAGE CII	TOTAL CII
A	15D 2H	4,345.42	759.5	174.78 (-)	3.06	2.92
B	14D 19H	4,261.9	747.08(-12.48)	175.29 (0.3%)	3.07	2.93
C	14D 19H	4,260.23	744.6(-14.9)	174.78 (0%)	3.06	2.92

Instructed speed
Standard route



Instructed speed
Weather routing



Speed
Optimization



Arrive on time, **reducing FOC by 2%** while keeping CII stable

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A unique challenge for each and every vessel

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Addressing Challenges

Of High Frequency Data

DATA CONTINUITY

- Hardware & Firmware
- Remote Health Monitoring

DATA QUALITY

- Sensor calibration
- Data cleaning
- Data redundancy
- Error handling techniques
- Virtual Sensors

DATA AUGMENTATION

- Interoperability
- Enhanced Algorithms
- Open systems & APIs
- Interconnection with 3rd party systems / providers
- Digital Twins

EDGE COMPUTING

Concluding

Digitalization is not just about embracing new technologies, but rather a mindset to seek expanding our knowledge, understanding and addressing issues on the most effective and efficient way.

Decision making based on hard facts (Data) is the cornerstone for facing new challenges with more confidence while ensuring sustainability of our business.

At METIS, we are working hard to help our customers maximize the benefit they get from digitalization and achieve their business goals.



Thank You

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