

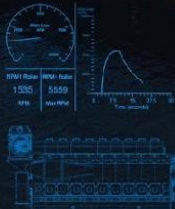
BUREAU  
VERITAS

30 NOVEMBRE 2022

| BUREAU VERITAS MARINE & OFFSHORE

# SMARTSHIP

100%	100%	100%	100%
100%	100%	100%	100%
100%	100%	100%	100%
100%	100%	100%	100%



# AGENDA

---

**01**

**ENERGY TRANSITION  
CONTEXT**

**02**

**SMARTSHIP  
& DIGITAL SOLUTIONS**

**03**

**HOW TO CREATE  
VALUABLE INSIGHTS  
FROM SHIP'S DATA?**

**04**

**BV'S MISSION, STRATEGY,  
NOTATIONS &  
DEVELOPMENTS**

**05**

**USV – NR461**



# ENERGY TRANSITION CONTEXT

# ENERGY TRANSITION

## WHAT COULD BE THE OPTIONS?

### CAPEX driven



#### 1 New / retrofitted hull design

- Scale effect, vessel size
- CFD & Hull shape
- Air cavity lubrication
- New anti-fouling
- Propeller appendages: Cap fins, Mewis ducts, Pre Swirl Stator, Contra-rotating Gate rudder



#### 2 New / retrofitted propulsion & power system

- Waste heat recovery
- Alternative fuels: LNG, Ammonia, Hydrogen fuel cell, Biofuels
- Electric & Hybrid
- Electronic Engine Control
- Prop. Efficiency Devices
- Freq. converters
- Lights system



#### 3 Alternative sources of energy

- Kite (WASP)
- Fixed sails or wings
- Solar panels
- Sore power, cold ironing

### OPEX driven



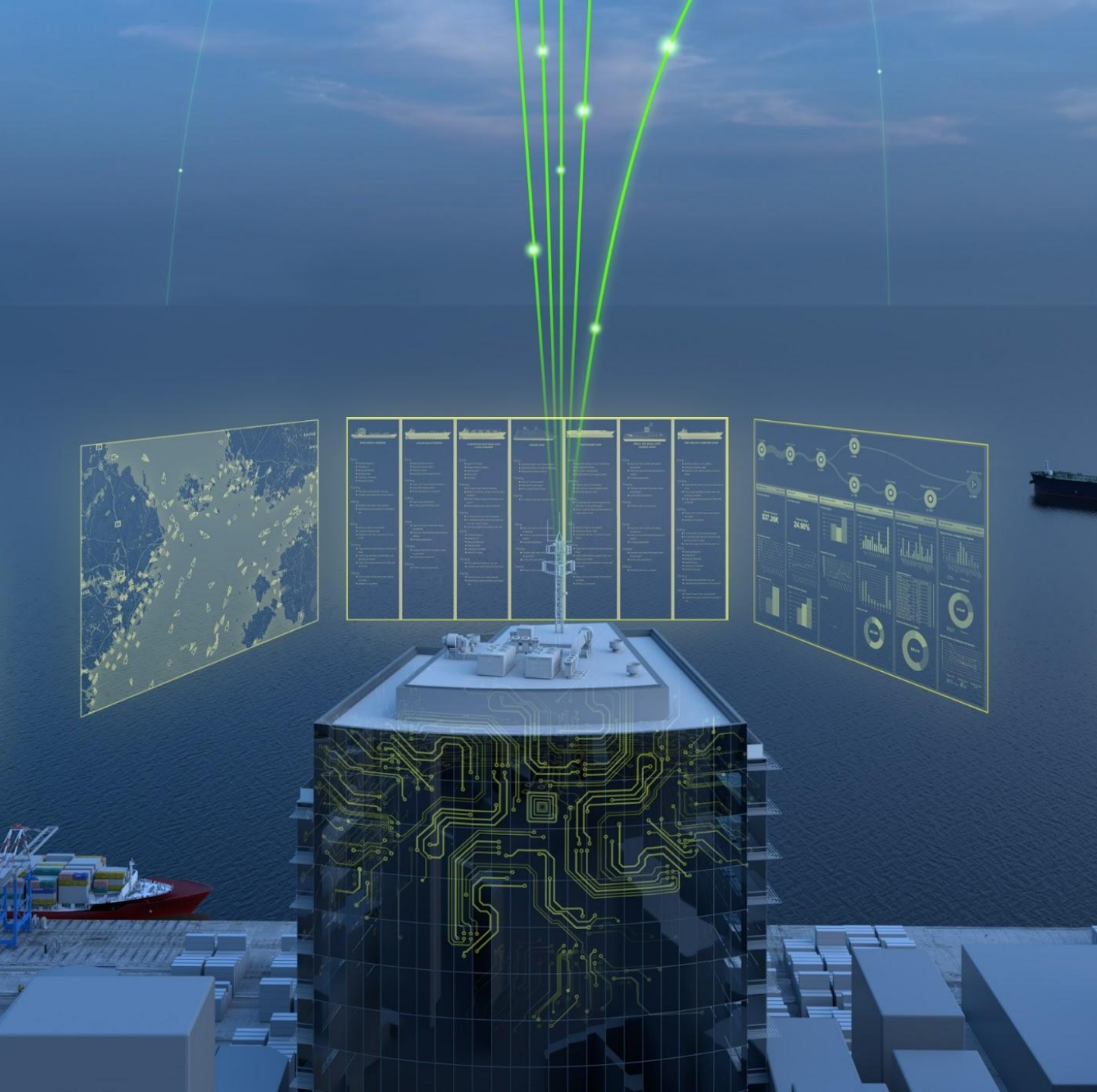
#### 4 Speed limitation

- Engine Power Limitation (EPL)
- Engine de-rating
- Shaft Power Limitation (ShaPoLi)



#### 5 Operation optimization Enabled by digitalization

- Voyage optimization
- Weather routing
- Just-in-time arrival
- Trim optimization
- Propeller/speed optimization
- Steam plant optimization
- Hull & propeller cleaning
- Power management optimization



02

# SMARTSHIPS & DIGITAL SOLUTIONS

# SMARTSHIP

## OUR UNDERSTANDING OF SHIP-OWNERS OBJECTIVES

### BE MORE SUSTAINABLE

- Improve energy efficiency in operation
- Control & reduce waste generation
- Benchmark my ship performance

### SAVE OPERATIONAL COSTS

- Through remote operations
- Through data driven optimizations
- Reduce machinery down-time and spare parts consumption through optimized and predictive maintenance
- Improve fleet utilization through better anticipation and planning

### BE MORE EFFICIENT

- Improve connectivity
- Reduce reporting time
- Identify on-time the valuable data
- Improve data quality
- Standardize data exchange formats
- Improve tracking and monitoring

### BE SAFE & SECURED

- Through robust IT infrastructure
- Through resilient software
- Through Cyber-security management and design



# SMARTSHIP

## USE CASE : ROUTE PLANNING & WEATHER ROUTING

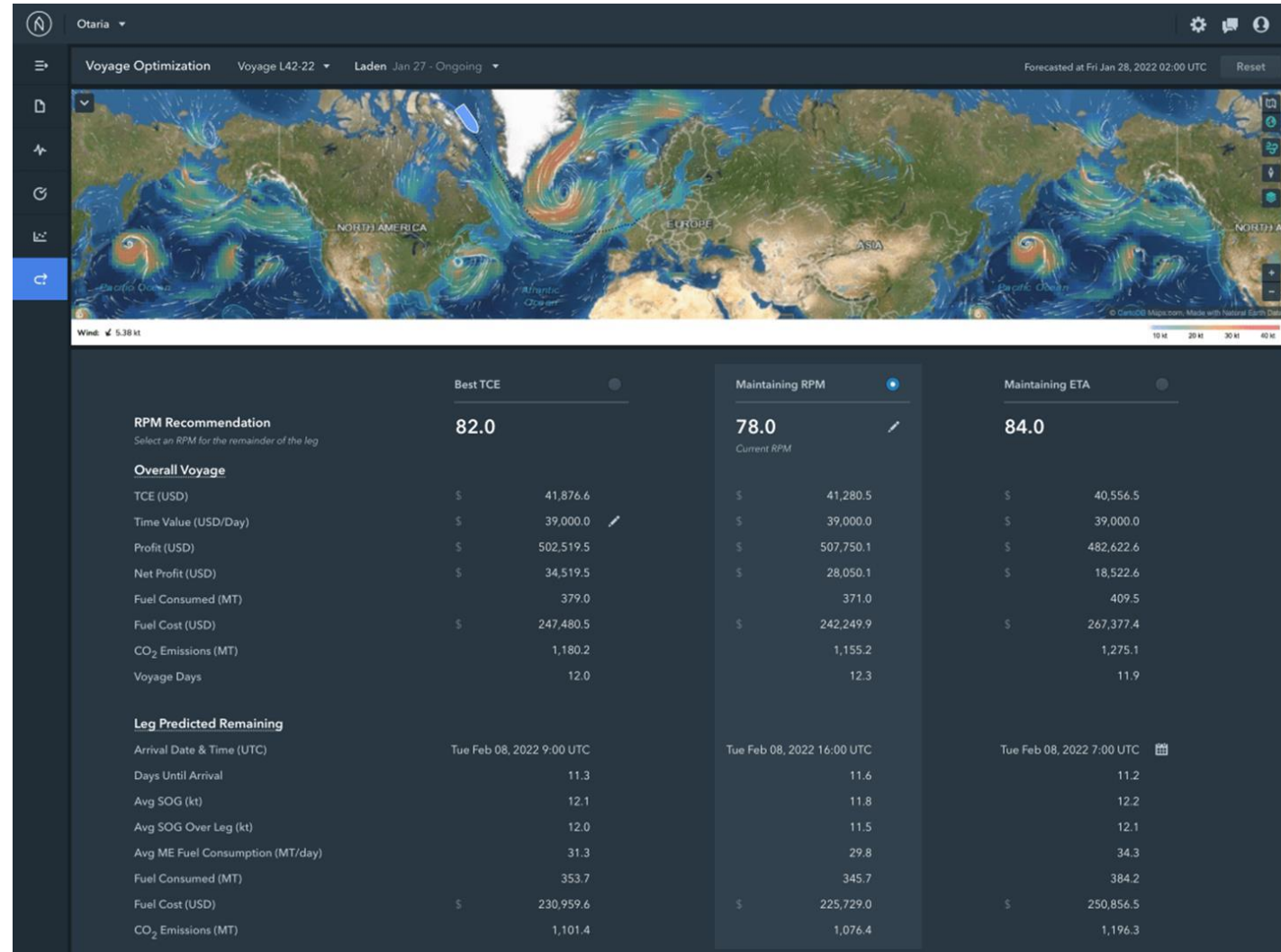


### • Data used:

- Ship characteristics
- Ship's loading conditions
- Weather forecast, waves & currents
- Engine & propeller conditions (E. Shaft Power, rpm, pitch)
- ECDIS
- AIS: ship's position, heading, speed
- Freight rate and bunker prices

### • Output

- **Best route ponderated by selected criteria:**
  - **Limited risk on:**
    - Hull structure,
    - Cargo,
    - Passenger comfort
  - **Compliance with chartering contract**
  - **ETA**
  - **Engine power/RPM, Fuel consumption**
  - **TCE Time Charter Equivalent**
- Real time data sharing



# SMARTSHIP

## OTHER USE CASES

- Hull performance
- Optimized mach maintainance
- Fleet occupancy
- Power Management System
- Propeller pitch & shaft generator optimization for manoeuvring
- Cargo consumers optimization
- Liquid cargo heating system optimization (liquid tankers)
- BOG vs. sloshing optimization (LNG carriers)
- Just-in-time arrival
- Anti-collision assistance
- ...

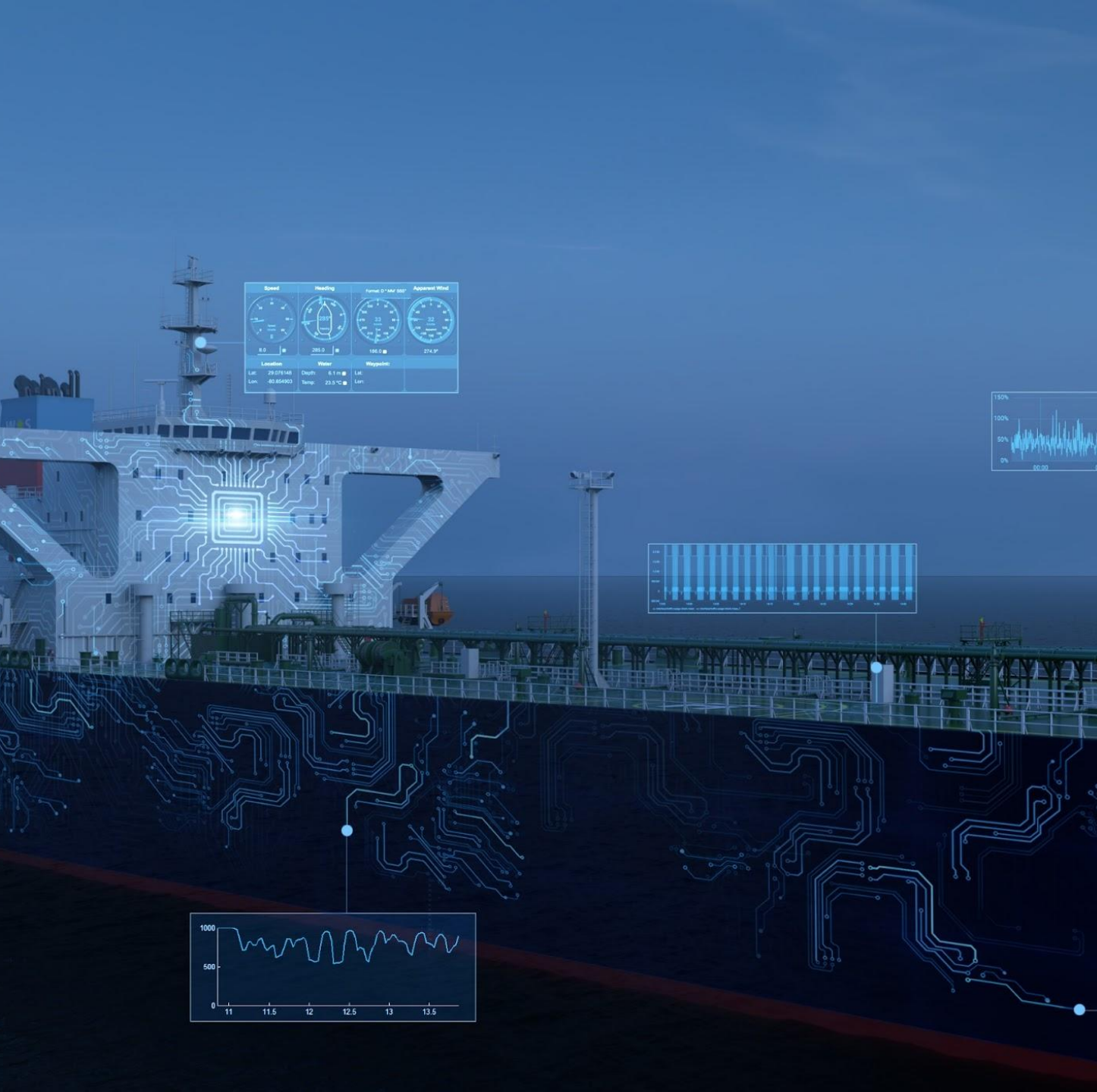




# SMARTSHIP

## LANDSCAPE OF SHIP PERFORMANCE DIGITAL SOLUTIONS

**MANY ACTORS...  
MANY PROFILES...  
NOT AT EVEN STAGE OF MATURITY...**

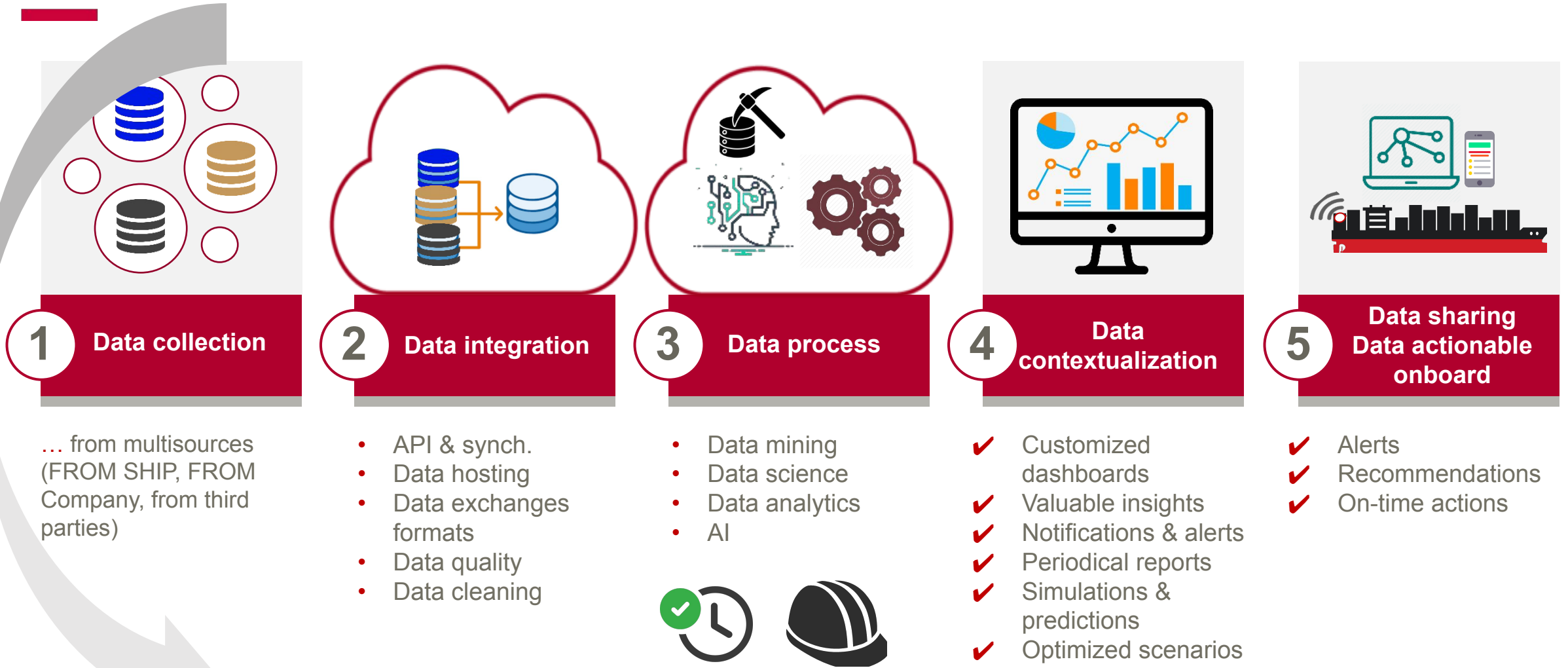


03

# HOW TO CREATE VALUABLE INSIGHTS FROM SHIP'S DATA?

# DATA DRIVEN MODEL

## OF DIGITAL SOLUTIONS



## TRANSFORMING DATA INTO ACTIONS



**04**

# **BV'S MISSION STRATEGY, NOTATIONS & DEVELOPMENTS**

# OUR SMART GROUPS FRAMEWORK

## GROUP 1

### COMPUTER BASED SHIPS

Covering the functional safety of computer based systems and digital solutions capturing data onboard

## GROUP 2

### CONNECTED SHIPS

Covering ship-to-shore data transfers, means of remote access to ship's data (data infrastructure) and cyber security

## GROUP 3

### AUGMENTED SHIPS

Covering the data driven operating **models from shore**, including ship monitoring, remote support and ship's efficiency optimisation for operational and environmental performance.

## GROUP 4

### AUTONOMOUS SHIPS

Covering the advanced functions needed for ships remotely operated from shore up to fully autonomous ships  
**(INCLUDES USV)**



# OUR SMART() NOTATIONS FOLLOW A BI-DIMENSIONAL APPROACH



Additional Class notation  
{ **SMART ( \_ \_ )**

## Scope of the smart system

The scope of application of the smart function:

- H** for Hull
- M** for Machinery
- MH** for Machinery Health Monitoring
- N** for Navigation
- EnE** for Energy Efficiency
- X** for Special

## Where is the data in the cycle?

The smart group designation

- 1** for Computer Based Ship
- 2** for Connected Ship
- 3** for Augmented Ship
- 4** for Remotely operated and Autonomous ship

# OUR NEW NOTATIONS

## COMING IN JANUARY 2023

**SMART(MH)**

**NR675 R02**

**SMART(EnE)**

**NR675 R02**

**SMART(X)**

**NR675 R02**

**DATA INFRA**

**NR467 R15**

**ASYNC-COM  
ASYNC-COM-R**

**NR467 R15**

**CII-REALTIME**

**NR467 R15**

**CYBER  
RESILIENT**

**NR659 R02**

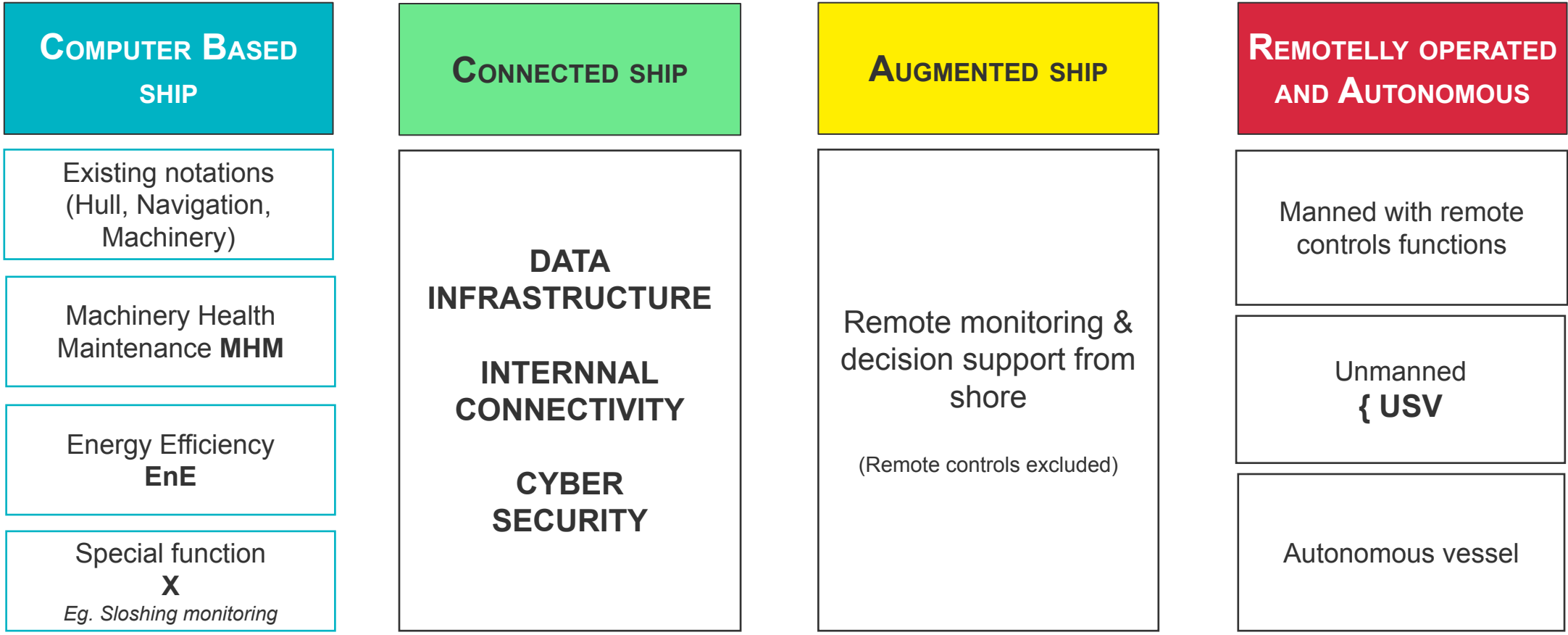
**Roadmap development for 2023**

**Augmented ships SMART(\_3), digital surveys, data quality, UR E26/27 integration in NR467**



# SMART() RULES

## ON-GOING DEVELOPMENTS



**CYBER RESILIENCE**





# CYBERSECURITY

## AN INTEGRATED FAMILY OF NOTATIONS AND SERVICES



ISM  
READY



CYBER  
MANAGED  
READY



CYBER  
MANAGED



CYBER  
SECURE  
READY



{ CYBER  
SECURE



FLEET  
ASSESSMENT

**Cyber Managed = Ships in Service**

**Cyber Secure = New Constructions**

**Cyber Resilient = compliance with UR E26 (until 1st January 2024)**



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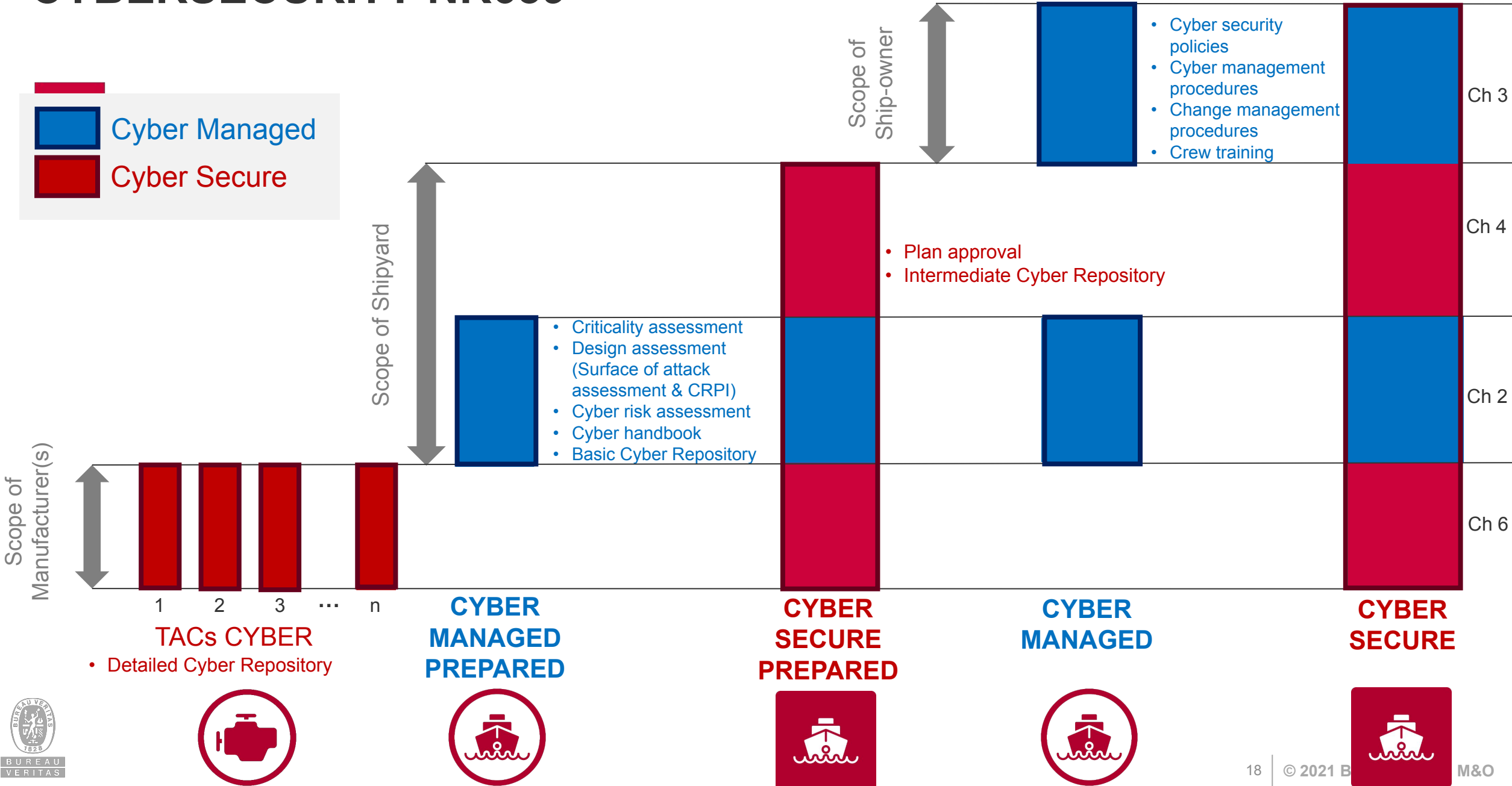
SOLUTIONS  
Marine & Offshore



BUREAU  
VERITAS

# CYBERSECURITY NR659

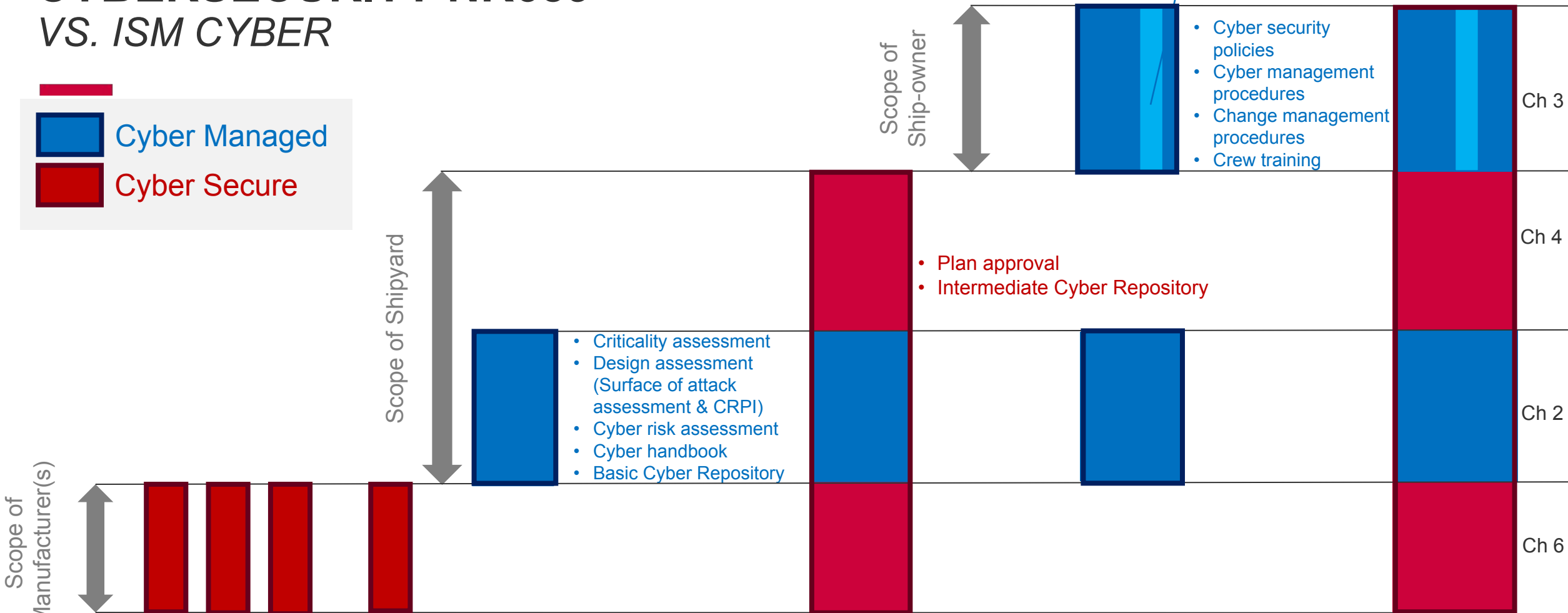
NR 659



# CYBERSECURITY NR659 VS. ISM CYBER

Cyber ISM since 01/01/2021 NR 659

**Cyber Managed**
  
**Cyber Secure**



**TACs CYBER**

- Detailed Cyber Repository

**CYBER MANAGED PREPARED**

**CYBER SECURE PREPARED**

**CYBER MANAGED**

**CYBER SECURE**



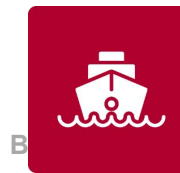
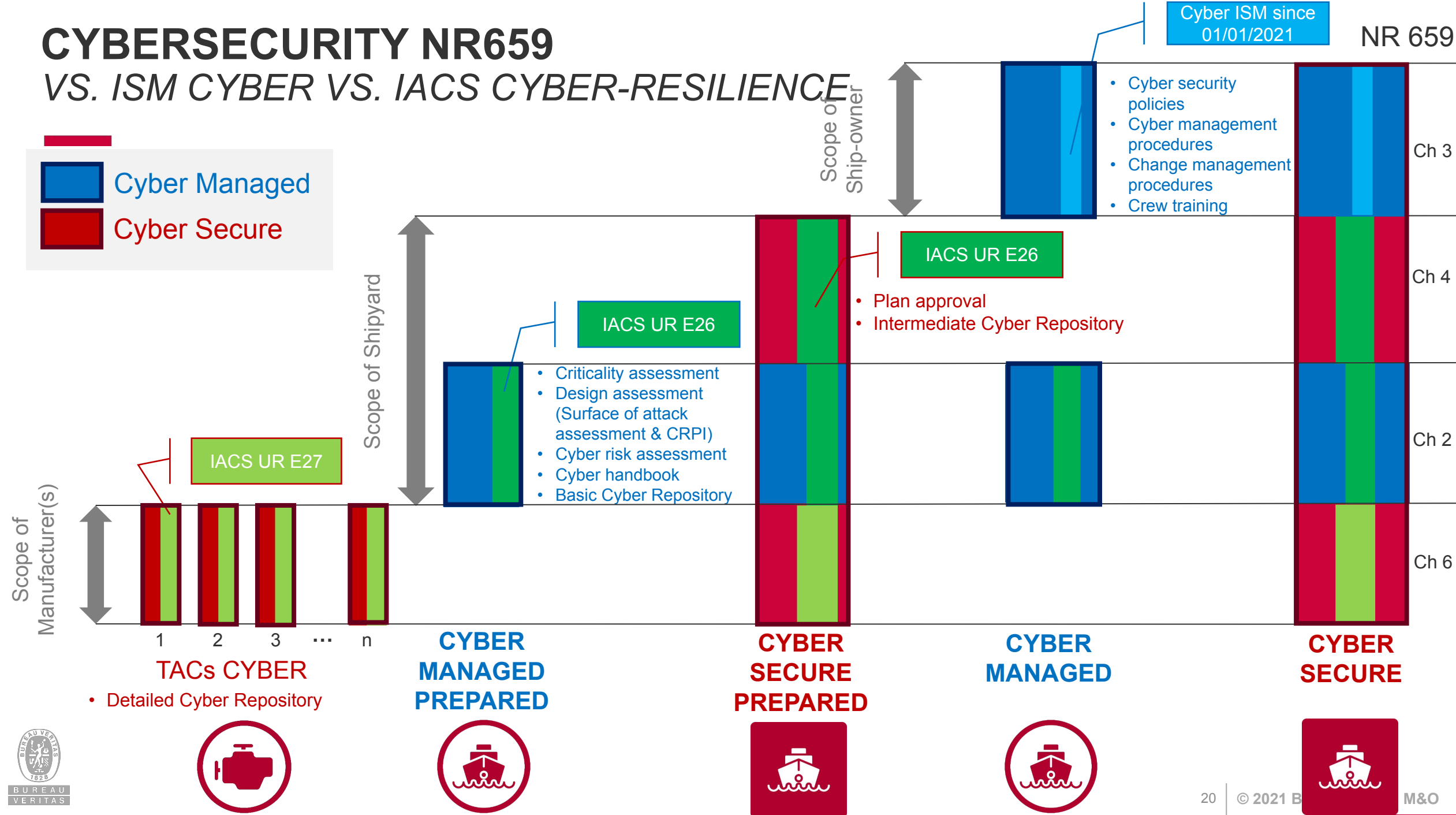
# CYBERSECURITY NR659

## VS. ISM CYBER VS. IACS CYBER-RESILIENCE

Cyber ISM since 01/01/2021

NR 659


  
 Cyber Managed
   
 Cyber Secure



1  
05

NR681 USV

-

JULY 2022



## Unmanned Surface Vessel (USV)

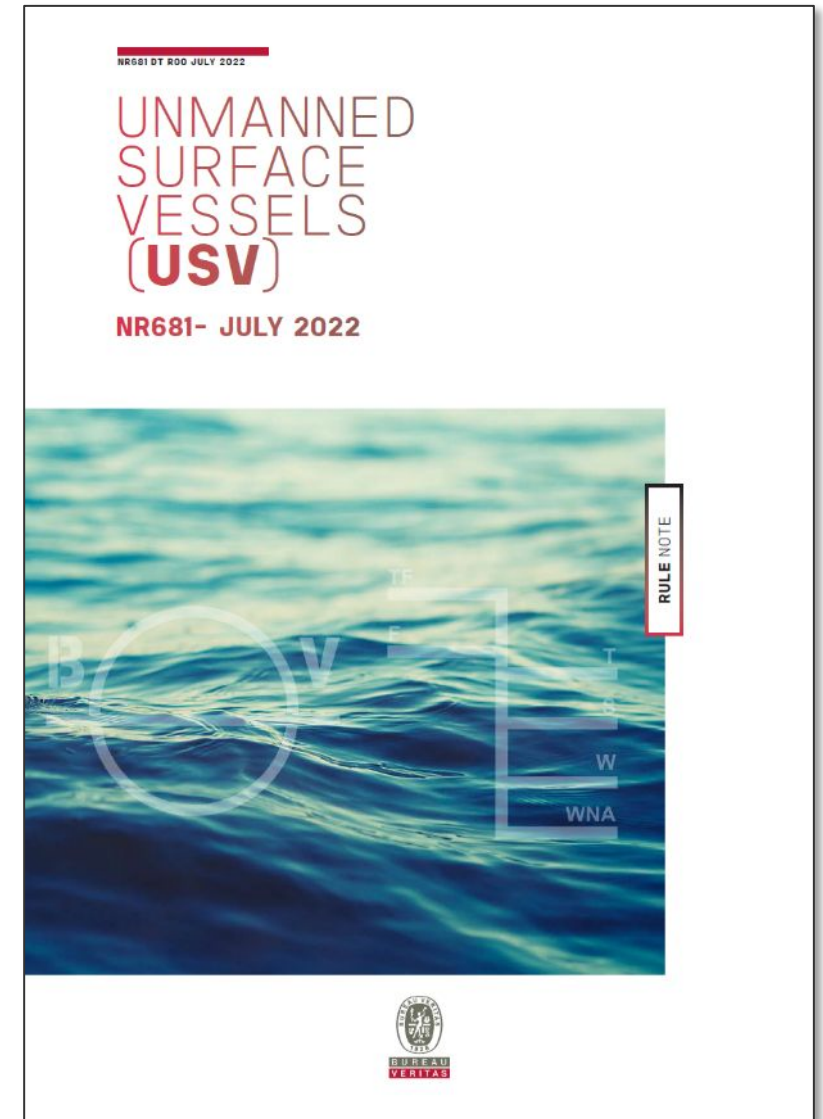
The service notation **USV** is assigned to unmanned surface units.

The type of service is to be specified after the service notation.

Example: **USV / hydrographic survey ship**

Example: **USV / minehunter**

The scope of application and the requirements for the assignment of the service notation **USV** are given in the Rule Note NR681.



- The scope of the service notation **USV** is limited to units with the following characteristics:
  - **unmanned surface** vessel (no human aboard)
  - **less than 500 GT**
  - built in **steel, aluminium, or composite** materials
  - with the following degrees of automation, direct control and remote control as defined in NI641 Sec1 Table 1 & 2:
    - A1 - DC0 - RC3** (human directed, no direct control, full remote control)
    - or
    - A2 - DC0 - RC2** (human delegated, no direct control, discontinuous remote control)
    - or
    - A3 - DC0 - RC1** (human supervised, no direct control, available remote control)
  
- **Underwater** vehicles & **non-manoeuving** units, such as drifting buoys used for scientific research are **out of scope**

NI 641 Sec 1 Table 1

Degree of automation	Manned	Definition	Information Acquisition	Information Analysis	Authority to make decisions	Action initiated by
A0 Human operated	Yes	Automated or manual operations are under human control. Human makes all decisions and controls all functions.	System Human	Human	Human	Human
A1 Human directed	Yes/No	Decision support: system suggests actions. Human makes decisions and actions.	System	System Human	Human	Human
A2 Human delegated	Yes/No	System invokes functions. Human must confirm decisions. Human can reject decisions.	System	System	Human	System
A3 Human supervised	Yes/No	System invokes functions without waiting for human reaction. System is not expecting confirmation. Human is always informed of the decisions and actions.	System	System	System	System
A4 Full automation	Yes/No	System invokes functions without informing the human, except in case of emergency. System is not expecting confirmation. Human is informed only in case of emergency	System	System	System	System

NI 641 Sec 1 Table 2

	Degree of control	Human presence	Location of control station
Direct control	DC0 No direct control	No crew available to monitor and control the system, nor to take control in case of warning or alert.	(1)
	DC1 Available direct control	Crew available aboard, ready to take control in case of warning or alert But they may be not at the control station	Aboard
	DC2 Discontinuous direct control	Monitoring may be discontinuous during a short period Crew always available at the control station, ready to take control	Aboard
	DC3 Full direct control	System is actively monitored and controlled at any time	Aboard
Remote control	RC0 No remote control	No operator available to monitor and control remotely the system, nor to take control in case of warning or alert.	(1)
	RC1 Available remote control	Operators available in the RCC, ready to take control in case of warning or alert But they may be not at the remote control station	RCC
	RC2 Discontinuous remote control	Remote monitoring may be discontinuous during a short period Operators always available at the remote control station, ready to take control	RCC
	RC3 Full remote control	System is actively monitored and controlled remotely at any time	RCC

(1) See also [2.8.3]: there may not be any integrated control station

### Characterisation according to NI641 Sec1 Table 1 & 2

**A1 - DC0 - RC3** = human directed, no direct control (nobody on board), full remote control

**A2 - DC0 - RC2** = human delegated, no direct control (nobody on board), discontinuous remote control


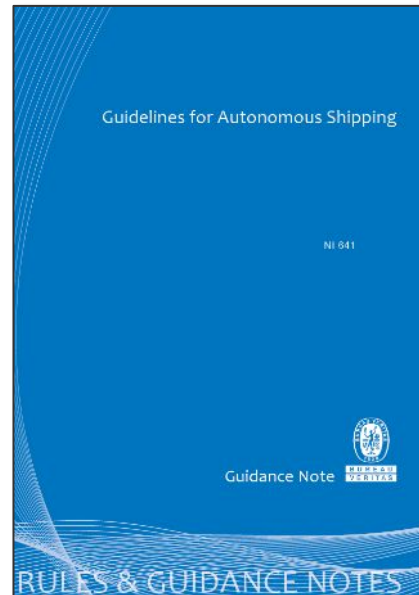
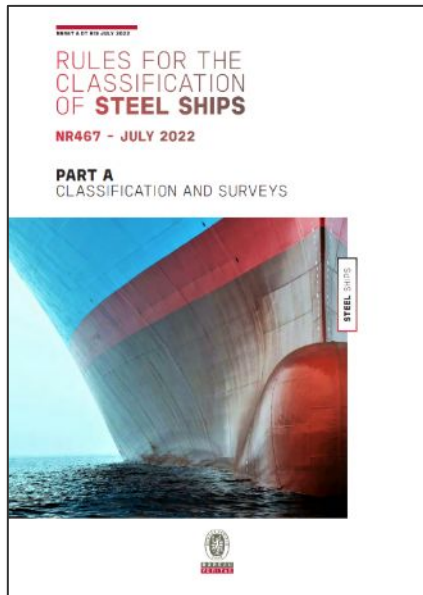
**A3 - DC0 - RC1** = human supervised, no direct control (nobody on board), available remote control



### 4.1.1 Civilian units

Unmanned surface civilian units assigned with the service notation **USV** are to comply with:

- a) the Rules for the Classification of Steel Ships NR467, Part A (Classification and Surveys),
- b) the present Rule Note Sec 1 to Sec 7,
- c) the Guidance Note NI641 for all matters related to classification.



NR681  
UNMANNED SURFACE VESSELS  
(USV)

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Section 1	General
Section 2	Hull Scantlings and Structure Arrangement
Section 3	General Arrangement Design, Intact Stability and Hull Integrity
Section 4	Machinery
Section 5	Electricity
Section 6	Automation
Section 7	Fire Safety
Section 8	Additional Requirements applicable to Naval Units

**Civil units**

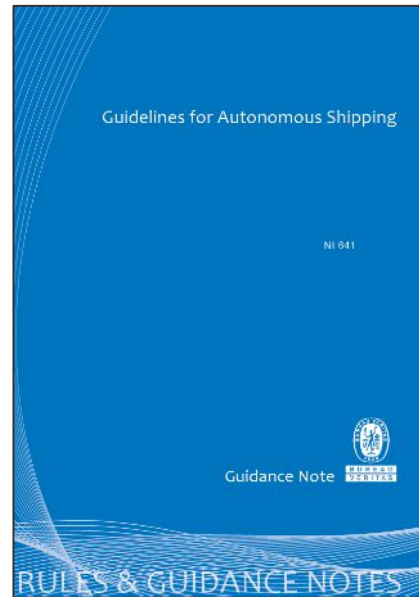
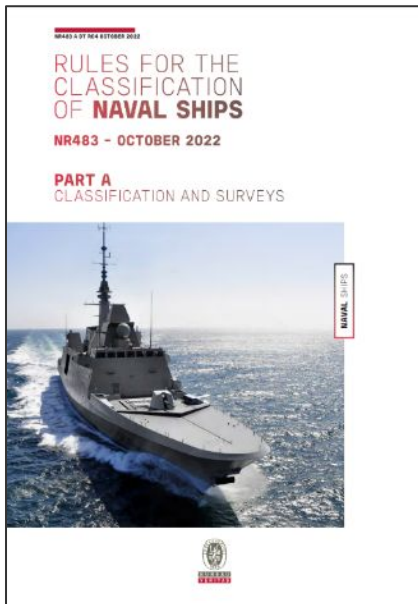
July 2022

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### 4.1.2 Naval units

Unmanned surface naval units assigned with the service notation **USV** are to comply with:

- a) the Rules for the Classification of Naval Ships NR483, Part A (Classification and Surveys),
- b) the present Rule Note Sec 1 to Sec 8,
- c) the Guidance Note NI641 for all matters related to classification.



## NR681 UNMANNED SURFACE VESSELS (USV)

Section 1	General
Section 2	Hull Scantlings and Structure Arrangement
Section 3	General Arrangement Design, Intact Stability and Hull Integrity
Section 4	Machinery
Section 5	Electricity
Section 6	Automation
Section 7	Fire Safety
Section 8	Additional Requirements applicable to Naval Units

## Naval units

July 2022

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# REMOTELY OPERATED AND AUTONOMOUS SHIPS



- Regulatory Scoping Exercise approved at MSC 103
- Next step: MASS Code to be completed by 2025



ISO-TC8/DTS 23860 Vocabulary related to autonomous ship projects (under development)



- Expert group in MASS
- Position paper revised in Oct. 2020

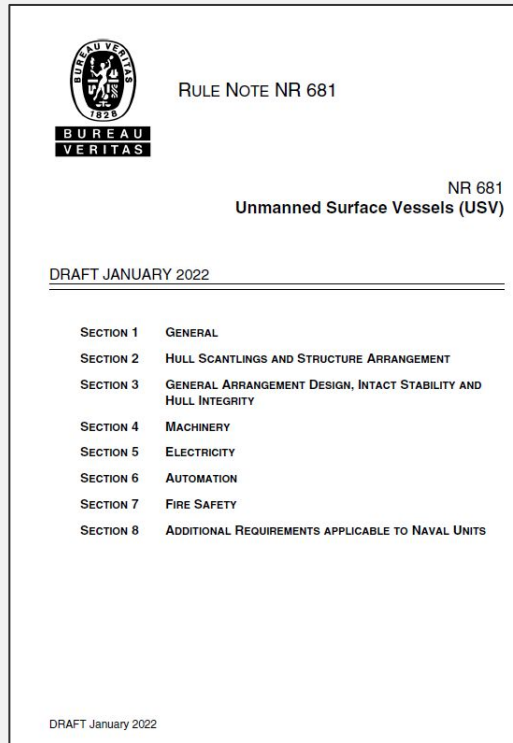


- Unmanned Systems WG
- Memorandum June 2021

INTERNATIONAL NAVAL SAFETY ASSOCIATION



**OUR INVOLVEMENT IN REGULATORY WORKING GROUPS**



- { USV service notation**
- < 500 GT
  - No crew, no direct control onboard
  - Including underwater vehicles, non-manoeuving units like drifting buoys

**NR681**

*EU Development Projects*



*TACs & AiP for units in operation*



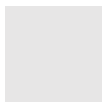
*And many others (but confidential)...*

**SOME EXAMPLES OF OUR DELIVERABLES**

# KEY TAKE AWAYS



- It refers to **digitalization**
- It means a **transformation**
- It is not related to specific technologies but to **operational improvements**
- BV is offering SMART () notations suite to cover industry developments





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