



MARITIME

Business models for the future – adapting to a new reality

ETA Autumn Conference

A.Eknes, Segment director, Offshore Service Vessels, DNV GL
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What is smart operations?

- Smart tug operation – or smart harbour operations – ***are you operating smart today?***
- Who will get the benefits of smart technologies – or smarter operations
- What do we need to know – before we can act smarter

If Only We Knew What We Know...
(quote from someone)

SMART technology
should address
NEED to have
before
NICE to have

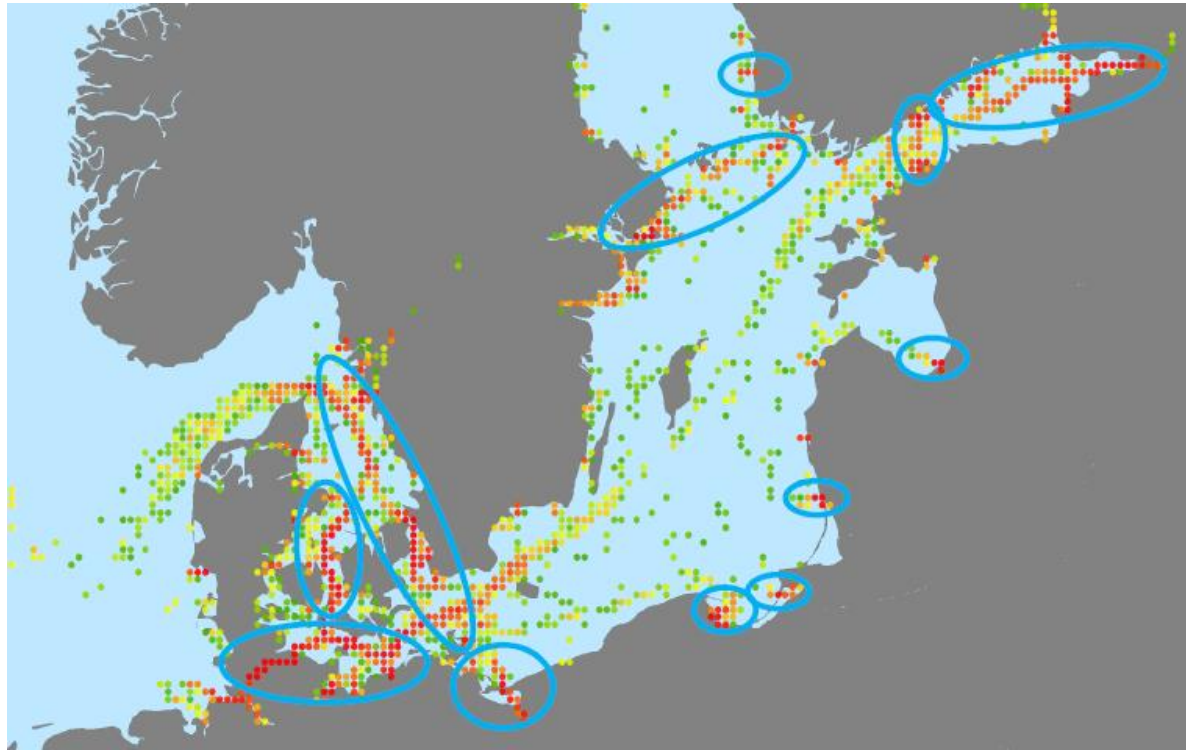
Tugs have different capabilities / technology / operational use (area, duration, criticality of mission, environmental conditions) - One size does not fit all!



- Major differences in operation between
 - Harbour tug
 - Icebreaking tug
 - Tug for long distance offshore towing
 - Escort tug
 - Pusher/pull tug, for coastal or inland waterways
- Operational profiles / envelope and power demand curves varies a lot
 - between the different tug types
 - and among each category above

Dynamic predictions & risk management: locate response capabilities where they have highest impact on risk reduction / reducing consequences

Risk models for collisions – identify hot spots for a specific year (source AISyRisk – DNVGL)



Location of emergency response or proactive towing resources can be managed dynamically – adapting to the actual risk / cargo / weather / consequences) etc.

And where collisions happened from 1989-2013 (source; Helcom)



Once upon a time – alone at sea – or in space - far from disturbances – when life was different ...



'Houston – we have a problem'



Aviation: worlds first Remote Tower Centre, opened October 2019



Centralization – an established principle in safety critical industries



Railway



Aviation



Process plant



Telecom



Production platform



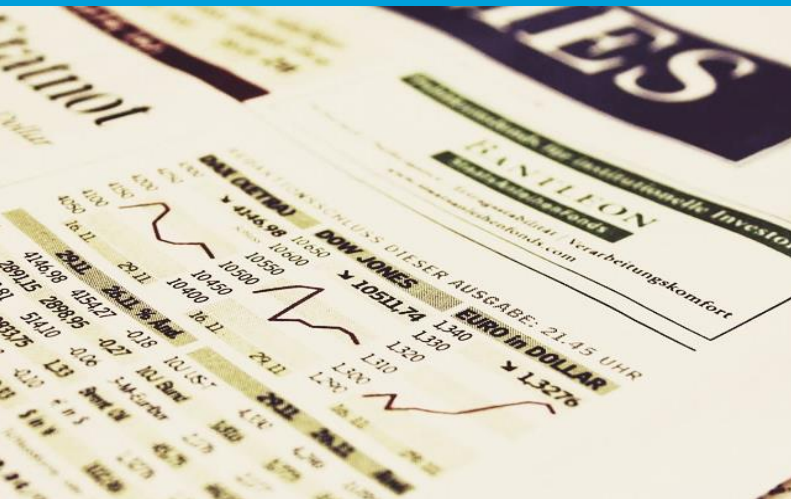
What about shipping..?



Times of transformation for the maritime industry. Major drivers having influence on ship owners decision making.

There are tectonic shifts within Maritime on three fronts right now

MARKETS



Increasingly unpredictable

REGULATIONS



Growing expectations towards transparency and sustainability

TECHNOLOGY



Strong impact of new (digital) technologies on shipping

At DNV GL, we are advancing on our digital journey at rapid speed



My Services



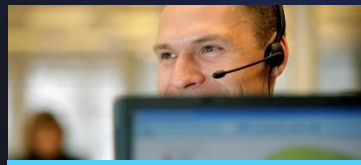
E-certificates



Machine learning



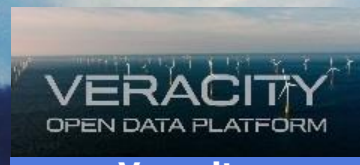
Digital Class



DATE



Remote surveys



Veracity data platform



Simulations



Drone surveys



Smart survey booking

Prevent Fire, Machinery Spaces	Detect and Extinguish Fire, Machinery Spaces	Contain Fire, Machinery Spaces
<ul style="list-style-type: none"> Check fire alarm Check fire extinguishers Check fire doors Check fire blankets Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers 	<ul style="list-style-type: none"> Check fire alarm Check fire extinguishers Check fire doors Check fire blankets Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers 	<ul style="list-style-type: none"> Check fire alarm Check fire extinguishers Check fire doors Check fire blankets Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers Check fire extinguishers

Insights Barrier Reporting



Automated Approval



Today

Piloting

Future

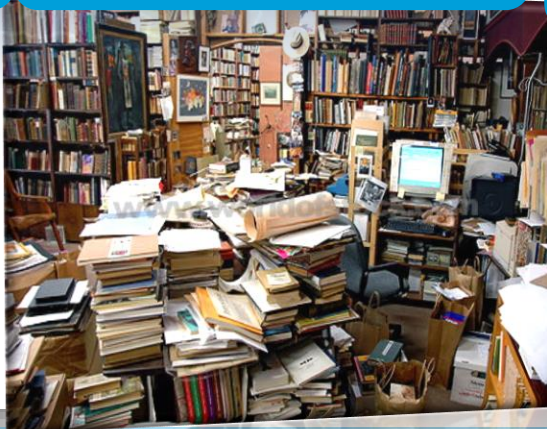
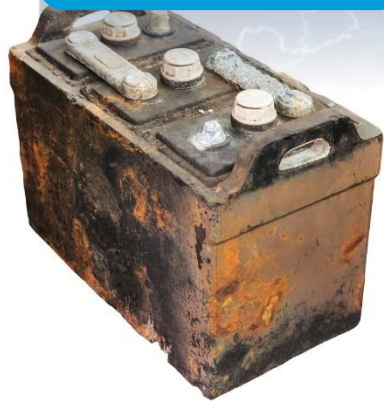
Global trends - the essentials are changing

Storage



Energy

Information



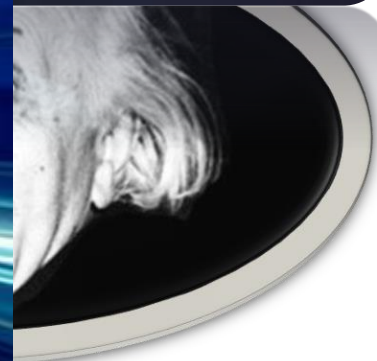
Connectivity



Algorithms &
decision making



Fast / instant computing



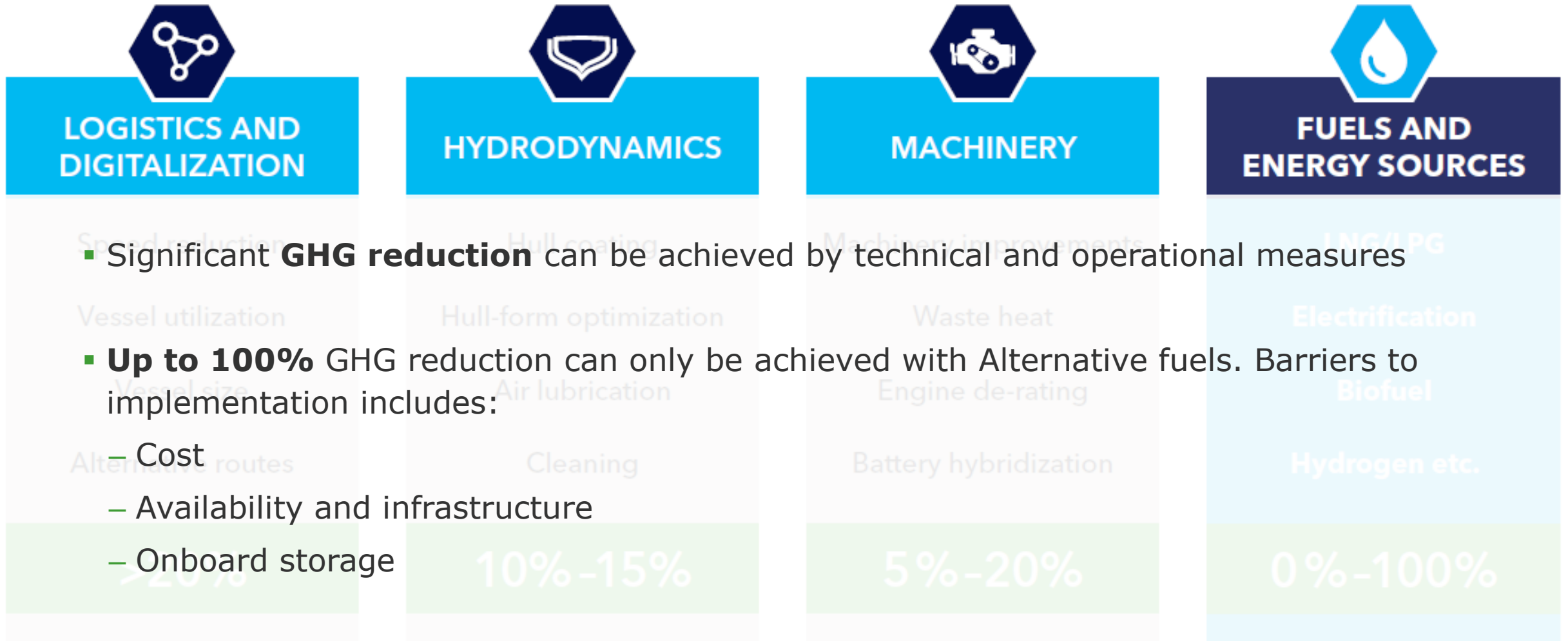
3x MORE EFFICIENT



Photo: Wikipedia/Nissangeniss

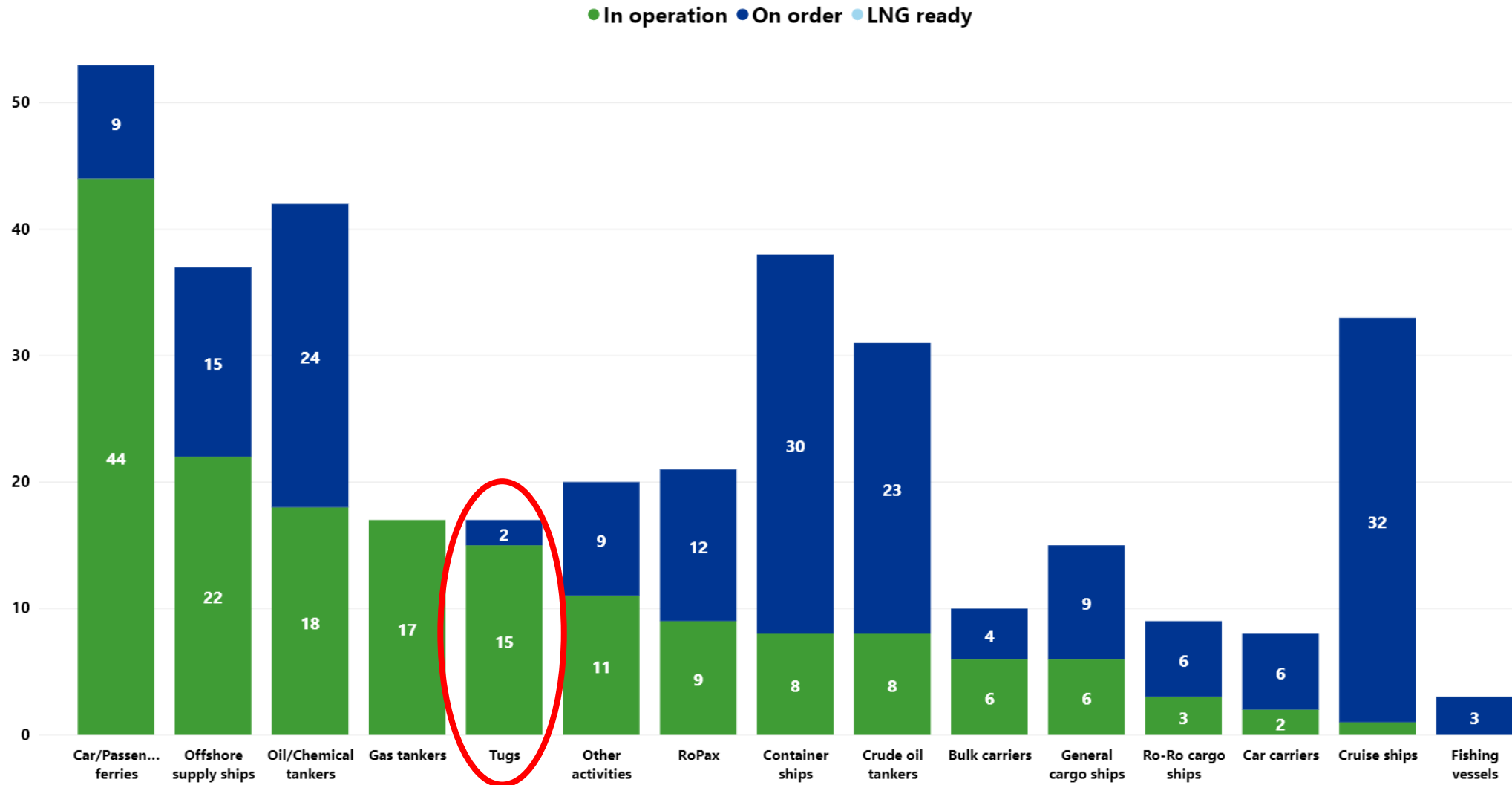


Decarbonization options for shipping



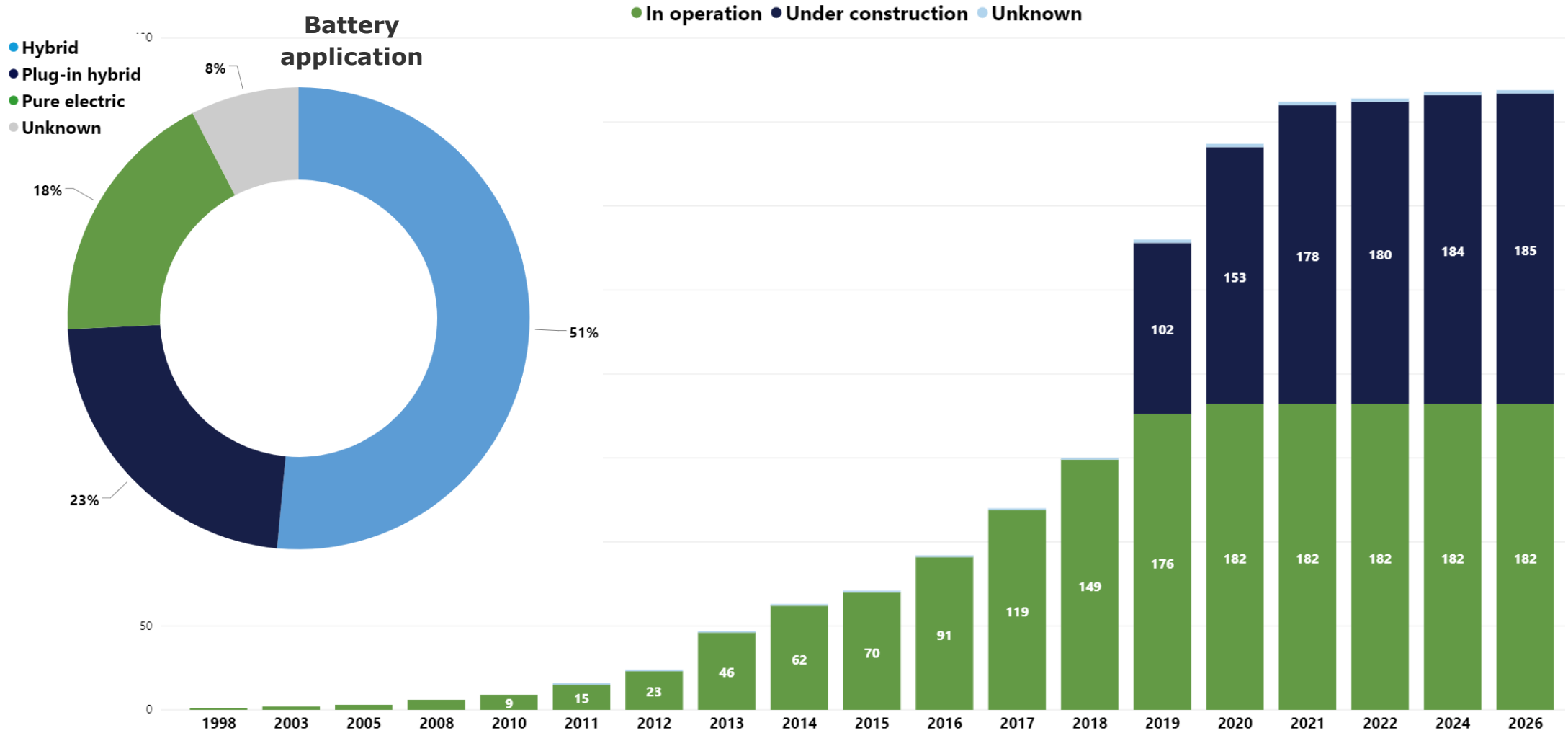
- Significant **GHG reduction** can be achieved by technical and operational measures
- **Up to 100%** GHG reduction can only be achieved with Alternative fuels. Barriers to implementation includes:
 - Cost
 - Availability and infrastructure
 - Onboard storage

LNG fuelled fleet by vessel type



Source: DNV GL Alternative Fuels Insight, 2019

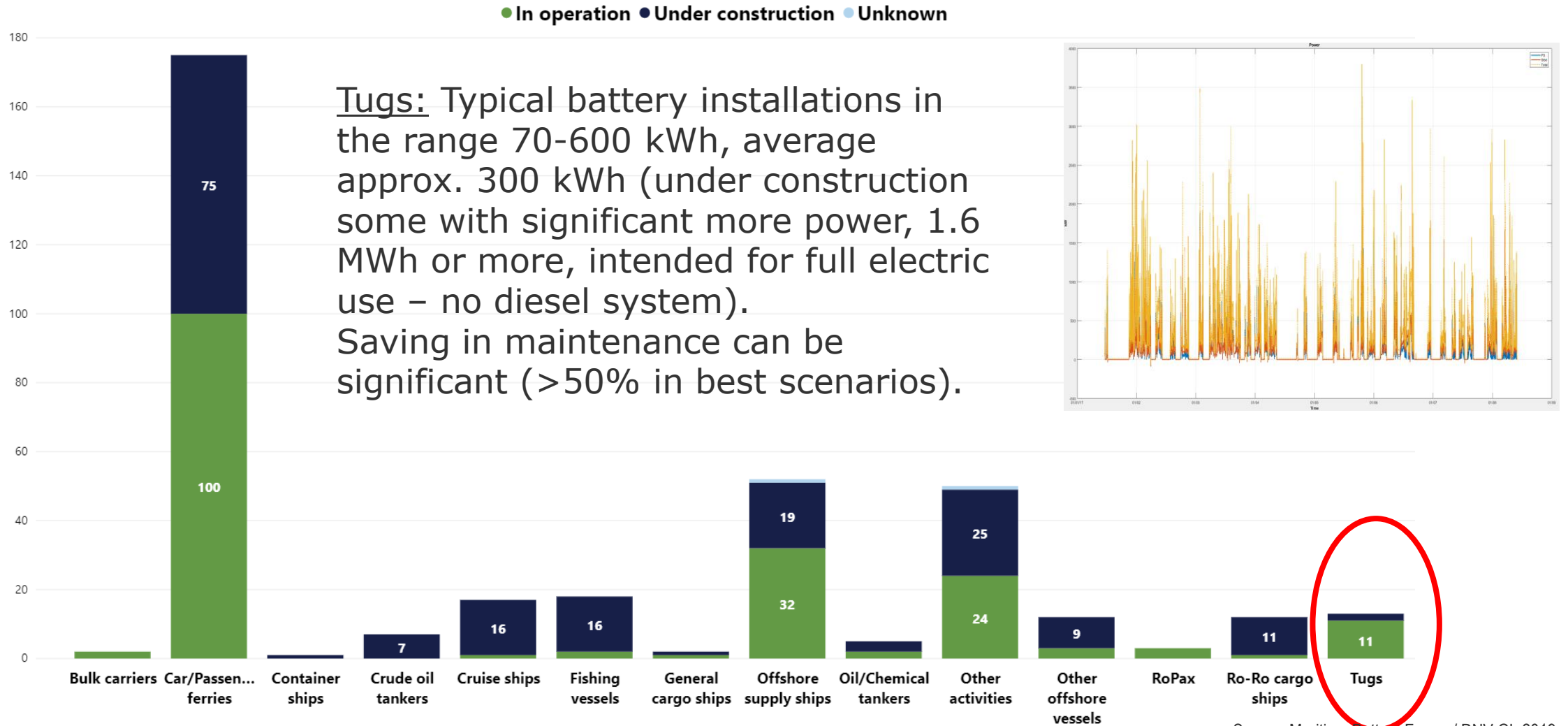
There are currently 369 ships confirmed with battery installations



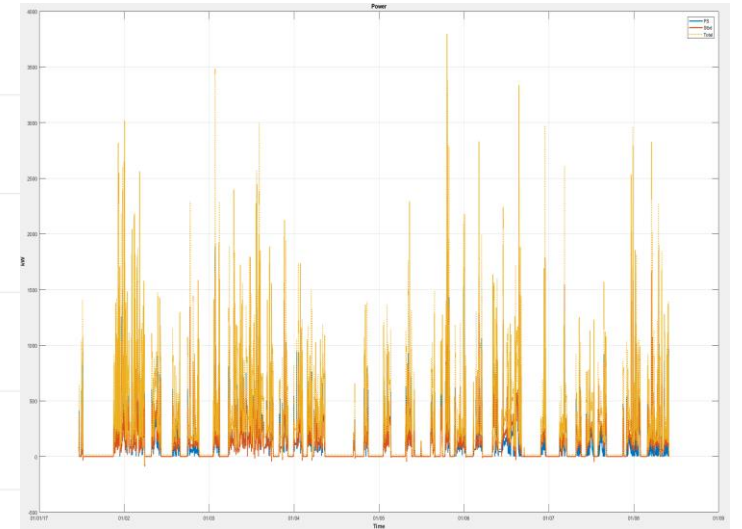
Showing delivery year of existing orders only. Future additional contracts will increase the number of scrubber installations in 2020 and onwards.

Source: Maritime Battery Forum / DNV GL Alternative Fuels Insight, 2019

Number of ships with batteries by ship type

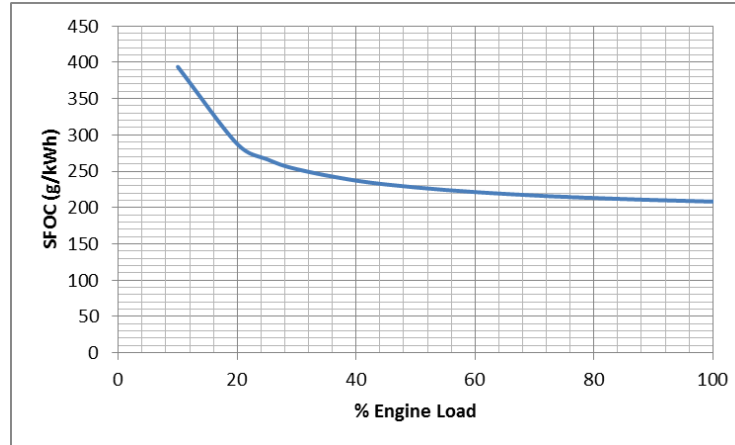
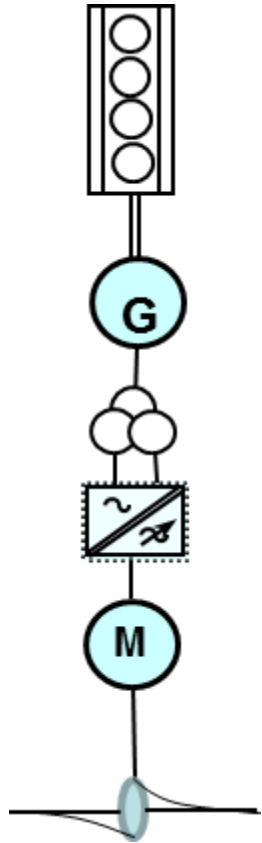


Tugs: Typical battery installations in the range 70-600 kWh, average approx. 300 kWh (under construction some with significant more power, 1.6 MWh or more, intended for full electric use – no diesel system). Saving in maintenance can be significant (>50% in best scenarios).

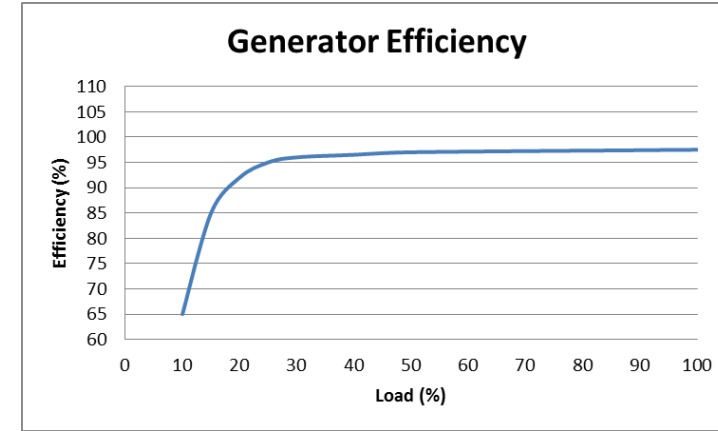


Source: Maritime Battery Forum / DNV GL 2019

Hybrid ships – running energy systems on optimal loads

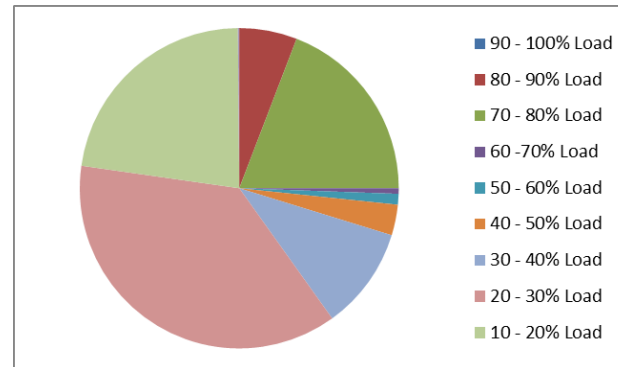


Specific Fuel Oil Consumption

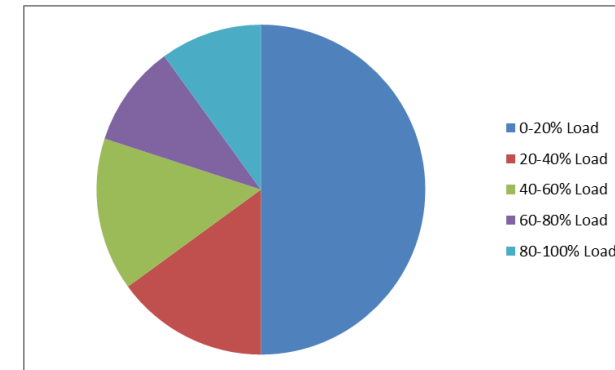


Generator Efficiency

Operating profiles:



OSV



TUG

Batteries respond faster than mechanical systems, this enables a number of possibilities



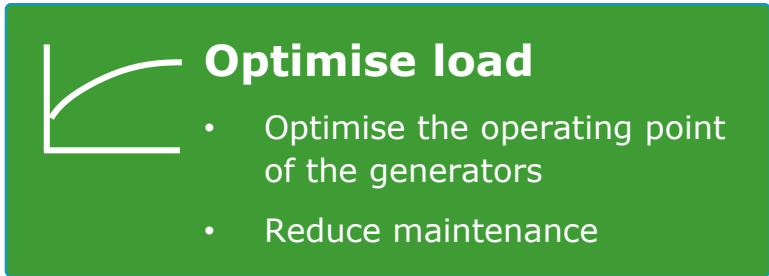
Spinning reserve

- Backup for running generators
- Fewer turbines needed online



Peak shaving

- Act as a buffer
- Level power seen by engines



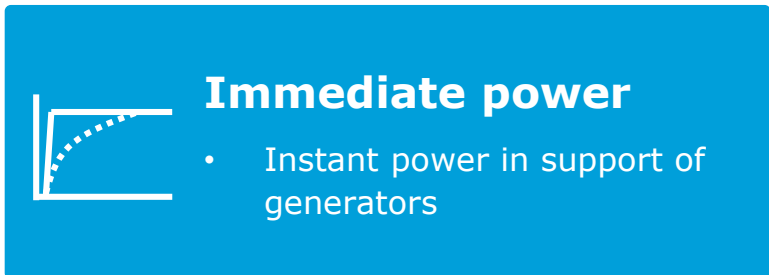
Optimise load

- Optimise the operating point of the generators
- Reduce maintenance



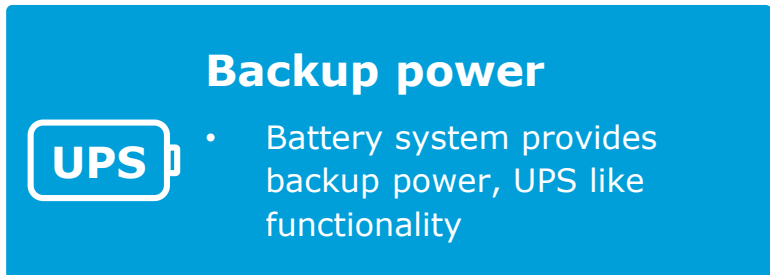
Harvest energy

- Recover energy from cranes, drilling equipment, etc.
- Accommodate energy from renewables



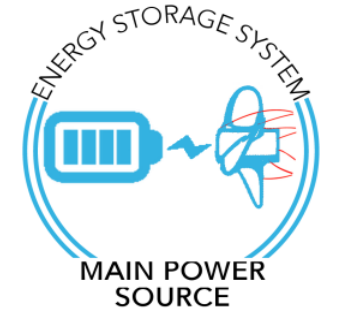
Immediate power

- Instant power in support of generators



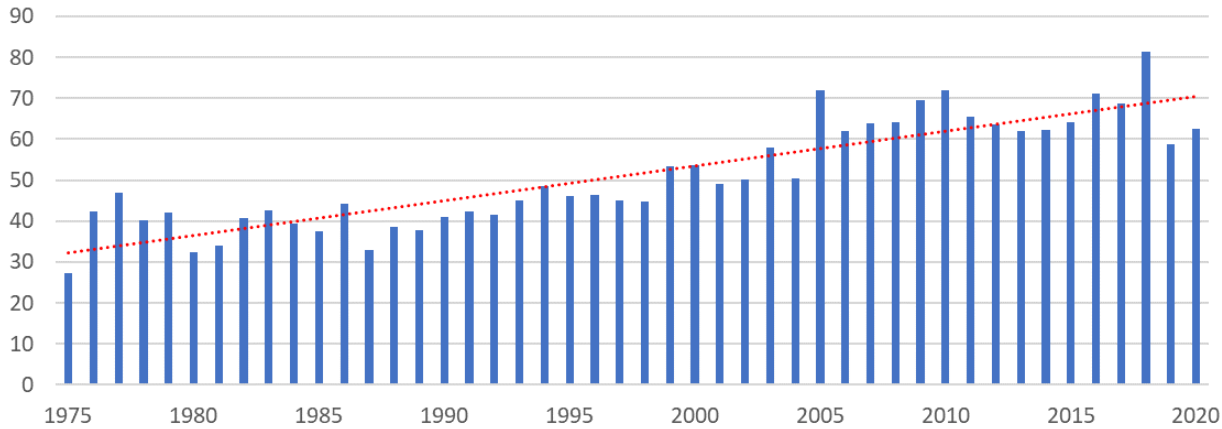
Backup power

- Battery system provides backup power, UPS like functionality



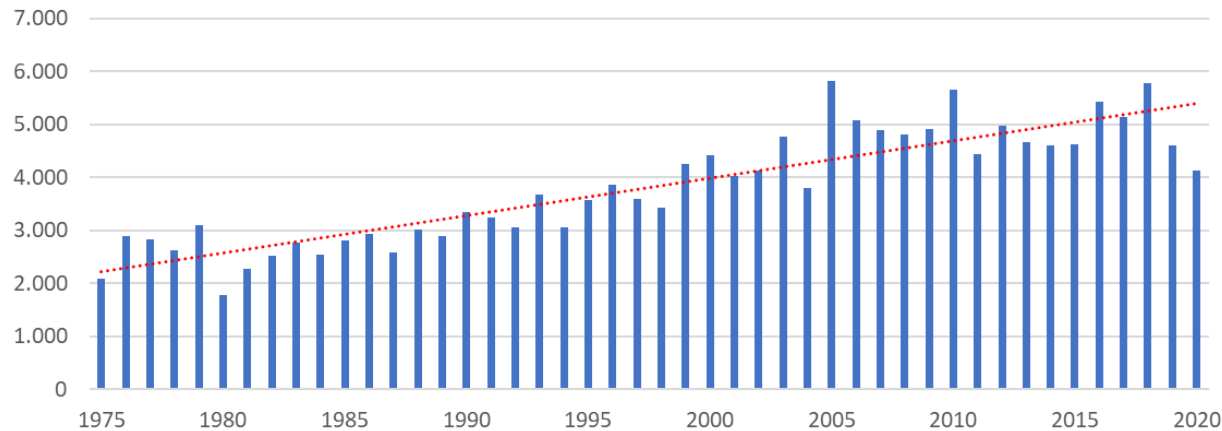
Tugboat pulling force and engine power have increased

Tugboat deliveries by year and average Bollard Pull [tons]



Pulling force of tugboats has increased to an average of **68 tonnes** in the decade 2010-2020

Tugboat deliveries by year and average Engine power [HP]



Engine power of tugboats has increased to an average of **5,000 HP** in the decade 2010-2020

Source: DNV GL, IHS Fairplay 2019

Tugboats have adapted their capabilities – and container vessels become larger

Containerships deliveries by year and average size in TEU

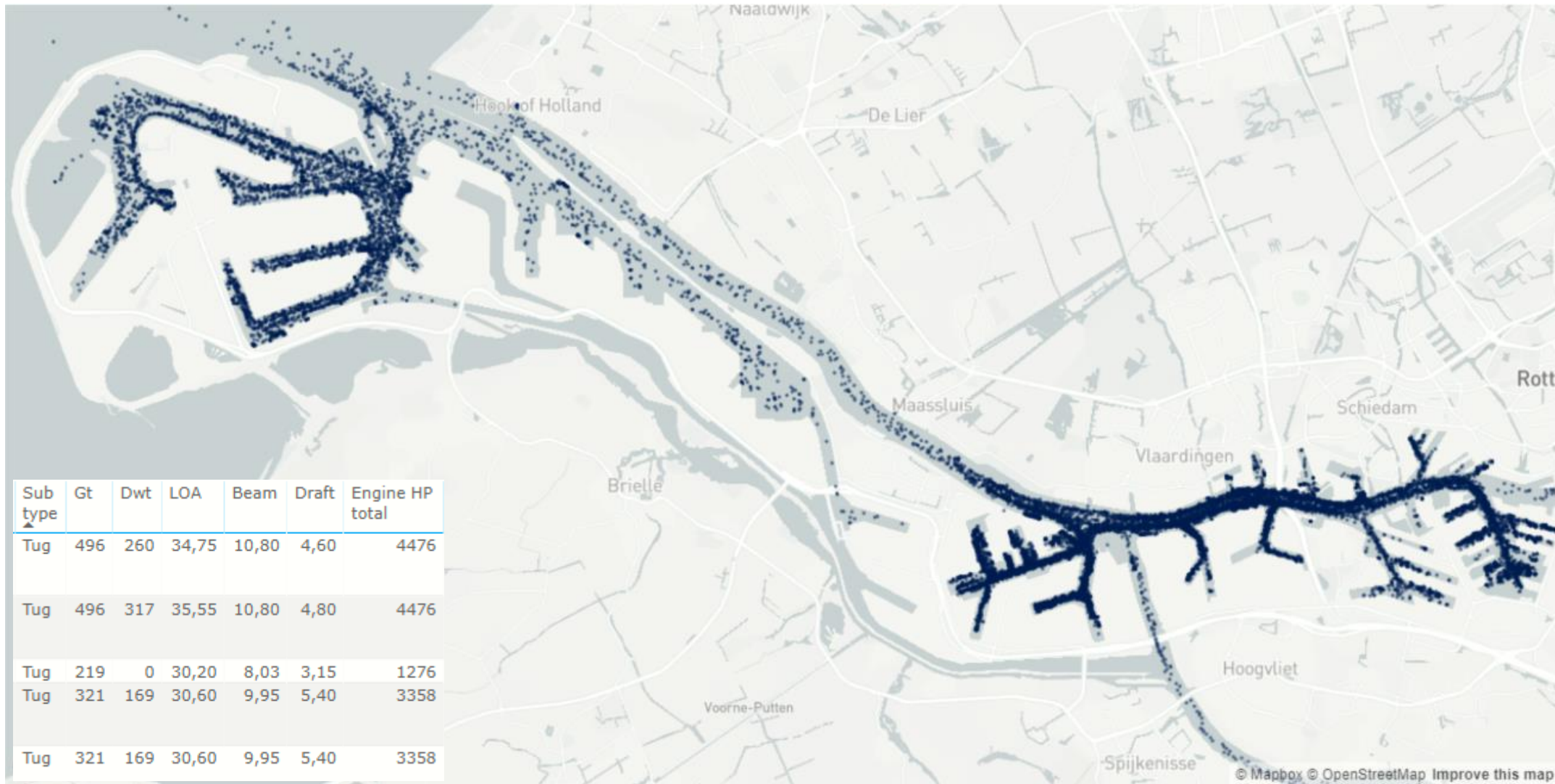


Source: DNV GL, IHS Fairplay 2019

Tugs have holding power to slow down – or to lead the way for cleaner and smarter ports / cities



Operational profile: example of 5 harbour tugs in Jan-Oct 2019



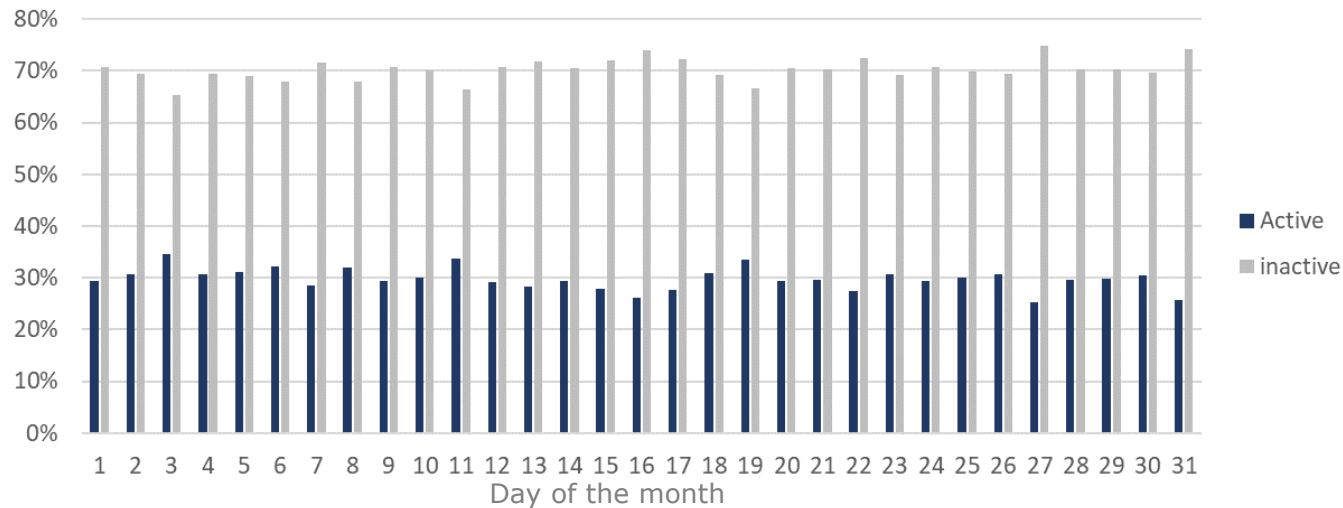
AIS traces of **5 harbour tugs** in Rotterdam between January – October 2019

Source: DNV GL, 2019

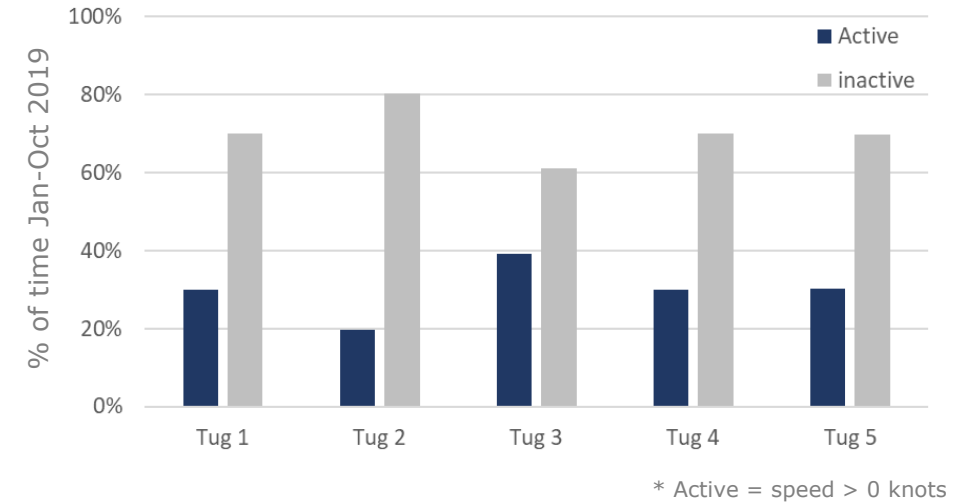
Activity of 5 harbour tugs in the first nine months of 2019

On average, each tug spends only 30% of the time being active

Daily active/inactive periods for 5 tugs in 2019 [in %]



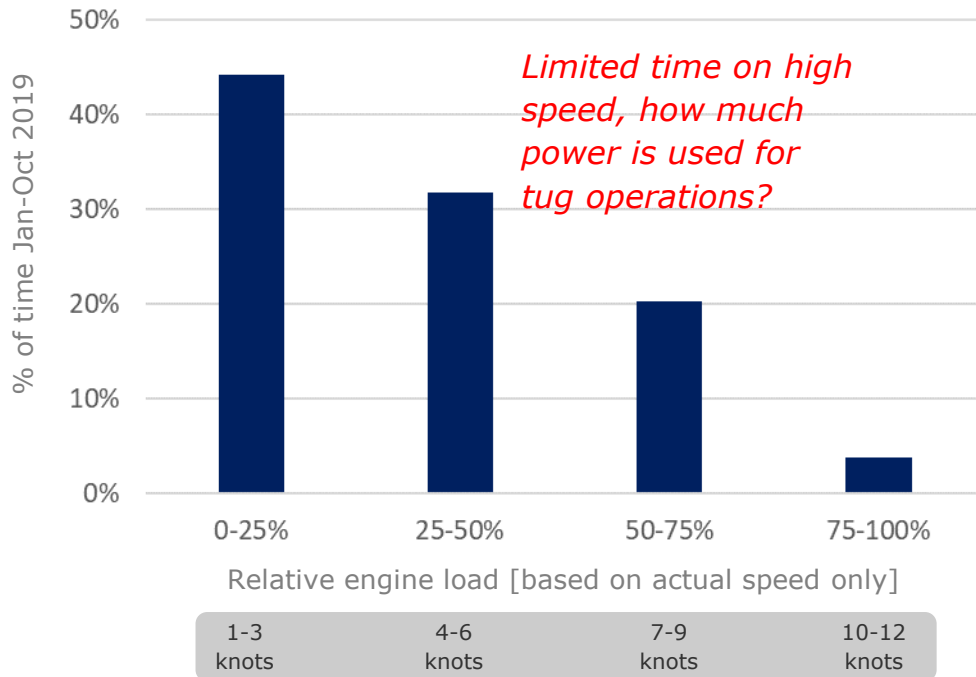
Active*/inactive time per tug in 2019



Source: DNV GL, 2019

Activity of 5 harbour tugs in the first nine months of 2019

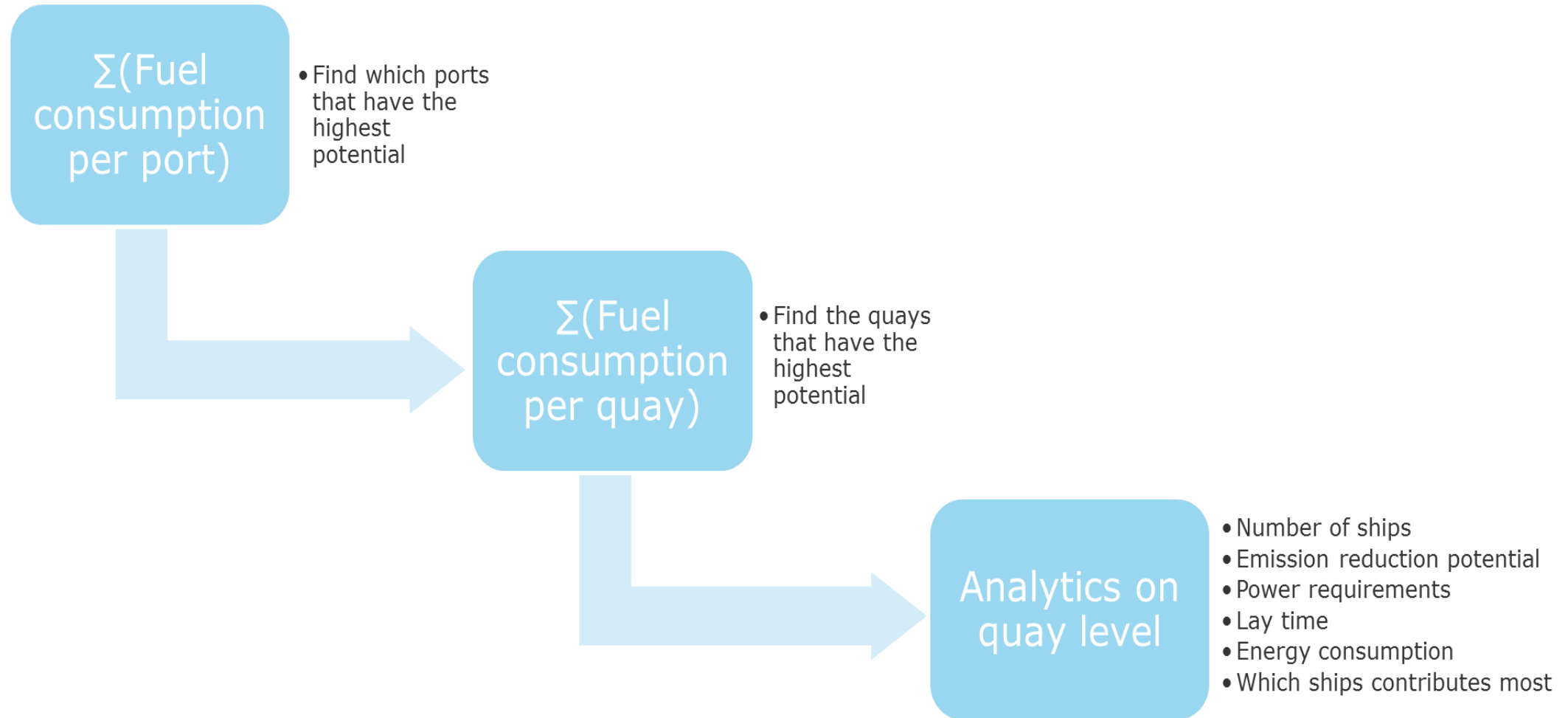
Estimated engine load/speed correlation for 5 tugs in 2019



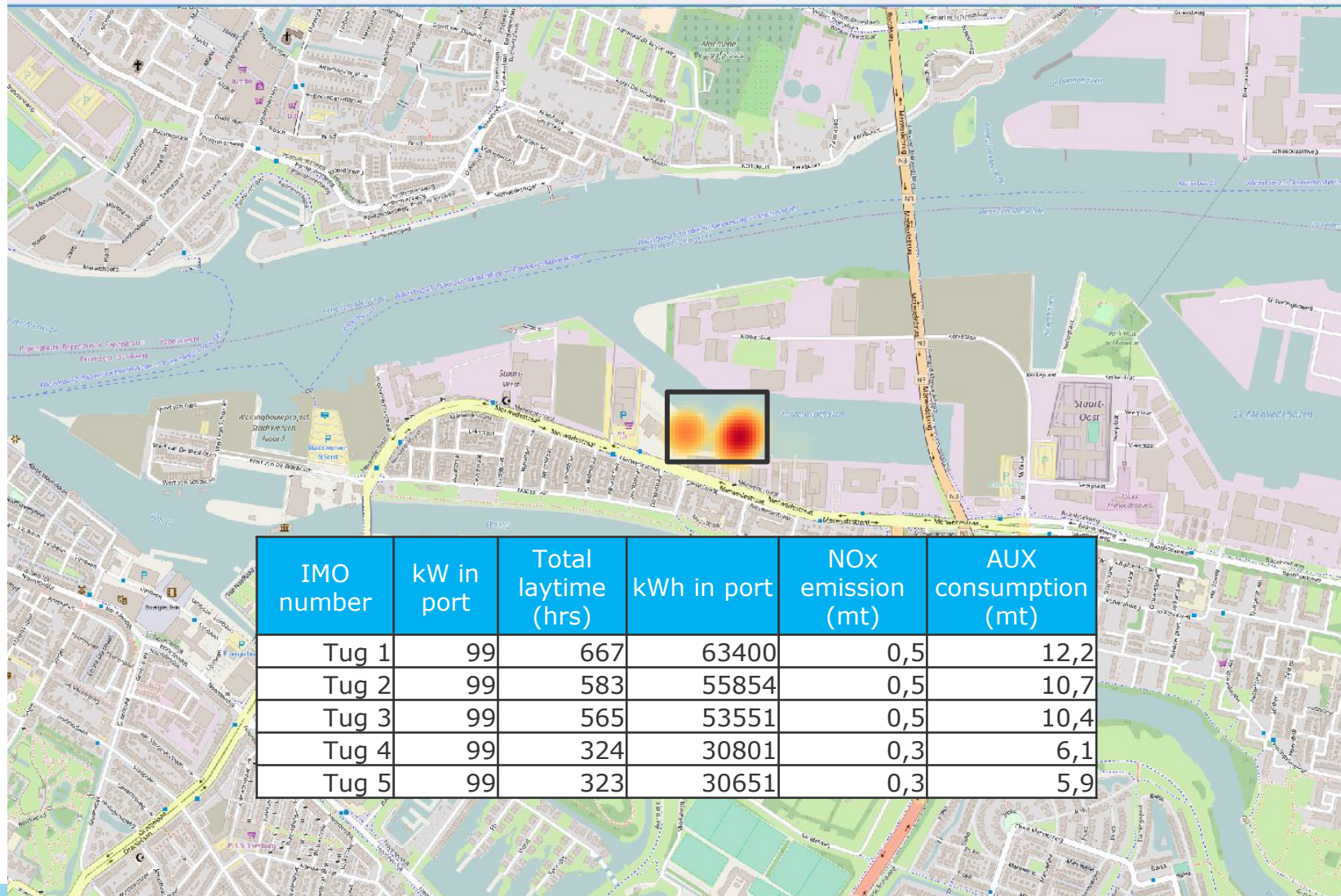
On average, each tug spends 75% of the time with low or no speed.

Source: DNV GL, 2019

Methodology – where does it make most sense?



Shore Power?



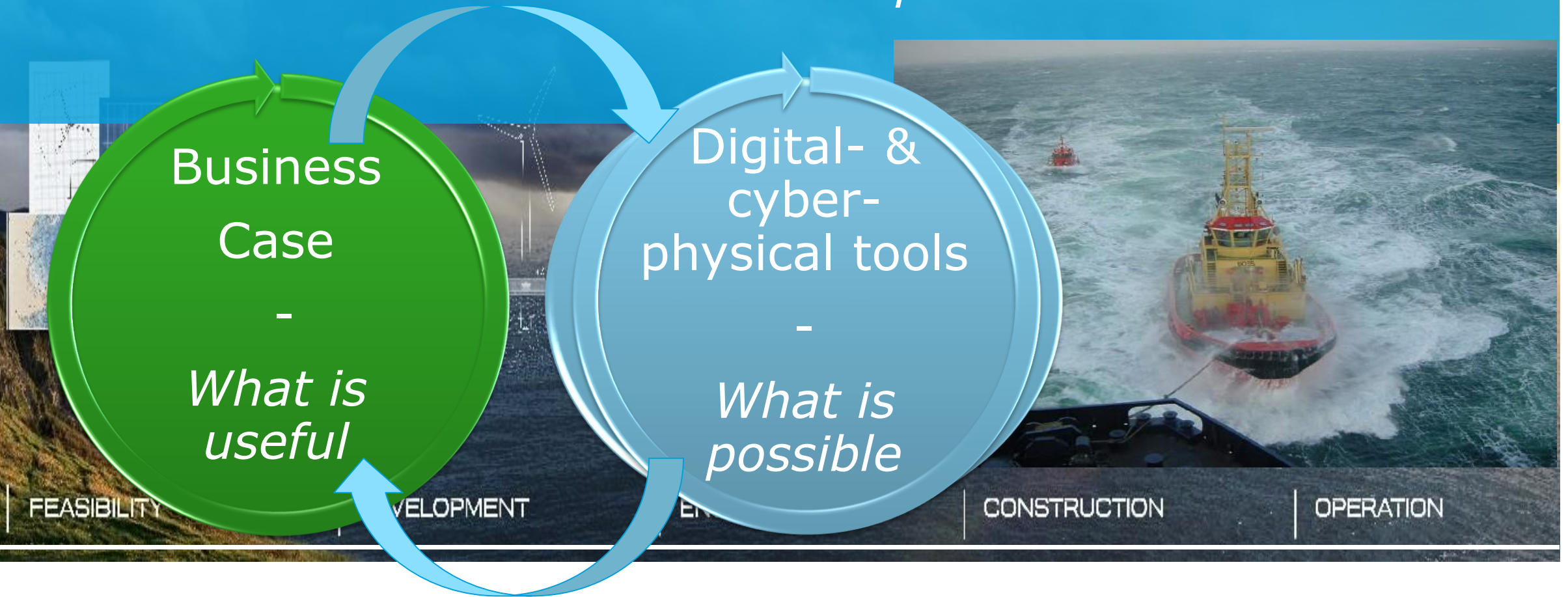
Source: DNV GL, 2019

Shore power infrastructure



Source: DNV GL Alternative Fuels Insight, 2019

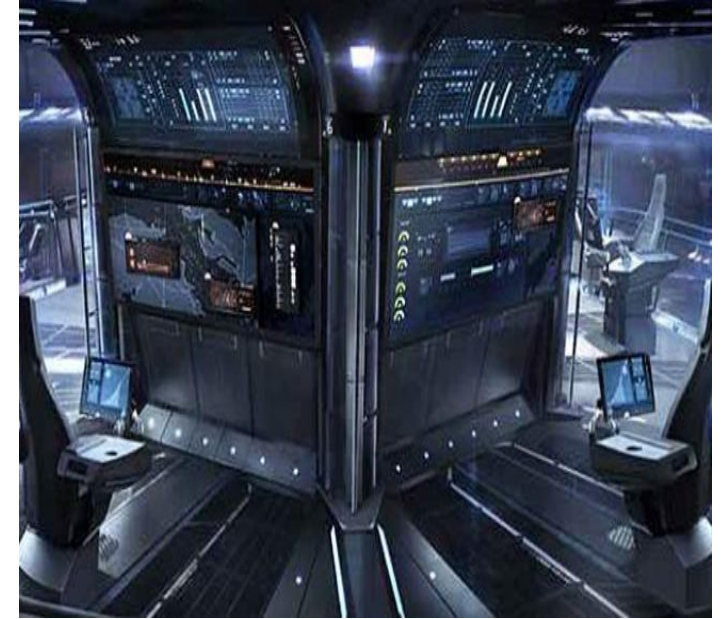
The challenge:
Reduce OPEX significantly for the existing fleet
– *with maintained or enhanced performance*



Data-smart algorithms – from decision support to autonomous

An incremental and step wise approach is highly recommended:

- Start connecting systems onboard, decide what is business critical information (sensor info and system performance from actual operations) and feed to shore
- Increased degree of automation of separate tug functions
- Remote operation of functions – still with crew onboard
- Remote operations – managed by people ashore (or at a different location than onboard)
- Towards autonomous operations – no people involved
 - a future with cyber physical systems programmed to take decisions safe
 - learning from operation without human intervention??



Business models can stimulate and accelerate operational changes

- Start by sorting out WHY you want new technology
 - and will this make a **positive impact on making your total operations**
 - **less costly** in operation (fuel / crew / spares / maintenance etc)
 - more **environmental friendly** (emissions / noise / discharges / waste etc)
 - **safer** (vessel / port operations / insurance etc)
 - more **attractive** (availability / external for direct and indirect customers / and internal for crew, training, retention, recruiting / both internal and external for financing purposes compared with alternatives / catalyst for smart port infrastructure or smart city program)
 - **other reasons** (e.g. increased market value due to more resilient solutions / prepared for scenarios you can imagine being realistic although not preferred /
- If you can not identify WHY to go smart – supporting your business case – why do it at all?

SMART technology
should address
NEED to have
before NICE to ...

OUR VISION

GLOBAL IMPACT FOR A SAFE AND SUSTAINABLE FUTURE

For more info – please contact:

arnstein.eknes@dnvgl.com

+47 948 66 883

www.dnvgl.com

SAFER, SMARTER, GREENER

Energy Transition Outlook

<http://eto.dnvgl.com>

Maritime Forecast 2050:

<http://eto.dnvgl.com/2019/maritime>

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