Vessel Performance Systems
An Engineering Approach

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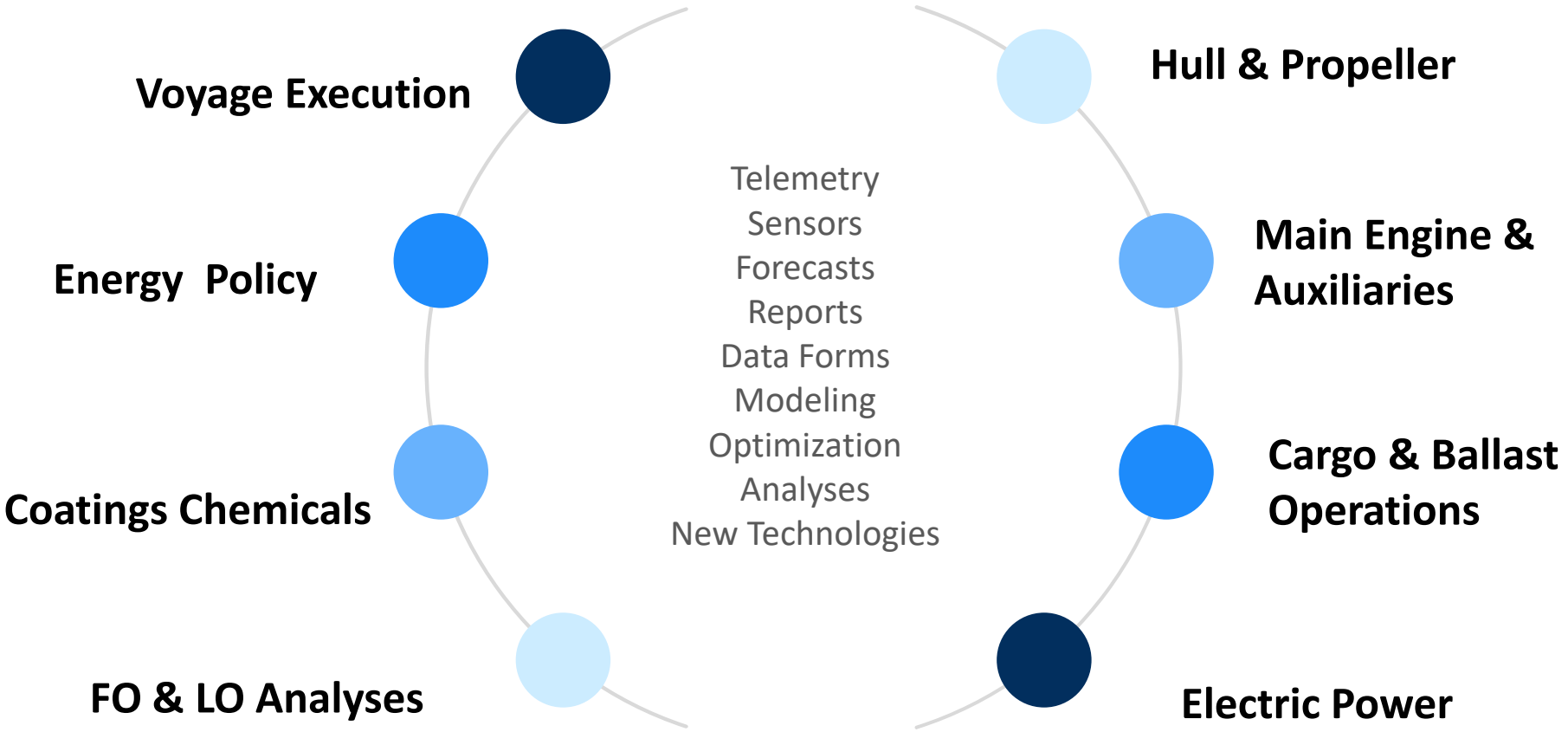
Overview

- Energy Performance Activities
- Data Ecosystem
- Typical Examples of our Work
- Pros and Cons of going Digital
- Questions

Energy Performance Activities



Energy Performance Activities – part 2

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Machinery

- Consumption Monitoring
- Operations Monitoring (Loading, Discharging, Purging, etc.)
- Decision Support on Maintenance actions
- Optimization

Seafarers

- Support
- Training

Sensors

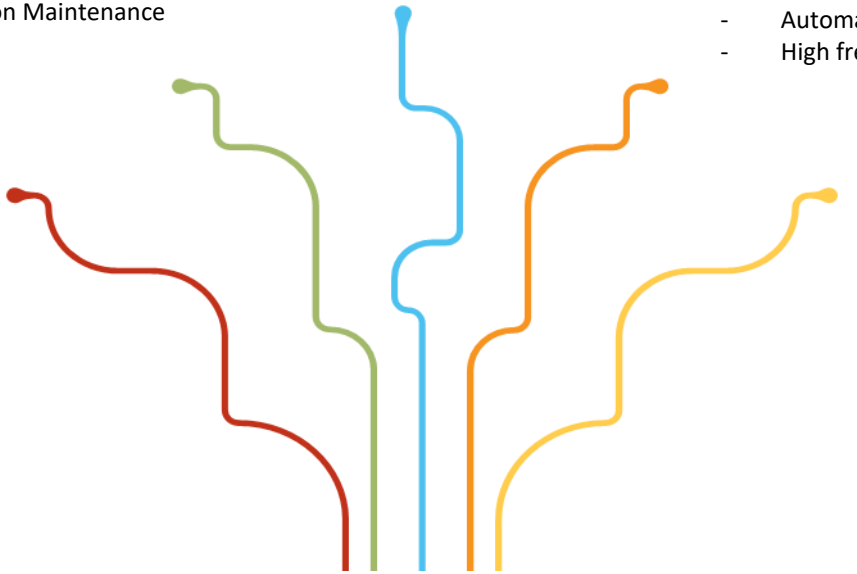
- Telemetry Systems
- Automated Noon Report
- High frequency & real time data

Hull & Propeller

- Propulsion Systems Modeling
- Trim Optimization
- Voyage Optimization
- Fouling Detection

Consumables

- Fuel Analysis & Consumption
- Lubricants Analysis & Consumption



Data Ecosystem

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Telemetry

Almost 50% of our Fleet is Telemetry equipped and new installations are on-going. Data Quality is continuesly monitored.

External Sources

We mainly use Weather services for Forecast and Hindcast data.

Algorithms

Numerous algorithms have been built in different programming languages (SQL, Python, etc.) to support our Reporting needs and the Tools of our key services.

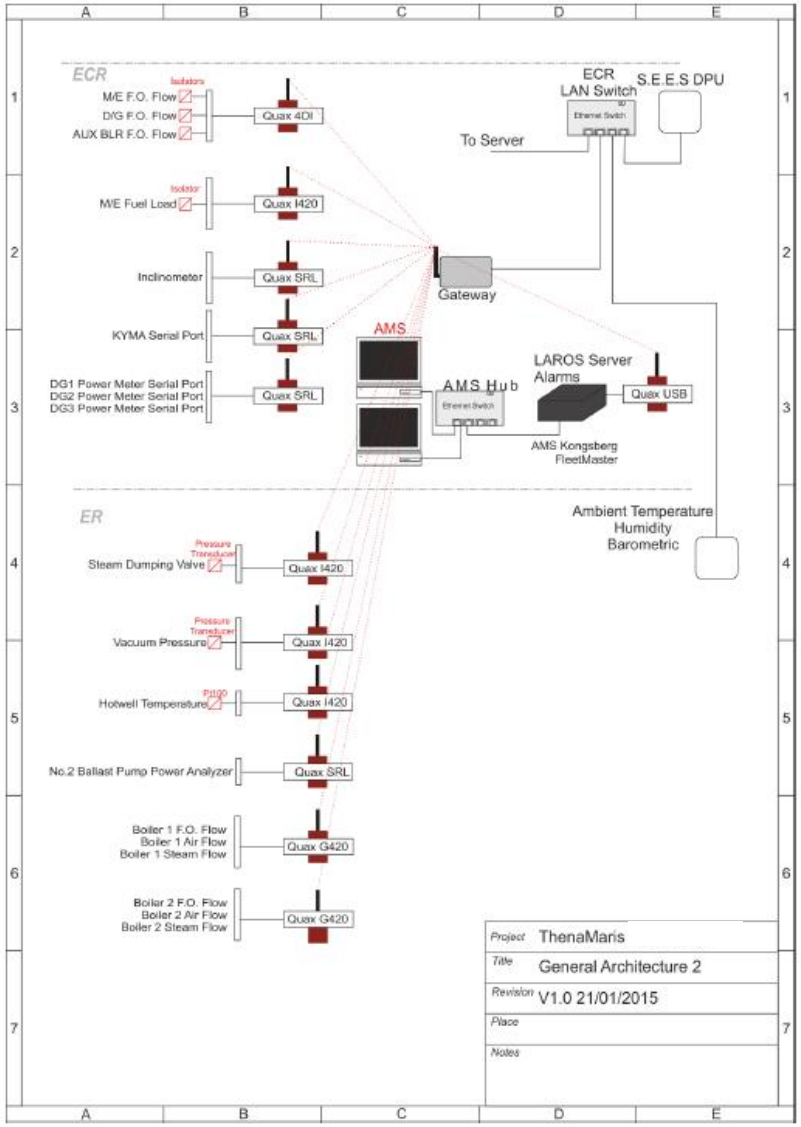
Vessel Reporting

There is a number of electronic Forms and Tools covering the majority of Operations and daily events.

Models

Baselines for Hull & Propeller and the majority of Machinery Components have been built to estimate Nominal Consumptions and actual Performance..

Telemetry Systems



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Telemetry Data Monitoring

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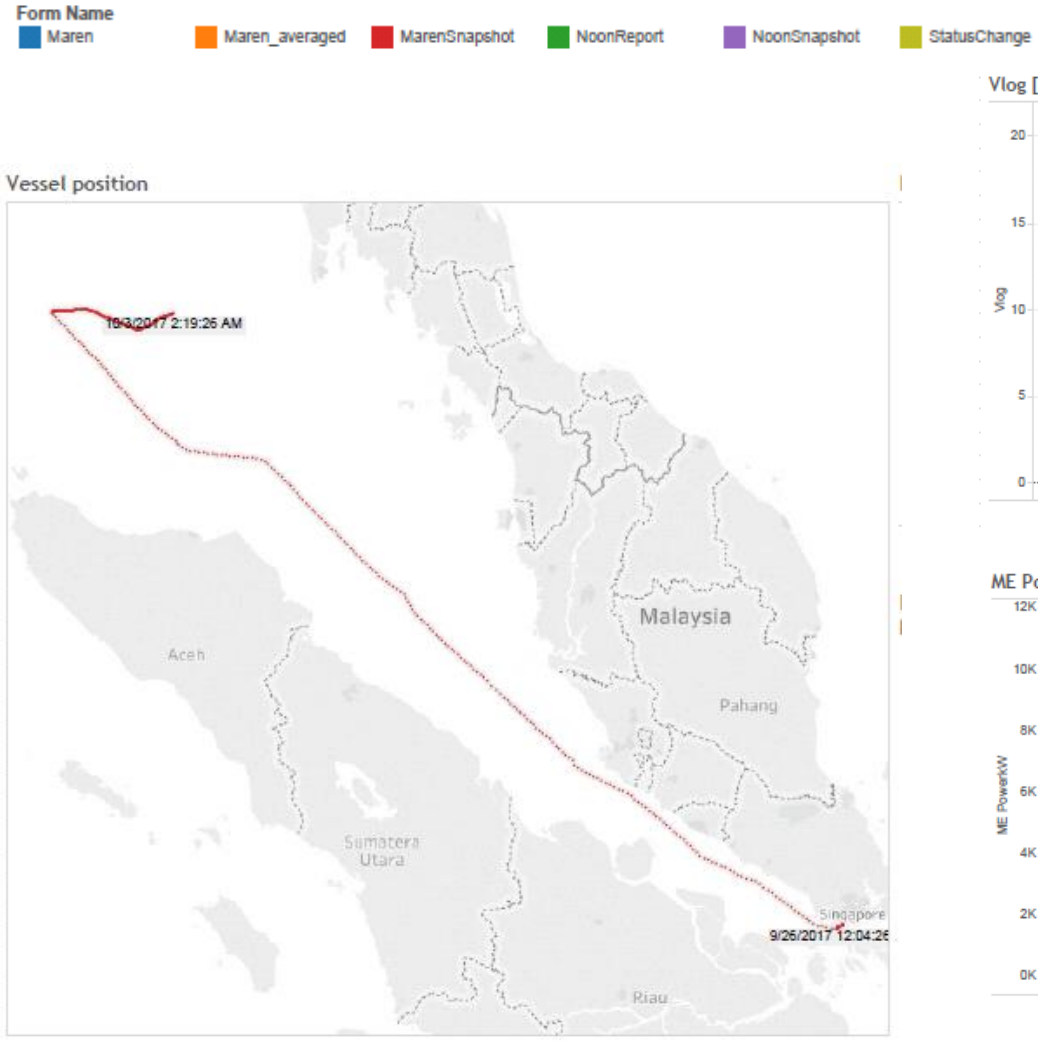

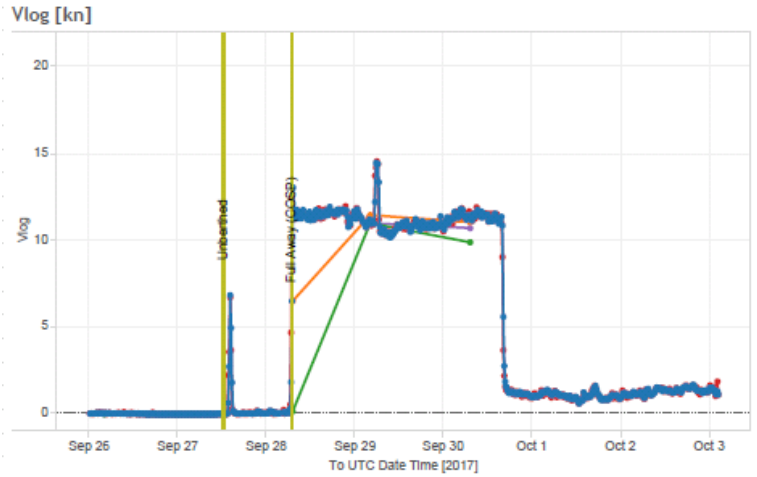

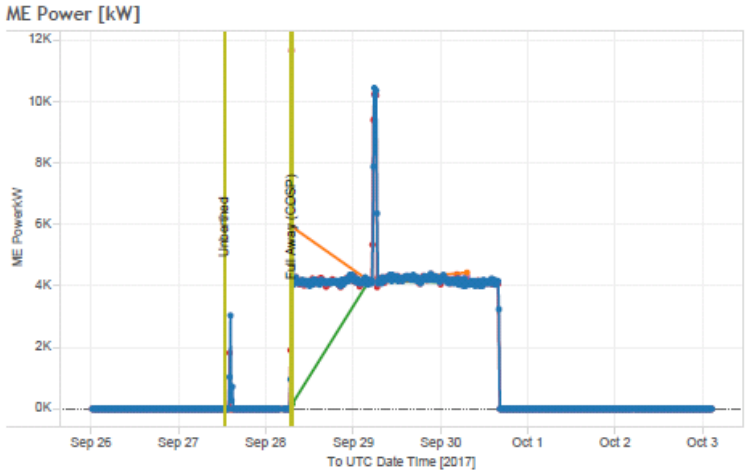

New semi-automated Noon Report

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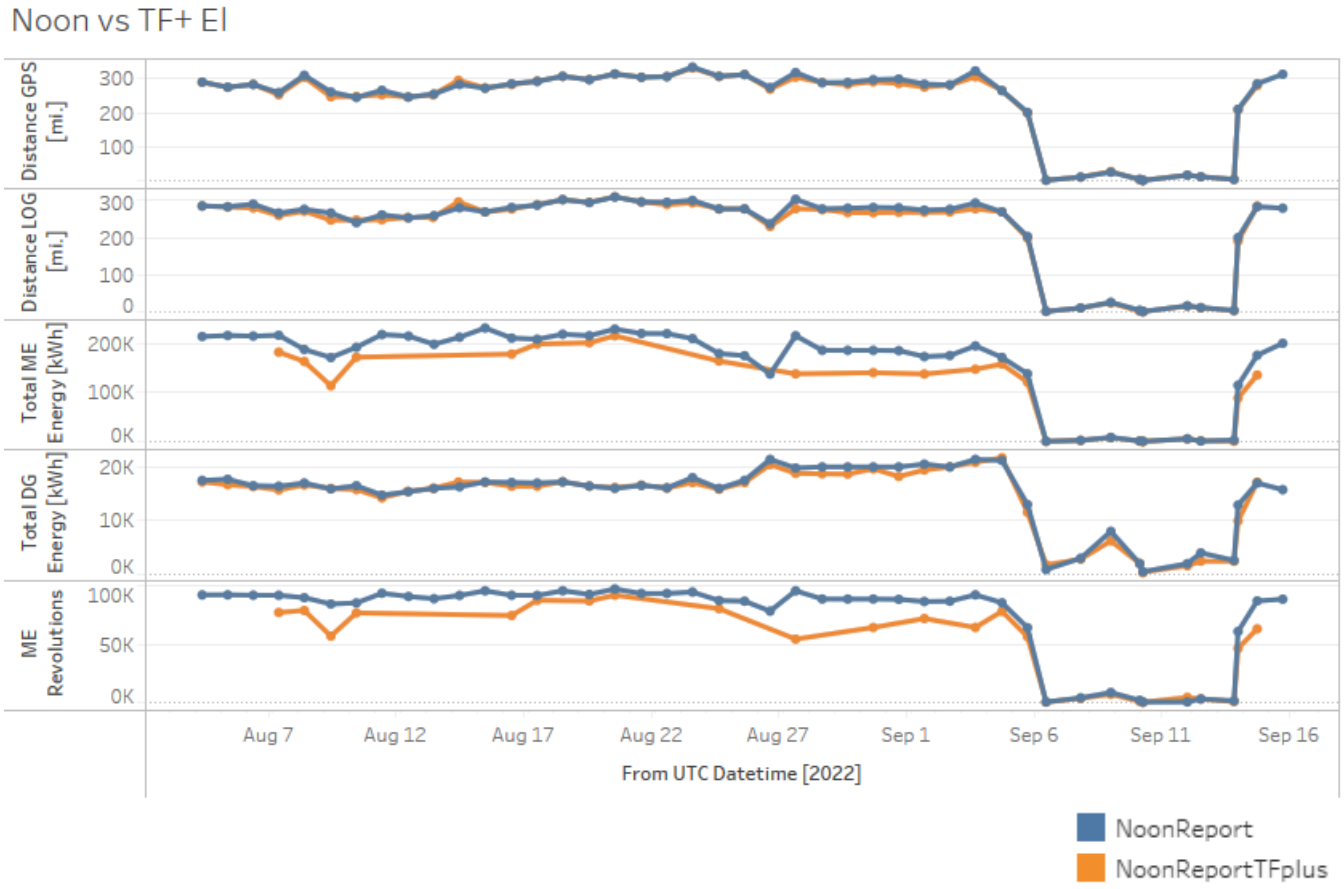
Telemetry Signals can replace part of the manual entries and therefore workload of reporting will be reduced by **43%** on a daily basis.



Example of Electronic Forms

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ROB calculation Tool based on measurements

		T_s (Midship Draft Starboard) *	15.00				
T_{fwd} (Forward Draft) *	15.00			T_{aft} (After Draft) *	15.00		
		T_p (Midship Draft Port) *	15.00				

Trim	0.00 m	0.00 deg	Trim by stern is positive
Heel	0.00 m	0.00 deg	Heel by starboard is positive

Tank	Batch *	Type	Fuel Item	Sounding [m] *	Ullage [m] *	Corrected Volume [m^3]	Density at 15°C [kg/m^3]*	Temp [°C] *	V.C.F	Volume at 15°C [m^3]	W.C.F [kg/m^3]	Calculated Quantity [MT]	Estimated Quantity [MT]
No1 (S)	WB-21-02	LSMGO	DMA_0.10_ISO 8217 : 2010	15.644	1.200	298.01	866.10	42.0	0.98	291.44	865.00	252.093	
No2 INNER MGO (P)	WB-21-02	LSMGO	DMA_0.10_ISO 8217 : 2010	11.914	0.000	652.66	866.10	43.0	0.98	637.73	865.00	551.636	
H.F.O. OVERF. T. (P)	WB-21-03	VLSFO	RMG380_0.50_ISO 8217 : 2010	5.782	0.000	35.34	904.50	55.0	0.97	34.25	903.40	30.938	
LSFO SETT./SERV. (P)	WB-21-01	VLSFO	RMG380_0.50_ISO 8217 : 2010	10.845	1.000	93.81	945.80	65.0	0.96	90.38	944.70	85.386	
No1 (P)	WB-21-03	VLSFO	RMG380_0.50_ISO 8217 : 2010	11.893	5.000	208.88	904.50	56.0	0.97	202.25	903.40	182.714	
No2 INNER (S)	N/A	N/A	N/A										0.000
No2 OUTER (P)	WB-21-03	VLSFO	RMG380_0.50_ISO 8217 : 2010	12.359	4.200	770.47	904.50	58.0	0.97	744.82	903.40	672.867	
No2 OUTER (S)	WB-21-03	VLSFO	RMG380_0.50_ISO 8217 : 2010	13.045	3.600	787.21	904.50	47.0	0.98	767.75	903.40	693.589	
SERV. (P)	WB-21-01	VLSFO	RMG380_0.50_ISO 8217 : 2010	7.695	4.145	65.50	945.80	65.0	0.96	63.11	944.70	59.618	
SETT. (P)	WB-21-01	VLSFO	RMG380_0.50_ISO 8217 : 2010	3.852	8.000	33.38	945.80	66.0	0.96	32.13	944.70	30.355	
MDO (P)	WB-20-10	LSMGO	DMA_0.10_ISO 8217 : 2010	4.072	1.360	40.16	880.90	41.0	0.98	39.33	879.80	34.600	
MDO (S)	WB-20-10	LSMGO	DMA_0.10_ISO 8217 : 2010	2.430	3.458	80.14	880.90	42.0	0.98	78.41	879.80	68.989	
MDO SERV. (P)	WB-20-10	LSMGO	DMA_0.10_ISO 8217 : 2010	6.695	0.100	41.93	880.90	41.0	0.98	41.06	879.80	36.121	

Total ROB Quantities [MT]

HSFO	0.00	LSMGO	943.44
ULSFO	0.00	MDO	0.00
VLSFO	1,755.47	TOTAL MO	943.44
TOTAL FO	1,755.47		

Weather Service

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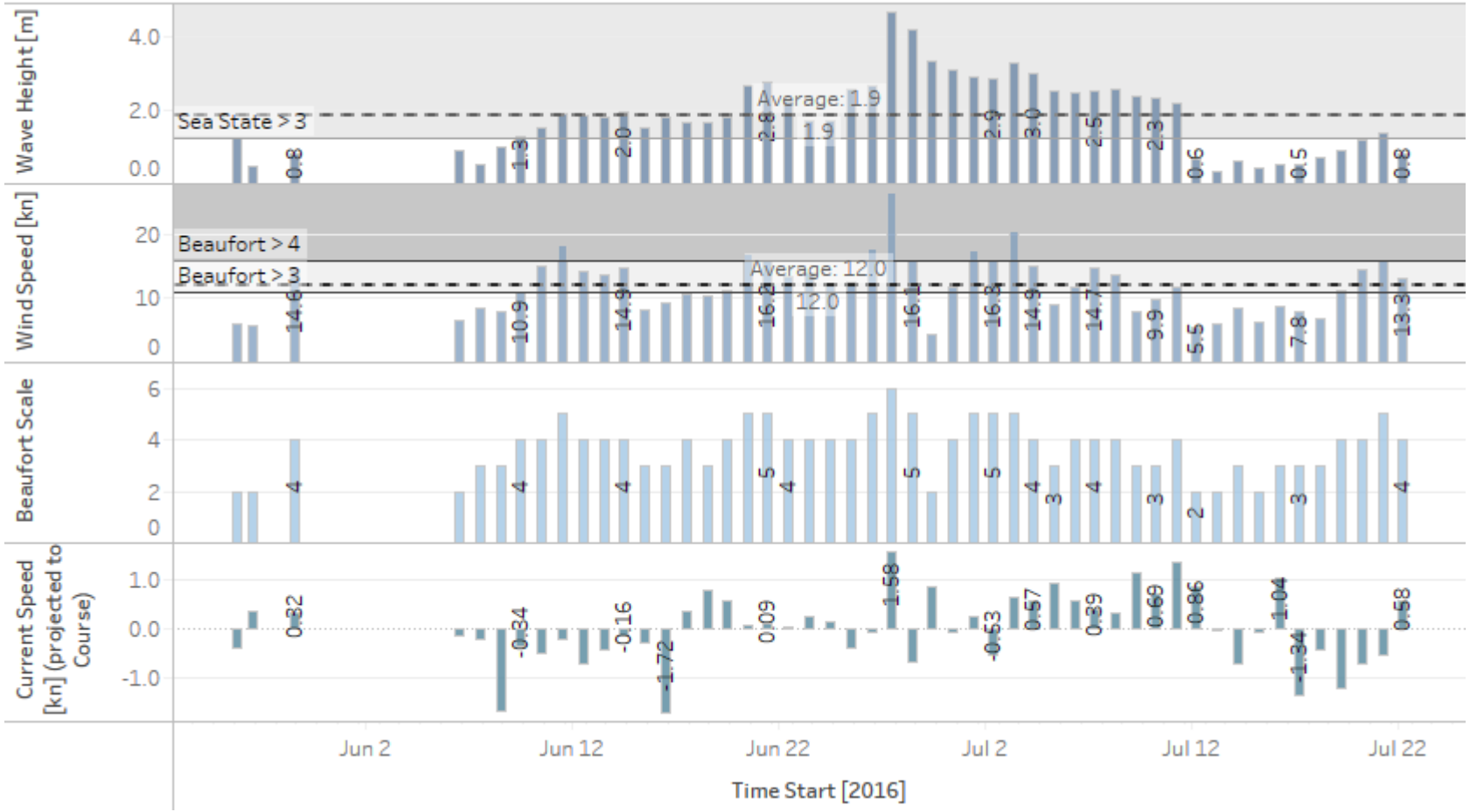
Accurate Hindcast Weather based on Time & Position.



Hull & Machinery Modeling

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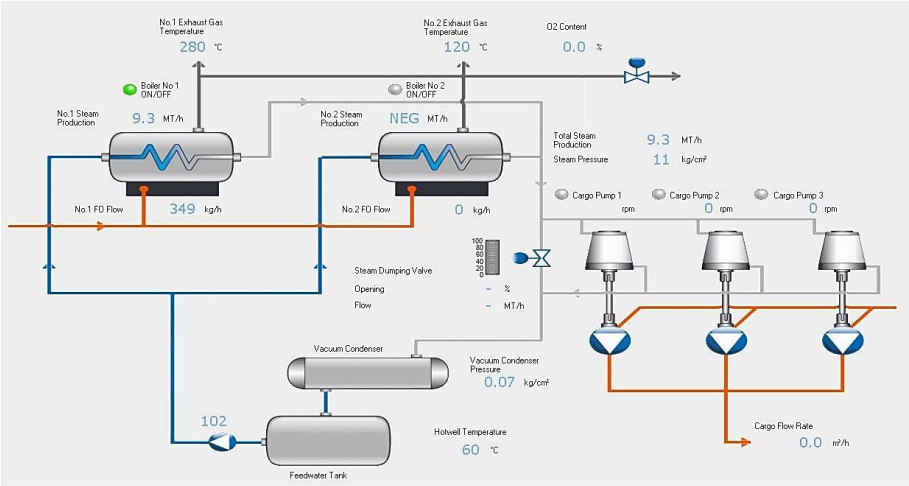

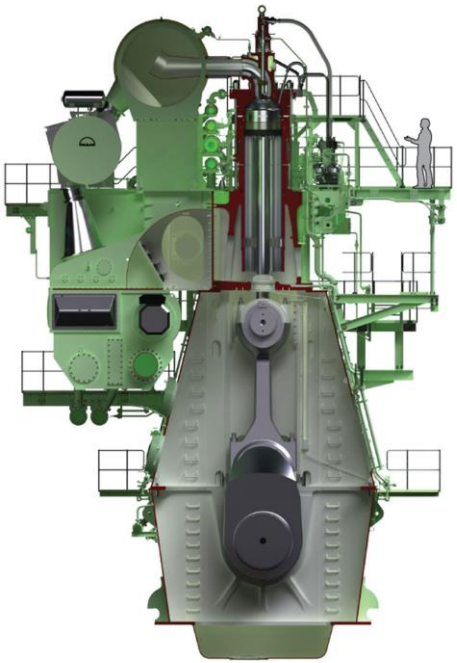

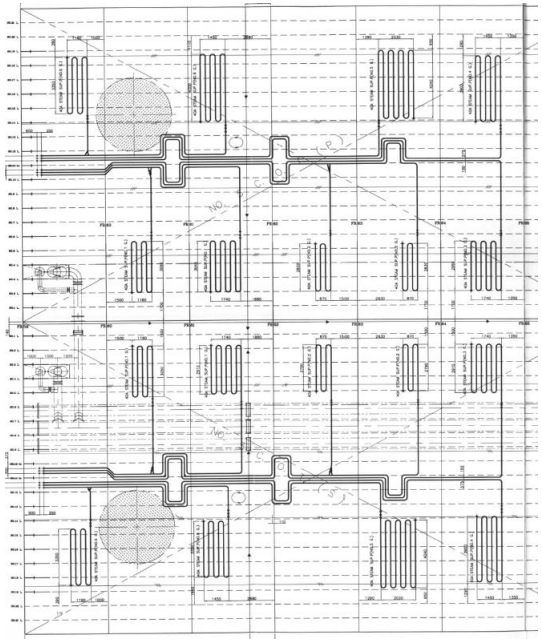

Model Verification and Calibration

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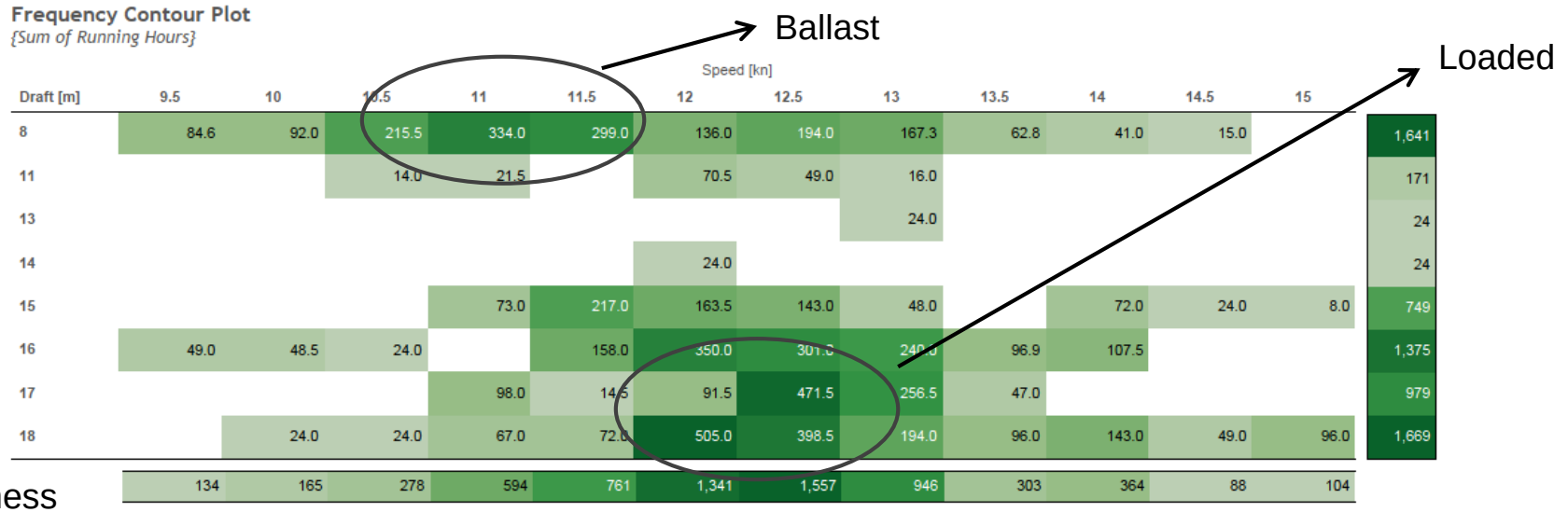
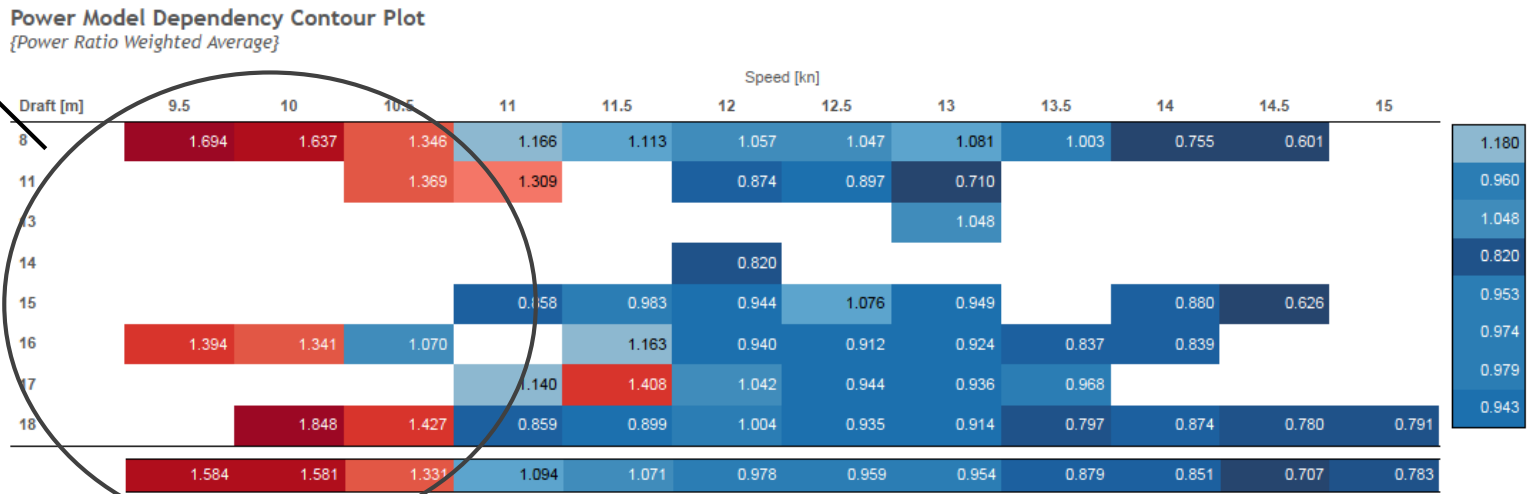


Model weakness in low Speeds

Power Ratio *{Weighted Average}*

1.0150	289



Emissions Monitoring & Reporting

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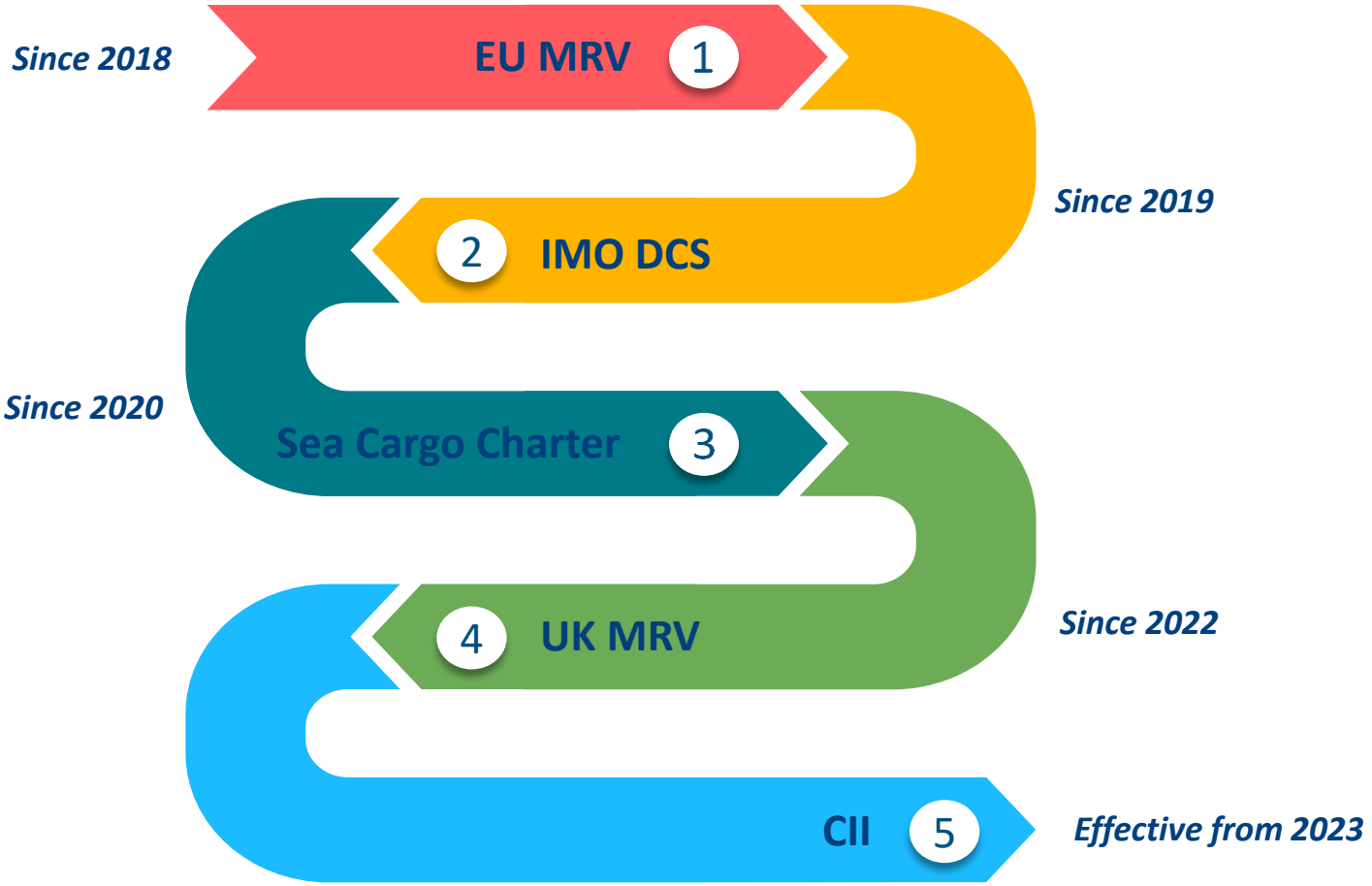
All components of our Data Ecosystem are combined in algorithms to support various reporting needs. Typical examples are the procedures built to achieve compliance in different Regulations relevant to Emissions.



Pros and Cons of going Digital

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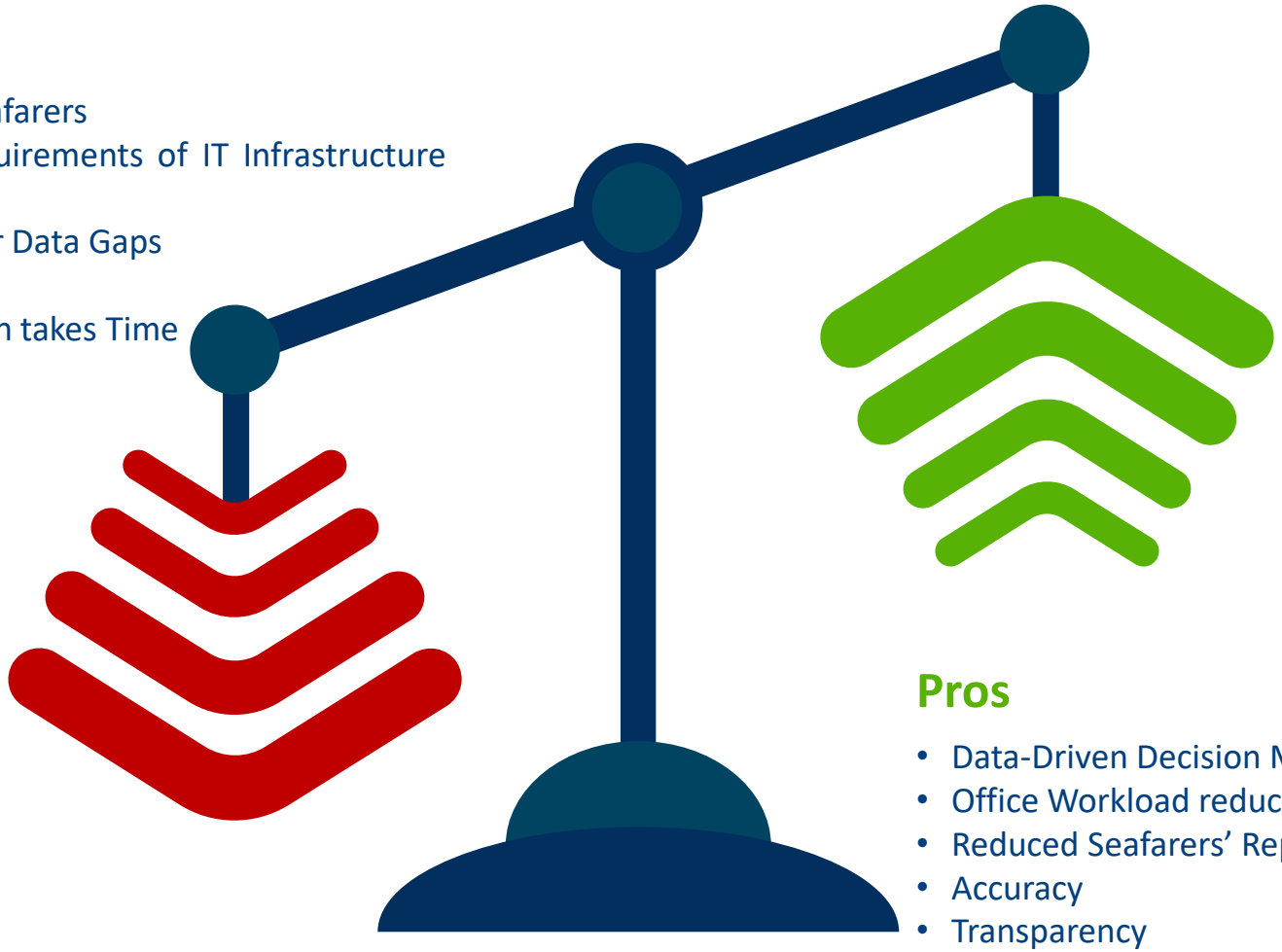
Cons

- Data Quality
- Training of Seafarers
- Increased requirements of IT Infrastructure and Resources
- Procedures for Data Gaps
- Cost
- Transformation takes Time



Pros

- Data-Driven Decision Making
- Office Workload reduction
- Reduced Seafarers' Reporting effort
- Accuracy
- Transparency
- Data can be reusable for various Reporting needs which are increasing
- Keep Up with new Technologies

Questions