KOREAN REGISTER
ACCREDITED VERIFIER FOR EU MRV

Korean Register
Future Technology Research Team
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Contents

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CHAPTER. 1
EU MRV

Image : carbon sink

EU MRV Requirements

KOREAN REGISTER

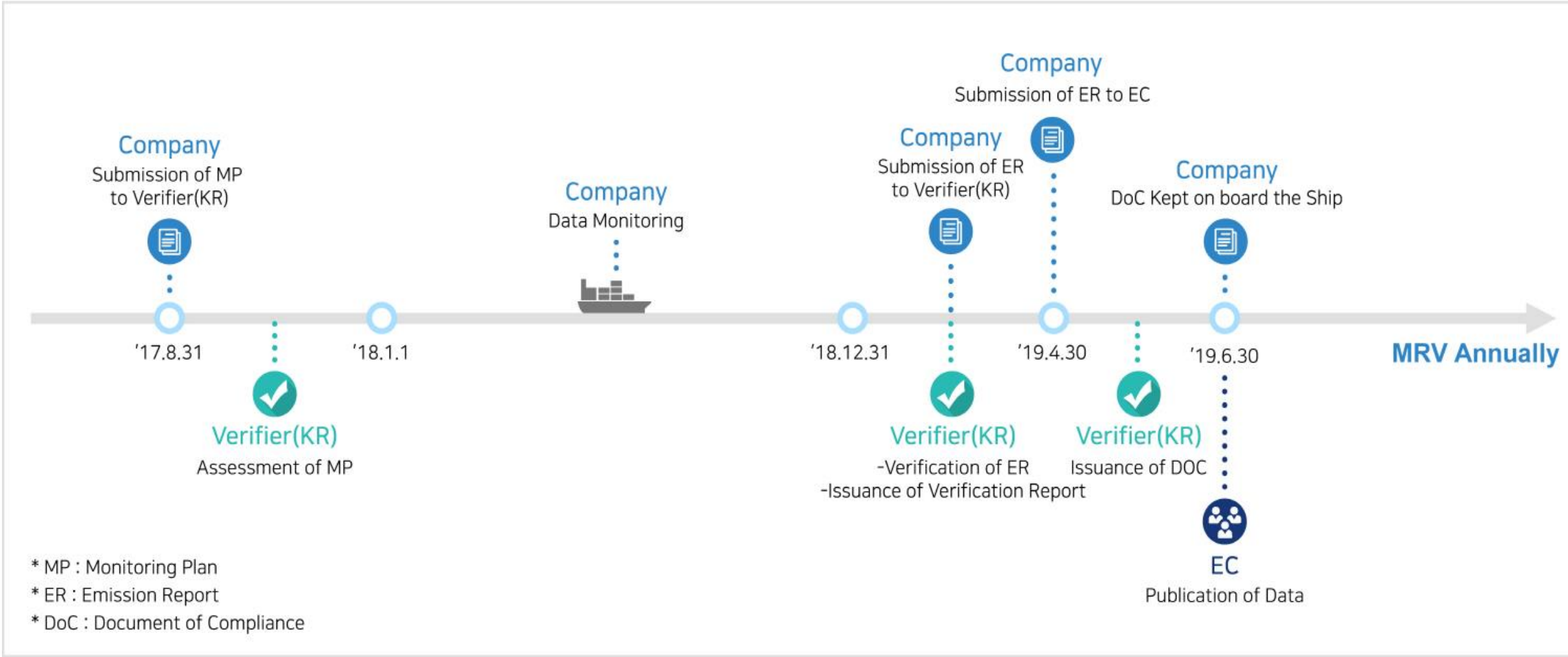
❖ Application

- Ships above 5,000 GT in respect of CO2 emissions on voyages from, to, between and within EEA ports

❖ Main Requirements

- Develop a Monitoring Plan (MP) for a ship and assessed by a verifier
- Monitor ship's data for annual reporting periods (calendar year)
- Develop an Emission Report (ER) and verified by a verifier
- Submit a verified ER to the European Commission
- Carry on board a valid Document of Compliance (DOC)

EU MRV Timeline



* MP : Monitoring Plan
* ER : Emission Report
* DoC : Document of Compliance

Monitoring Voyage

✓ **Voyage** means any movement of a ship that originates from or terminates in a port of call (EEA port) and that serves the purpose of transporting passengers or cargo for commercial purposes

❖ **Case 1**

- Busan : Cargo (un)loading
- Singapore : Cargo (un)loading, Bunkering
- Rotterdam : Cargo (un)loading

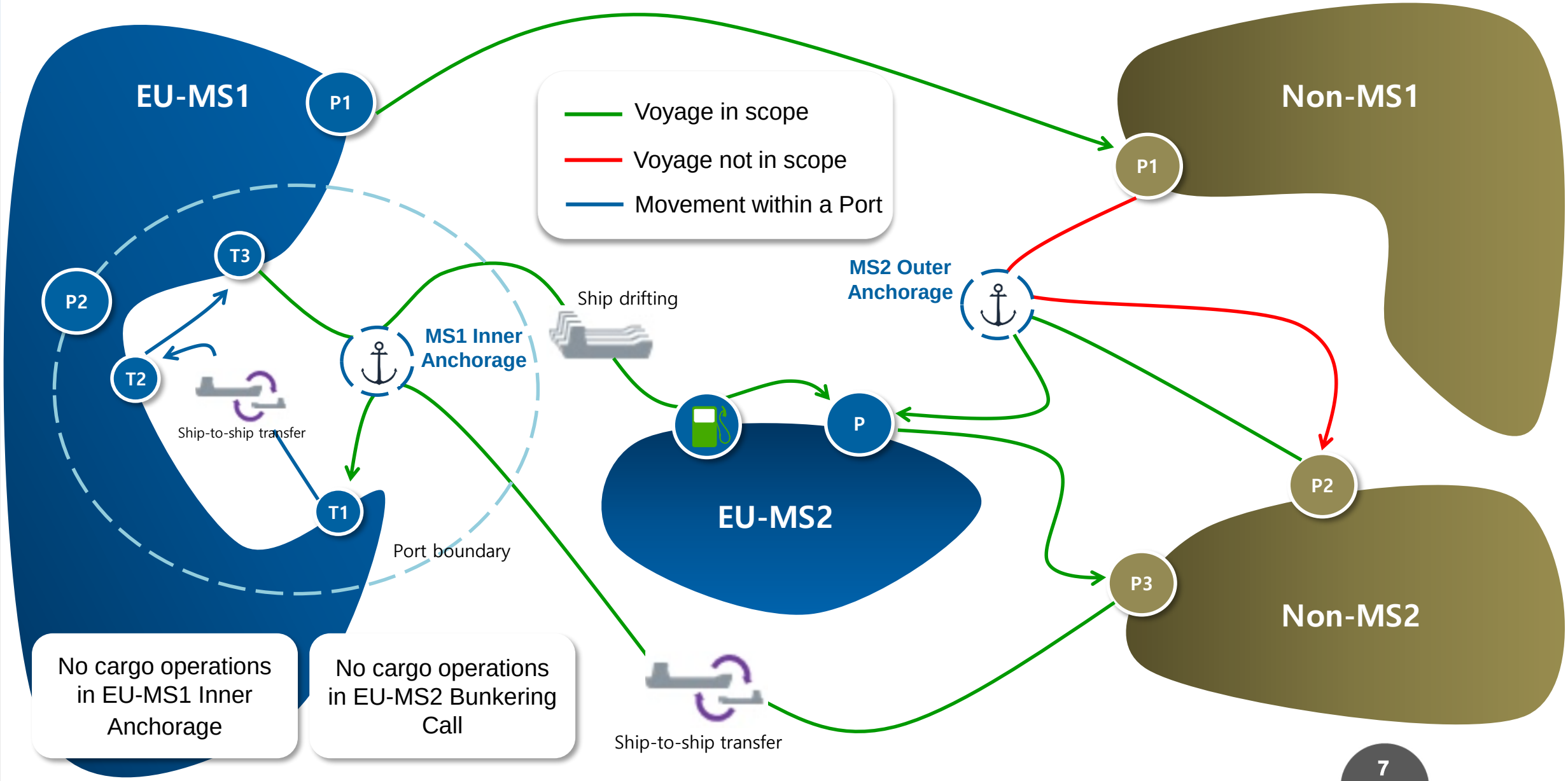
☞ **Voyage : Singapore - Rotterdam**

❖ **Case 2**

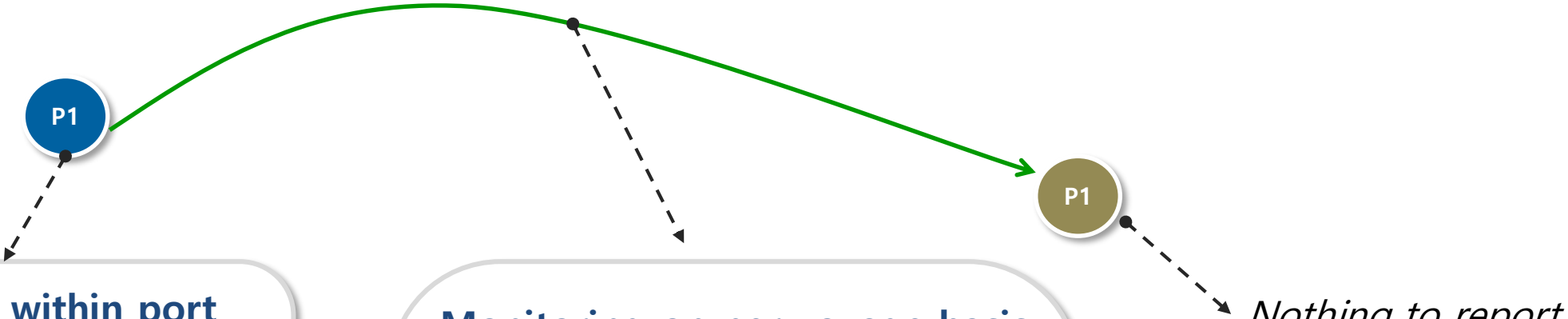
- Busan : Cargo (un)loading
- Singapore : Bunkering
- Rotterdam : Cargo (un)loading

☞ **Voyage : Busan - Rotterdam**

Monitoring Voyage



Monitoring Voyage



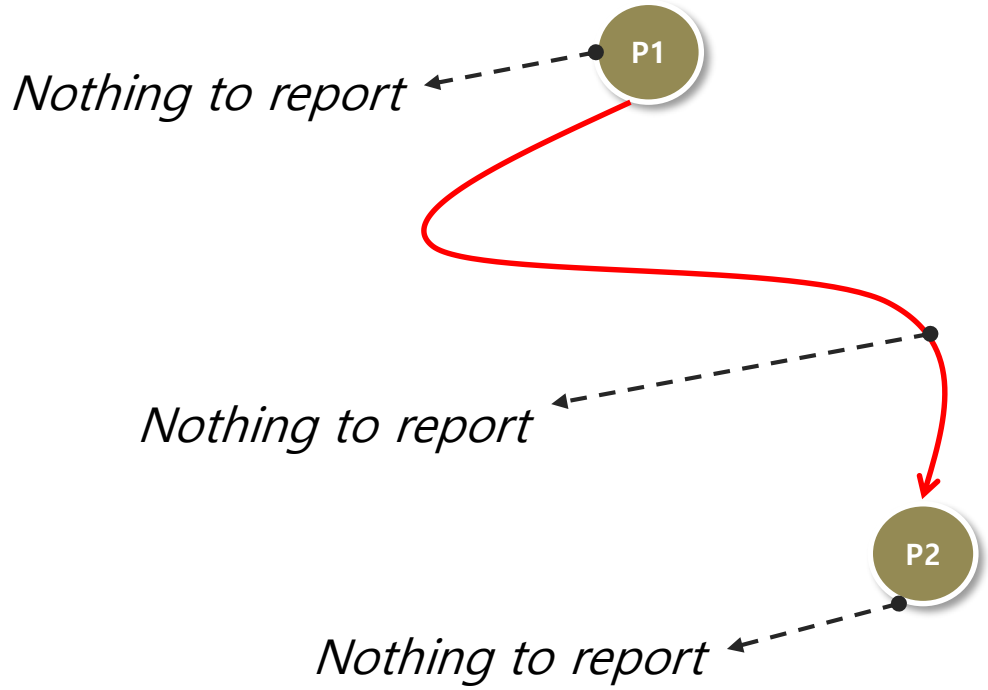
Monitoring within port

ATA **EU-MS1 P1**	12/01/2018
ATD **EU-MS1 P1**	13/01/2018
Fuel consumption	2 t
CO_2 emissions	6 t

Monitoring on per-voyage basis

ATD **EU-MS1 P1**	13/01/2018
ATA **Non-MS1 P1**	14/01/2018
Time at **Sea**	20 h
Distance travelled	240 nm
Cargo carried	100,000 t
Fuel consumption	150 t
Transport work	24 Mt · nm
CO_2 emissions	450 t

Monitoring Voyage

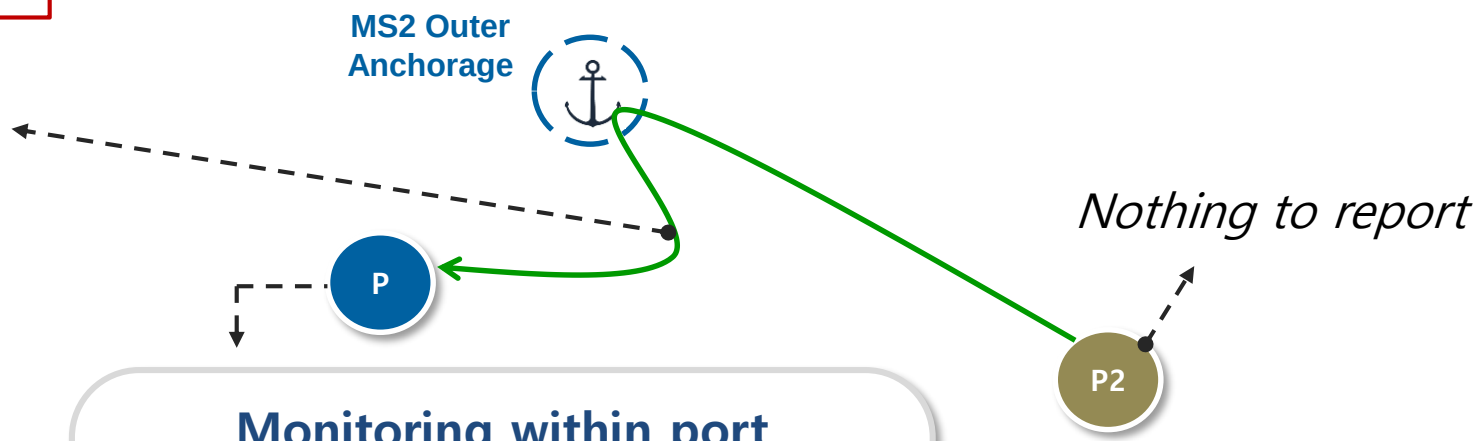


Monitoring Voyage

Monitoring on per-voyage basis

ATD **Non-MS2 P2**	24/01/2018
ATA **EU-MS2 P**	26/01/2018
Time at **Sea**	20 h
Time at **Anchorage**	24 h
Distance travelled	250 nm
Cargo carried	100,000 t
Fuel consumption	160 t
Transport work	25 Mt · nm
CO_2 emissions	480 t

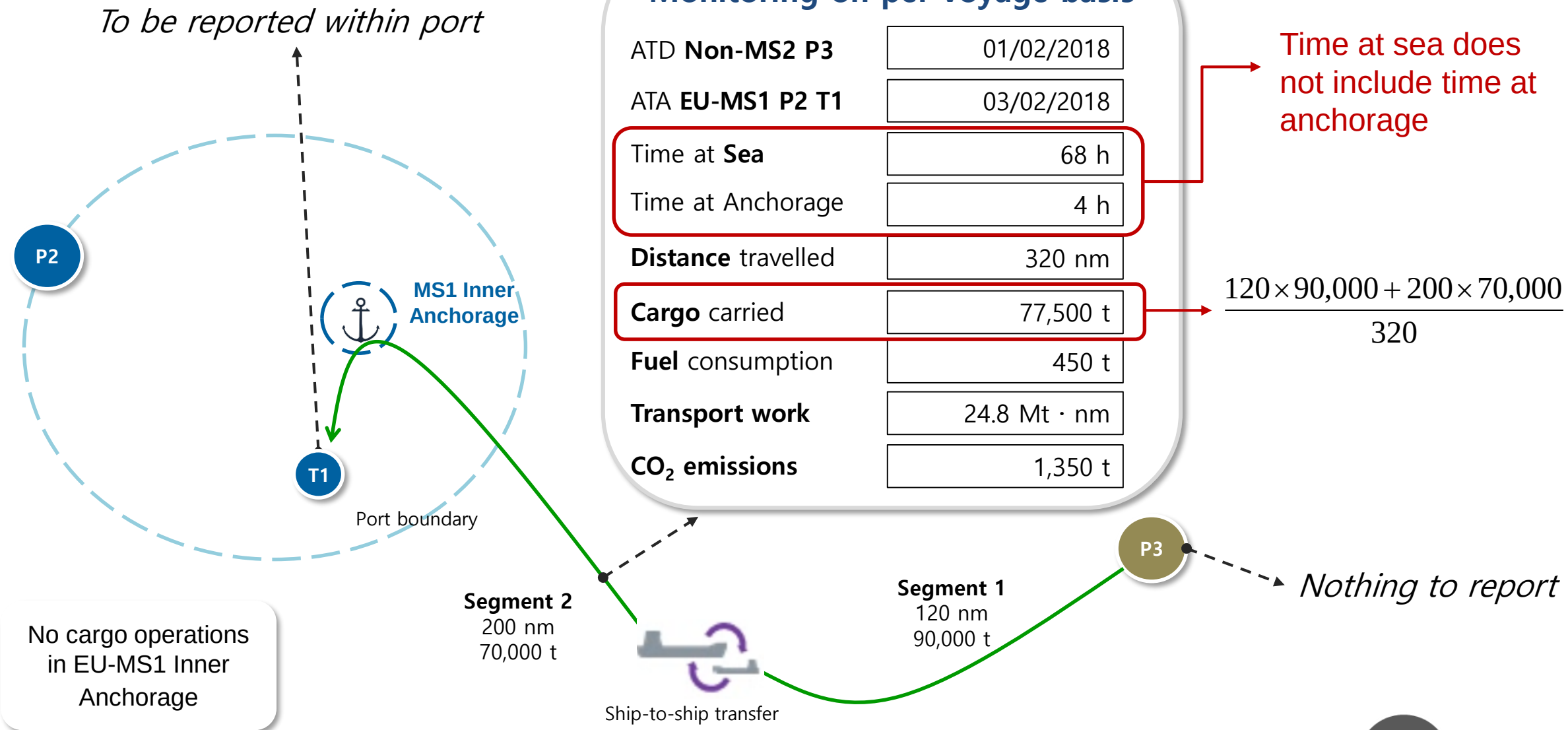
Time at sea does not include time at anchorage



Monitoring within port

ATA **EU-MS2 P**	26/01/2018
ATD **EU-MS2 P**	26/01/2018
Fuel consumption	2 t
CO_2 emissions	6 t

Monitoring Voyage



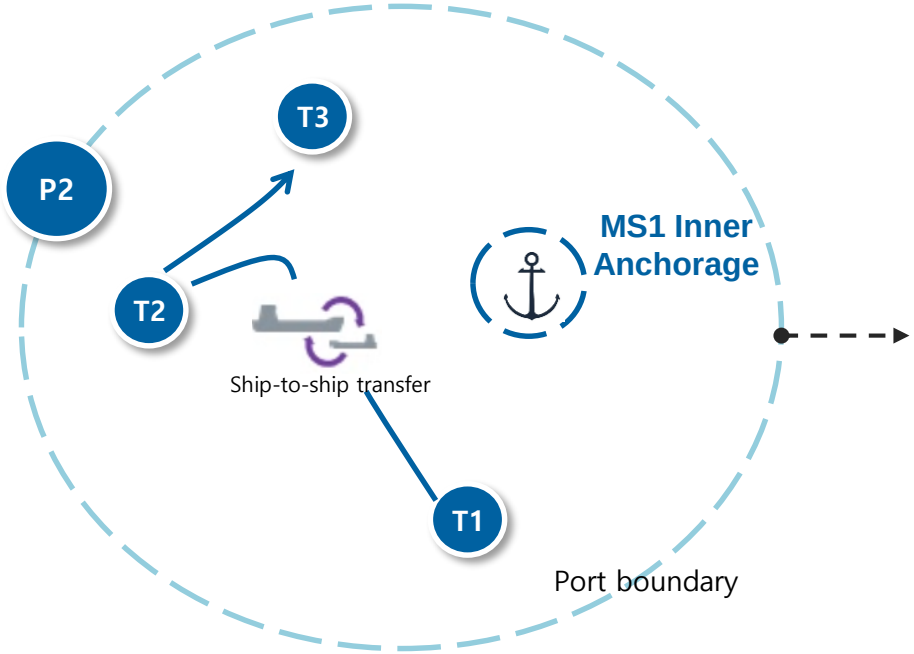
Monitoring on per-voyage basis

ATD **Non-MS2 P3**	01/02/2018
ATA **EU-MS1 P2 T1**	03/02/2018
Time at **Sea**	68 h
Time at Anchorage	4 h
Distance travelled	320 nm
Cargo carried	77,500 t
Fuel consumption	450 t
Transport work	24.8 Mt · nm
CO_2 emissions	1,350 t

Time at sea does not include time at anchorage

$$\frac{120\times 90{,}000 + 200\times 70{,}000}{320}$$

Monitoring Voyage



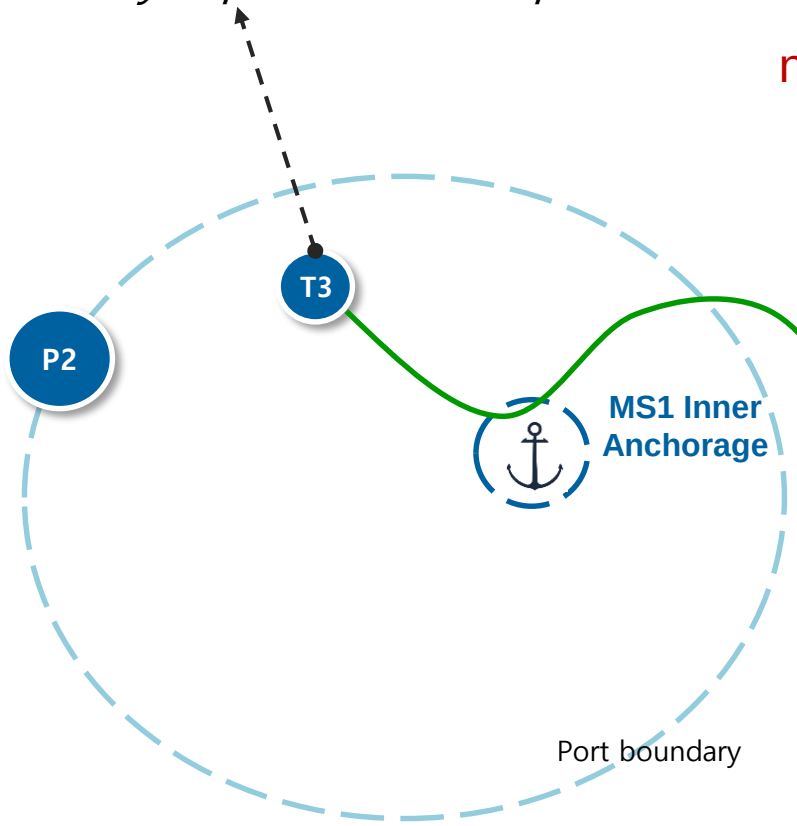
Monitoring within port

ATA **EU-MS1 P2 T1**	03/02/2018
ATD **EU-MS1 P2 T3**	10/02/2018
Fuel consumption	60 t
CO_2 emissions	180 t

Time, cargo and distance not considered

Monitoring Voyage

Already reported within port



Time at sea does not include time at anchorage

Monitoring on per-voyage basis

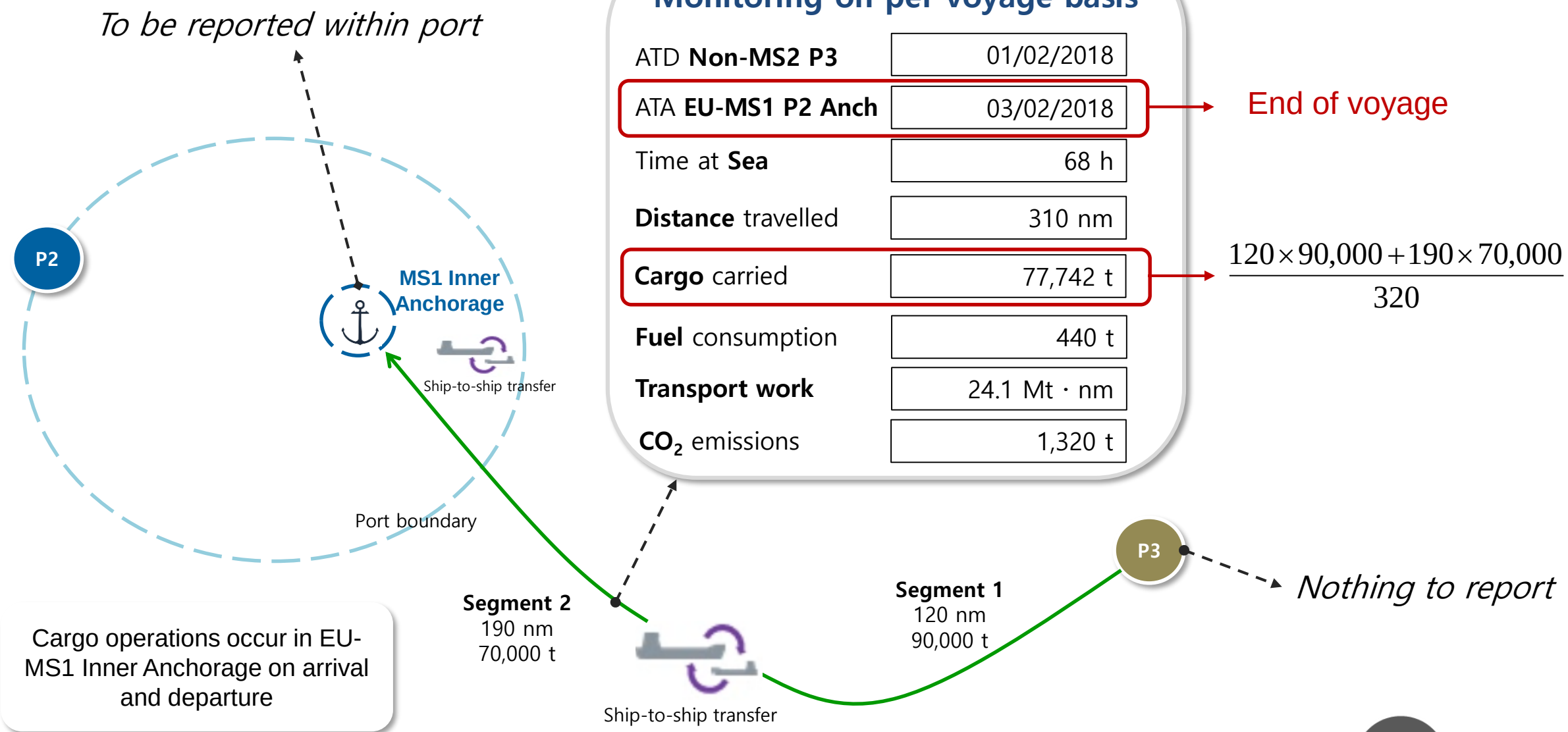
ATD **EU-MS1 P2 T3**	10/02/2018
ATA **EU-MS2 P**	15/02/2018
Time at **Sea**	116 h
Time at Anchorage	4 h
Distance travelled	250 nm
Cargo carried	110,000 t
Fuel consumption	200 t
Transport work	27.5 Mt · nm
CO_2 emission	600 t

No cargo operations in EU-MS2 Bunkering Call

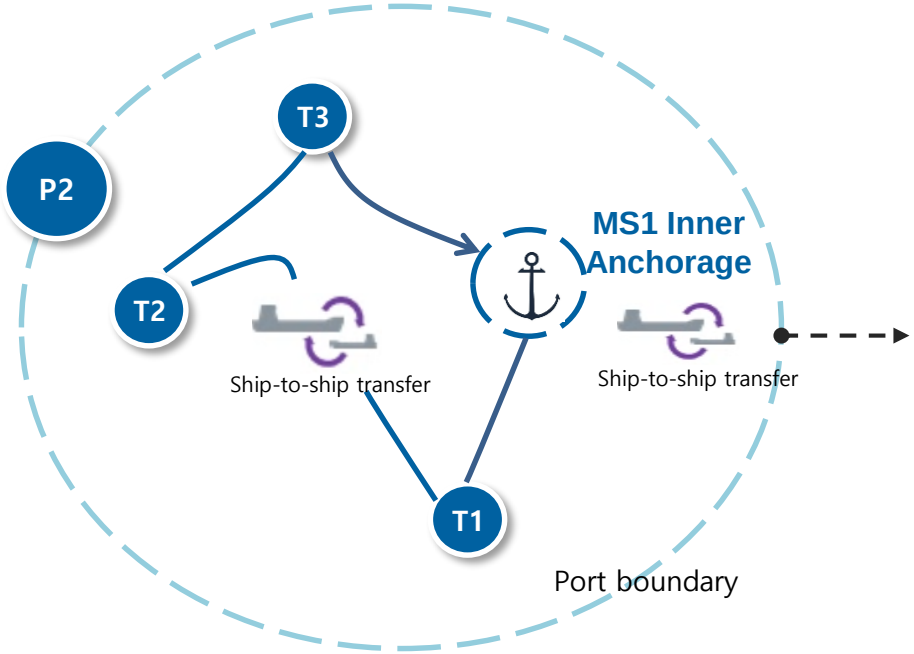
Monitoring within port

ATA **EU-MS2 P**	15/02/2018
ATD **EU-MS2 P**	16/02/2018
Fuel consumption	2 t
CO_2 emissions	6 t

Monitoring Voyage



Monitoring Voyage



Monitoring within port

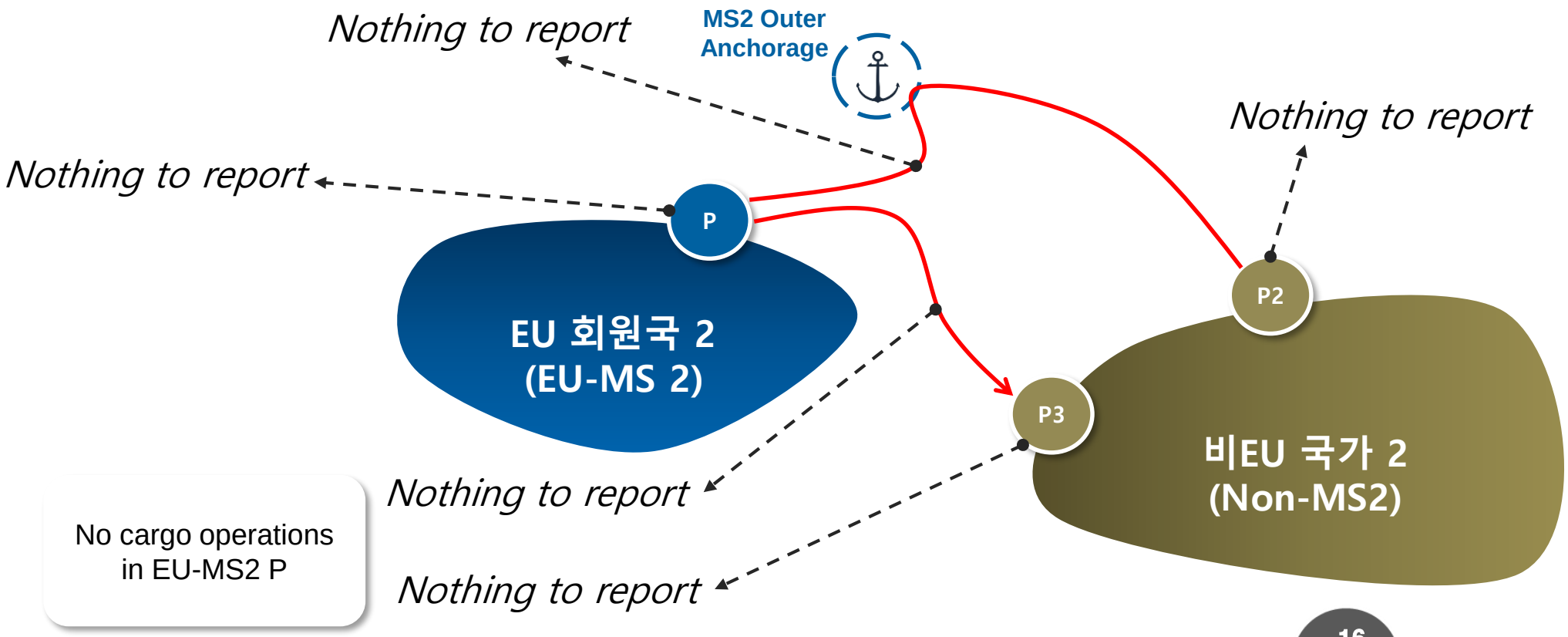
ATA **EU-MS1 P2 Anch**	03/02/2018
ATD **EU-MS1 P2 Anch**	10/02/2018
Fuel consumption	70 t
CO_2 emissions	210 t

Start and end of voyage

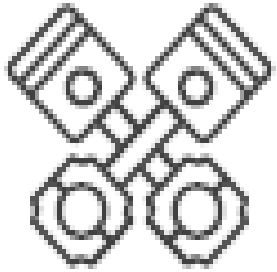
Time, cargo and distance not considered

Cargo operations occur in EU-MS1 Inner Anchorage on arrival and departure

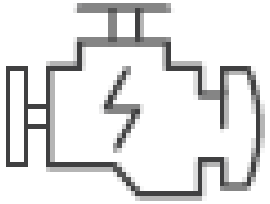
Monitoring Voyage



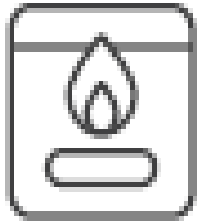
Monitoring Emission Sources



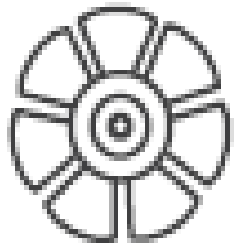
Main Engines



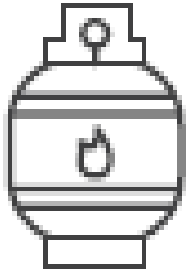
Auxiliary Engines



Boilers



Gas Turbines



Inert Gas Generators

Incinerator is not an emission source under EU MRV

Monitoring Methods for Fuel

Method A	**Bunker Delivery Note (BDN) and Periodic stocktake of fuel tanks** - Total consumption = Fuel stock at start of period + Deliveries – De bunkered – Fuel stock at end of period - Can not be used where cargo is burnt as fuel (e.g. LNG carriers)
Method B	**Bunker fuel tank measurements on board** - Tank reading occur daily when the ship is at sea and each time the ship is bunkering or de-bunkering - Cumulative variations of fuel tank level between two readings constitute the fuel consumed over the period
Method C	**Flow meter for applicable combustion processes** - Data from flow meters for all relevant emission sources combined - Measuring each fuel type consumed - Calibration methods applied shall be specified in the Monitoring Plan
Method D	**Direct CO2 emissions measurement** - CO2 emissions = CO2 concentration of exhaust gas X exhaust gas flow - Calibration methods applied shall be specified in the Monitoring Plan - Fuel consumption calculated using measured CO2 emission and Emission Factor for relevant fuel

* If fuel consumed is determined in units of volume (litres), company shall convert that amount from volume to mass by using actual density

1. On-board systems or
2. Fuel supplier invoice or BDN or
3. Analysis by laboratory

Monitoring Unit for Cargo

Unit of Cargo	Ship types
• **Passengers**	Passenger ships
• **Tonnes**	Ro-ro ships, Container ships, Oil tankers, Chemical tankers, Gas carriers, Bulk carriers, Refrigerated cargo ships, Combination carriers
• **Cubic meters**	LNG carriers - *Volume of the cargo on discharge*
• **Cubic meters**	Container/Ro-ro cargo ships
• **Tonnes of Deadweight carried**; or • Tonnes of Deadweight carried and Tonnes	General cargo ships - *DWT carried = volume displacement X water density – Ship's lightweight – fuel weight* - *Zero (0) for ballast voyages*
• **Tonnes**; or • Tonnes and Tonnes of Deadweight carried	Vehicle carries
• **Tonnes**; and • **Passengers**	Ro-Pax ships
• **Tonnes**; or • Tonnes of Deadweight carried and Tonnes	Other ship types

Reporting THETIS MRV

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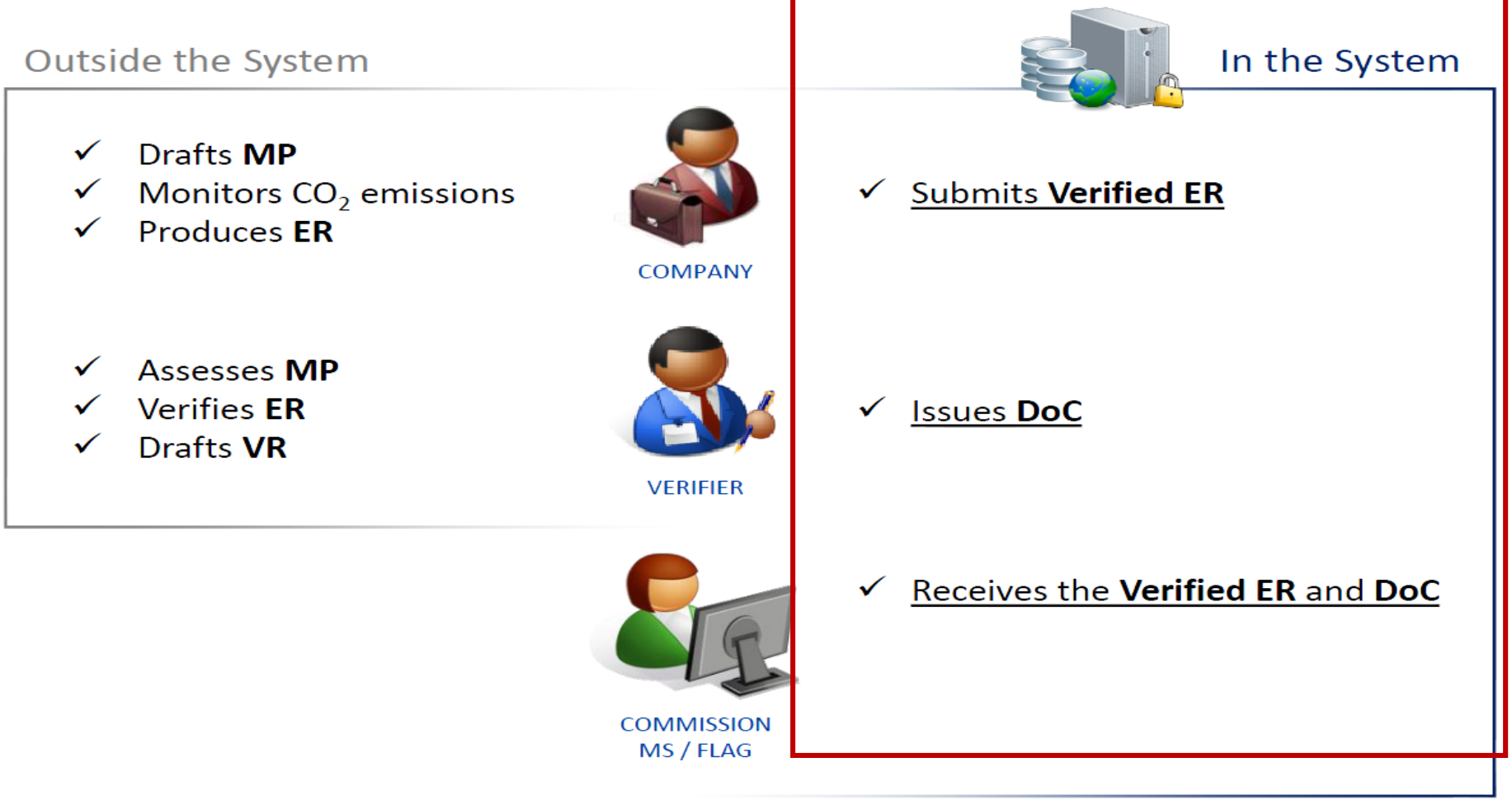
THETIS MRV – Information System of EU MRV operated by EMSA

Mandatory Requirements
- electronic templates -



CHAPTER.2
EU MRV FAQ

FAQ for Monitoring

- **Parameters to be monitored?**

Parameter	During voyage	In EU(EEA) ports
Fuel consumption	Yes	Yes
CO2 emissions	Yes	Yes
Distance travelled	Yes	No
Time spent at sea	Yes	No
Cargo carried	Yes	No

FAQ for Obligation

- **What if a ship starts carrying out voyages falling under the MRV Shipping Regulation after the deadline of 31st August 2017?**

  ☞ For ships which call into EEA ports for the first time after the deadline for submitting monitoring plans (set on 31st August 2017), MRV companies should submit a monitoring plan to an accredited verifier without delay, and **no later than two months** after the ship's first call at an EEA port.

FAQ for Obligation

- **What about ships that do not carry out any voyage falling under the MRV Shipping during a full calendar year?**

☞ A ship which has not carried out any EEA-related voyages during a whole reporting period (calendar year X) will **not be required** by Member States' authorities to have a Document of Compliance on board showing compliance for that specific reporting period (year X), when calling at EEA ports between 30th June of year X+1 and 29th June of year X+2.

FAQ for Obligation

- **What if a ship starts carrying out voyages falling under the MRV Shipping Regulation during a reporting period (e.g. June 2018)?**

  ☞ Submit **Monitoring Plan** to an accredited verifier no later than two months after the ship's first call at an EEA port.

  ☞ Develop **Emission Report** for the reporting period (e.g. from June 2018).

  ☞ Thus, it is recommended that monitoring methods the **ship has already carried out** are applied to Monitoring Plan.

FAQ for Voyage

- **Ship-to-ship transfer of cargo or passengers?**

  ☞ **(Outside a port of call) Part of voyage**, Cargo carried needs to consider the amount of cargo before and after ship-to-ship transfer by calculating the **weighted average** for the entire voyage

  ☞ **(Within a port of call) Cargo operations at berth**, A ship-to-ship transfer within a port prior to arrival at the first berth would be considered as the **end point of the incoming voyage** (and ship-to-ship transfer within a port after the last berth considered as **start point of next voyage**).

FAQ for Fuel consumption

- **Density for Commingled bunkers?**

☞ $$Mixed\ Fuel\ Density = \frac{Fuel\ Volume(A) \times Density(A) + Fuel\ Volume(B) \times Density(B)}{Fuel\ Volume(A) + Fuel\ Volume(B)}$$

- **Emission Factors for ULSFO?** * ULSFO : Ultra Low Sulphur Fuel Oils

☞ Confirm ISO 8217 Grade according to viscosity of the ULSFO

☞ Apply the relevant Emission Factors for Diesel/Gas oil or LFO

Type of fuel	Reference	Emission factor (tCO2/t-fuel)
Diesel/Gas oil	ISO 8217 Grades DMX through DMB	3.206
Light fuel oil (LFO)	ISO 8217 Grades RMA through RMD	3.151

FAQ for Fuel consumption

- **Uncertainty Level of Fuel Monitoring?**

Monitoring Method	Overall max of uncertainty level
Method A	± 10%
Method B	± 10%
Method C	± 10%

- **Is internal calibration for Flow Meter acceptable?**

☞ If the **followings are met**, internal calibration is also **acceptable**.

- Select **default value** for uncertainty of flow meter and

- Establish **procedures** relating to internal calibration(method, regular check, responsibility, record etc)

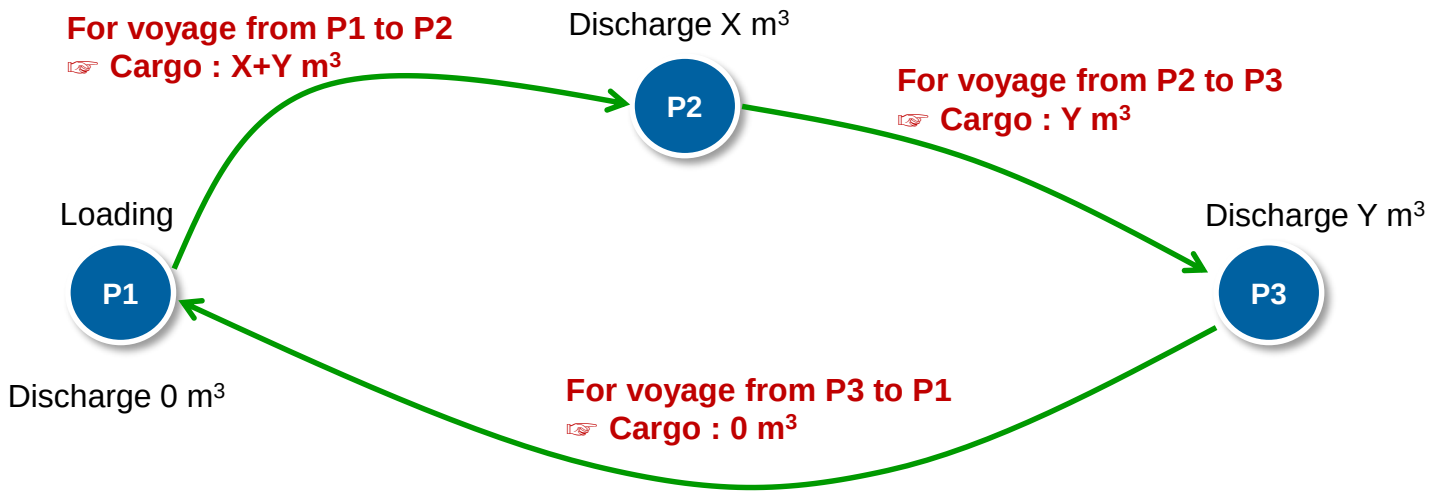
FAQ for Cargo

- **Default value for TEU?**

Container Size	TEU Conversion factor (TEU equivalents)	Default weight empty containers (in tonnes)	Default containers weights (in tonnes)
20’ ST TEU 8’6’’ plus 20’ High Cube (HC)	1.0	2	12
40’ ST FFE 8’6’’ (forty-foot equivalent unit)	2.0	4	24
40’ High Cube (FFE 9’6’’) plus 45’ and 48’	2.25	4.5	27

FAQ for Cargo

- **Cargo carried for LNG carrier?**
  - ☞ Cargo carried for LNG carrier is the volume of the cargo on discharge.
  - ☞ In case of discharge at **several locations in a port of call**, the discharged volumes have to be **aggregated**.
  - ☞ In case of further discharges **in other ports of call** (in other words: during the subsequent voyages), the volumes discharges in these ports have to be **added to the discharged volume**, until new cargo is loaded.



▶ CHAPTER.3
KR MRV Services

Tailor-made solutions

KR EU MRV Verification Services

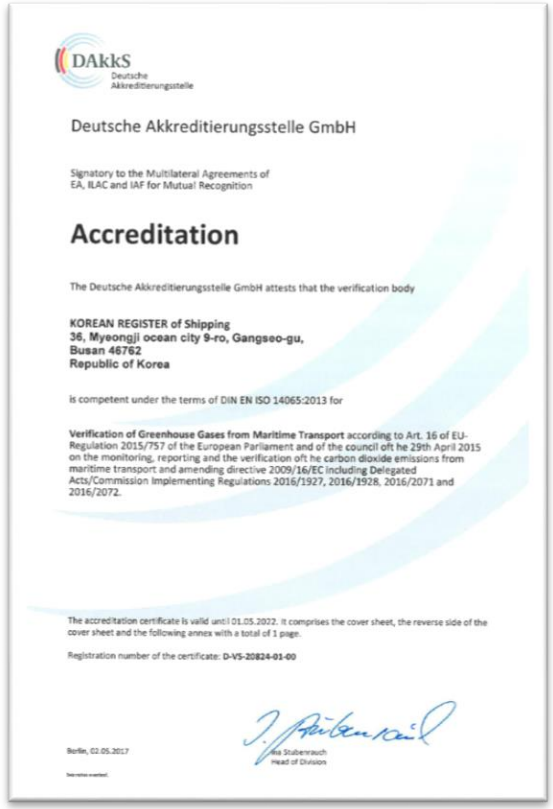
KR EU MRV Service

❖ Accredited Verifier

- Accredited by German Accreditation Body
- Without any non-conformities

❖ Accreditation Scope

- **Verification**
  - Assessment of Monitoring Plan
  - Verification of Emissions Reports
  - Issuance of Document of Compliance
- **Monitoring Methods**
  - All monitoring methods for fuel consumption



DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the verification body

KOREAN REGISTER of Shipping
36, Myeongji ocean city 9-ro, Gangseo-gu,
Busan 46762
Republic of Korea

is competent under the terms of DIN EN ISO 14065:2013 for

Verification of Greenhouse Gases from Maritime Transport according to Art. 16 of EU-Regulation 2015/757 of the European Parliament and of the council oft he 29th April 2015 on the monitoring, reporting and the verification oft he carbon dioxide emissions from maritime transport and amending directive 2009/16/EC including Delegated Acts/Commission Implementing Regulations 2016/1927, 2016/1928, 2016/2071 and 2016/2072.

The accreditation certificate is valid until 01.05.2022. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 1 page.

Registration number of the certificate: D-VS-20824-01-00

Berlin, 02.05.2017

Ina Stubenrauch
Head of Division

DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-VS-20824-01-00 according to ISO 14065:2013

Period of validity: 02.05.2017 to 01.05.2022 Date of issue: 02.05.2017

Holder of certificate:

KOREAN REGISTER of Shipping
36, Myeongji ocean city 9-ro, Gangseo-gu,
Busan 46762
Republic of Korea

Verification Body for the Verification of Greenhouse Gases from Maritime Transport according to Art. 16 of EU-Regulation 2015/757 of the European Parliament and of the council of the 29th April 2015 on the monitoring, reporting and the verification of the carbon dioxide emissions from maritime transport and amending directive 2009/16/EC including Delegated Acts/Commission Implementing Regulations 2016/1927, 2016/1928, 2016/2071 and 2016/2072 for the following activities:

Verification:

1. Assessment of Monitoring Plans
2. Verification of Emissions Reports

Methods according to Annex I EU-Regulation 2015/757:

A. Bunker fuel delivery note (BDN) and periodic stocktakes on board
B. Bunker fuel tank monitoring on board
C. Flow meters for applicable combustion process
D. Direct CO_2 emission measurement

KR EU MRV Service

KR
KOREAN REGISTER

Expertise

- EU MRV Inspectors with Industry-leading expertise and best practices

Cost-Effective

- Reasonable Price, Best Service

Agility

- Quick turnaround for urgent assessment and verification requests

Transparency

- Declaration of impartiality from top management
- No conflicting interests and fair decision making at all stages

Visit our EU MRV homepage :

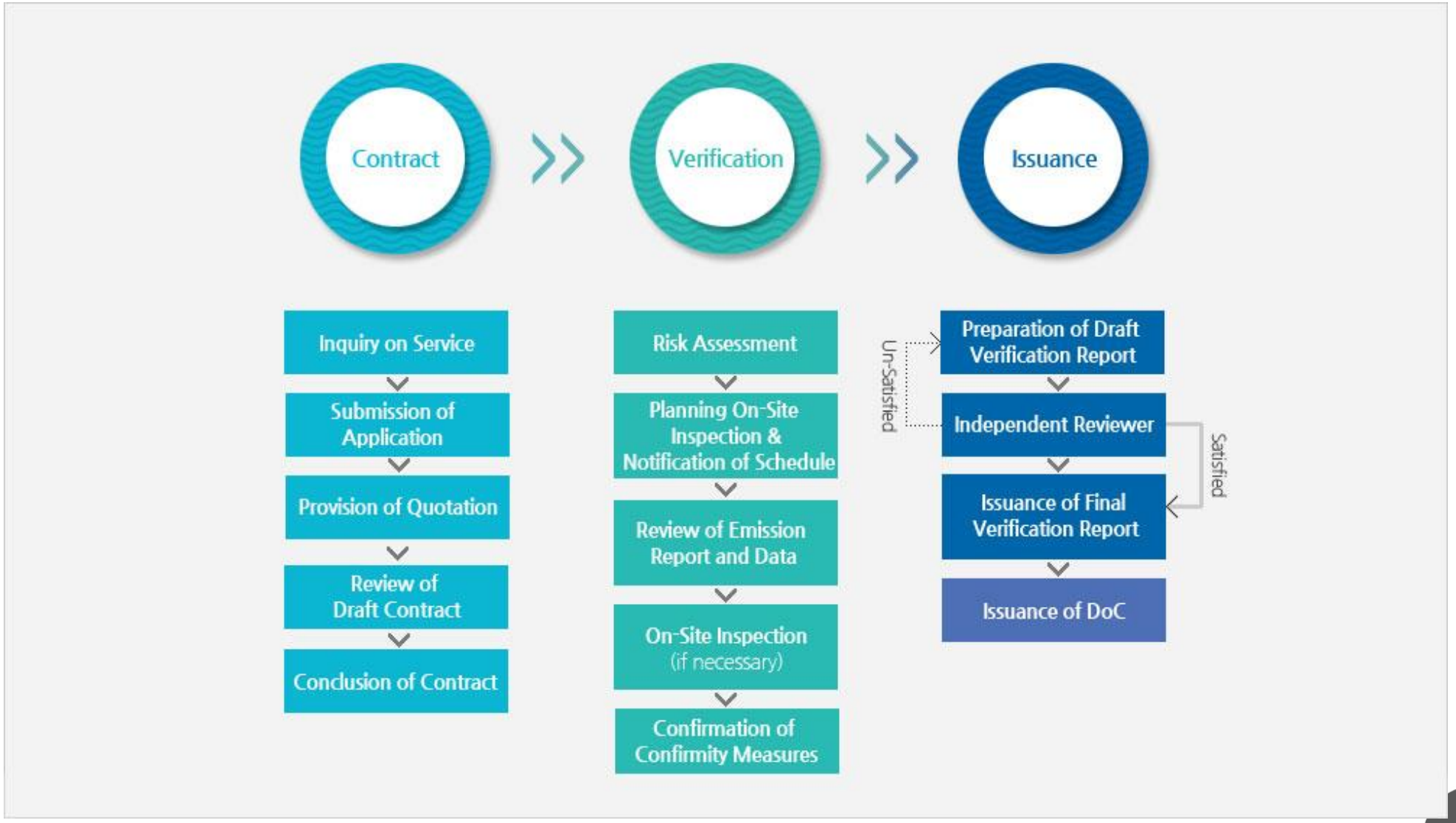
http://www.krs.co.kr/sub/eng_sub.aspx?s_code=0204050100

KR EU MRV Service

❖ Assessment of Monitoring Plan

KR EU MRV Service

❖ Verification of Emission Report



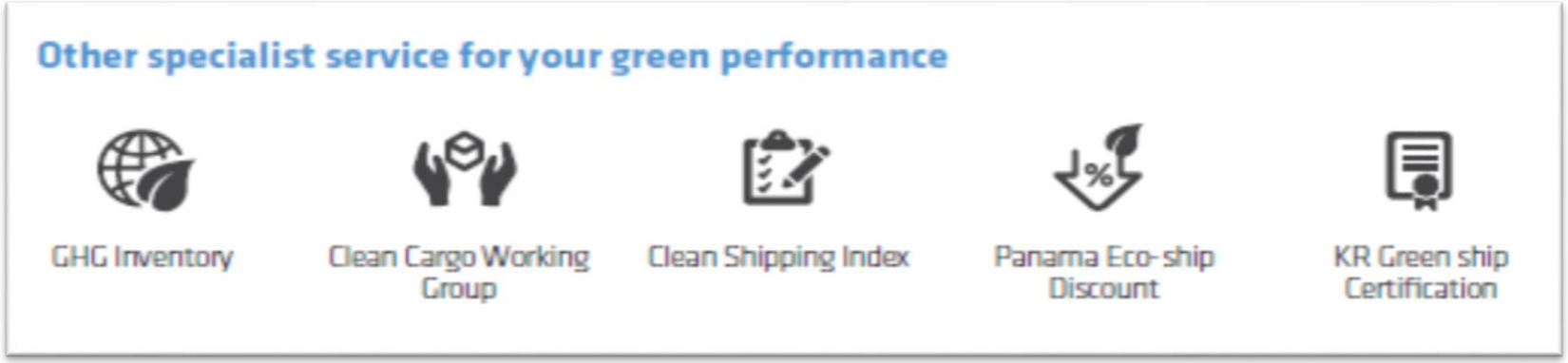
KR EU MRV Service

❖ Experiences

- Member of ESSF Sub-group on Monitoring and Verification/Accreditation

  * ESSF : European Sustainable Shipping Forum

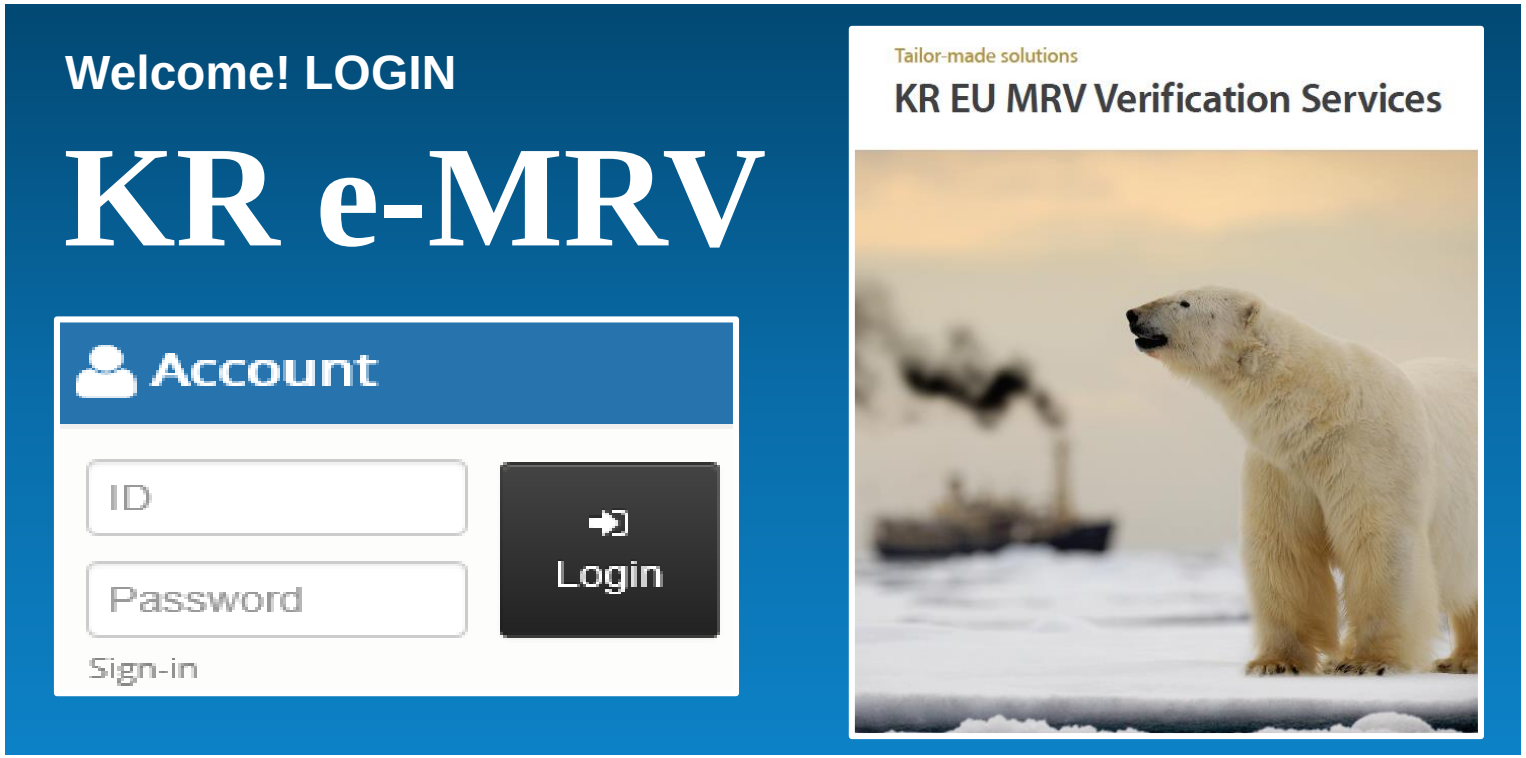
- More than 700 projects for verification of GHG and ship's Performance

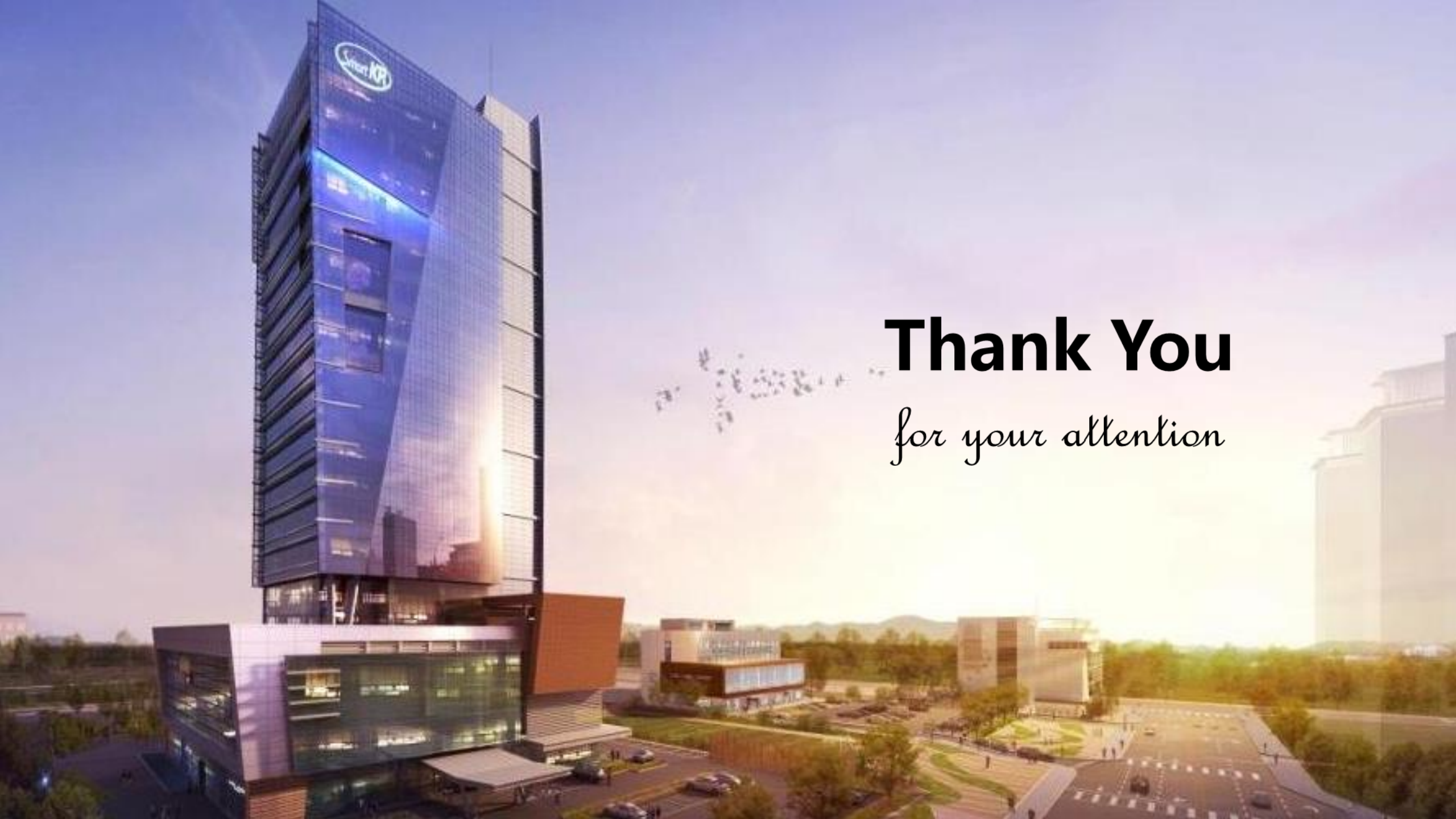


KR EU MRV Service

❖ Electronic Template of Monitoring Plan

- Meeting requirement to use standardized monitoring plan
- Electronic template corresponding to the model set out in Reg.2016/1927
- Providing best-practice based on the relevant guidance




Thank You
for your attention