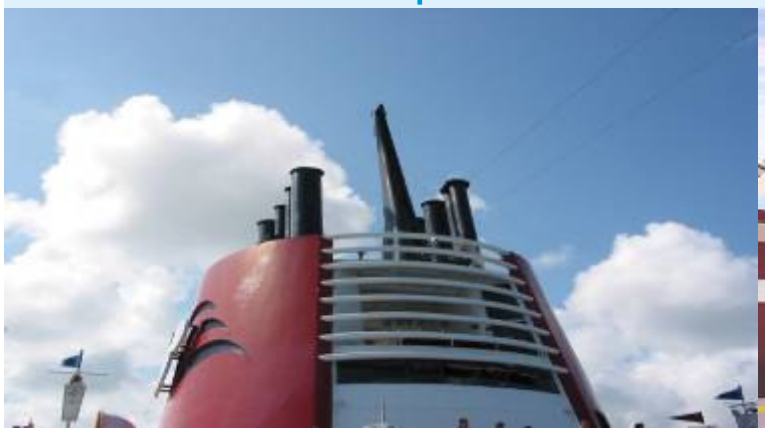
Onshore Power Supply

"Let stay connected"
WPCI WG OPS – 9th February 2010
Maurits Prinssen

Outline

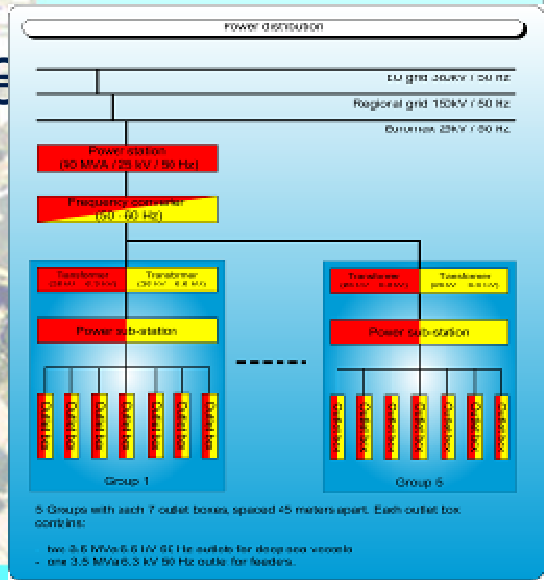
- Feasibility studies Rdam
  - Euromax (2006)
  - Cruiseterminal (2008)
  - ROPAX (roro-ferry) (2008)
- Other plans Rdam
- Lessons learned
- Remaining issues
- Development other Dutch ports



Feasibility study Euromax

- New built terminal
- Different ships (owners and capacity) on same terminal
- Max power demand is 7 MW for 5,000 TEU (300 reefers connectors)
- 6,600 Volt as standard, transformation to 400 Volt on board (stacker 7.5 kV-500A, Ø 30 cm)
- Total investment costs approx. 20-30 M€
- Emission reduction: 275,000 kg NO_x/ year, 135,000 kg PM_{10}/year

Contribution to NO2 levels from Euromax ships, no shore-side electricity	NO2 level ($\mu g/m^3$)	Increase (%)
	25.4	9.8
	24.9	8.0
	24.4	6.1
	23.9	4.2



Cruiseterminals others

- ***Juneau, Alaska, USA***

  Compulsury : 6.6 kV en 60 Hz

- ***Seattle, USA***

  thuishaven van de Holland America Line heeft walstroom voor deze cruiseschepen aangelegd : 11 kV en 60 Hz

- ***San Francisco, USA***

  mogelijkheden voor nieuwe cruiseterminal onderzocht : 6.6 kV en 60 Hz (12.5 MW)

- ***Vancouver, Canada***

  haalbaarheidsstudie en wenselijkheid van walstroom voor cruiseschepen. Resultaten nog onbekend.

- ***Southampton, UK***

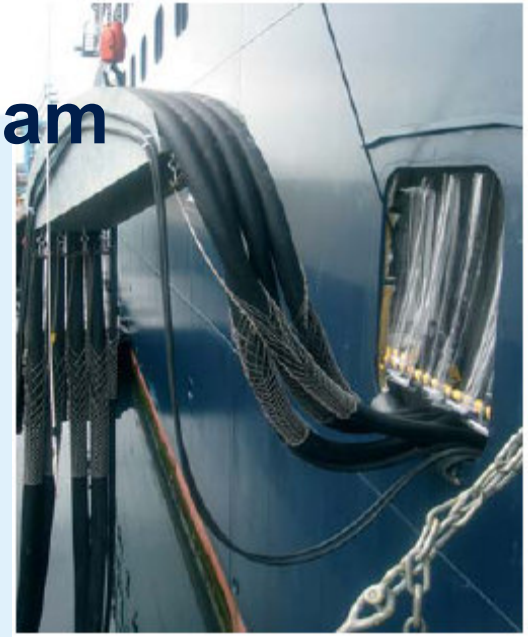
  geen concrete studies of initiatieven voor cruiseschepen.

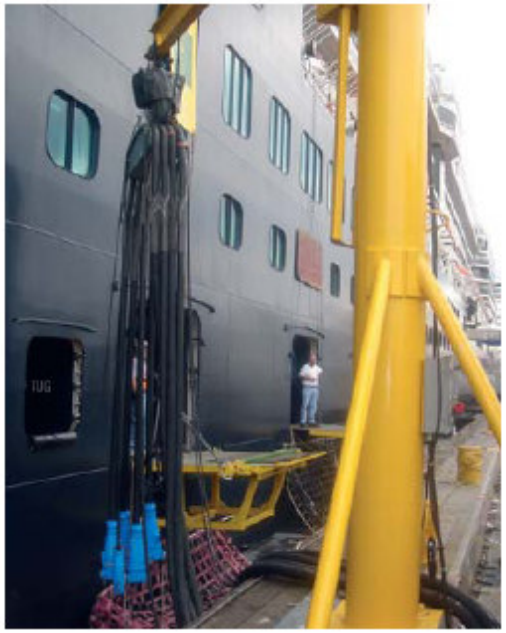
- ***Hamburg, Duitsland***

  Verkenning voor cruiseterminal, aanleiding woningbouw ontwikkelingen in het havengebied en luchtkwaliteit.

Feasibility study cruiseterminal Rdam (costs indication shore) in k€

	12 MVA / 6MVA double connection	12 MVA single connection	6MVA single connection
Cables	340	150	240
Transformors	900	600	300
Frequentcy convertor	1,800	1,050	750
Distribution housing	480	320	320
Subtotal	**3,520**	**2,120**	**1,610**
unforeseen 20%	704	424	322
Engineering	100	100	100
Automation	400	240	240
Building and coolinginstallations	730	438	438
assambly	150	90	90
Civil en excavation work	160	96	96
Total	**5,764**	**3,508**	**2,896**



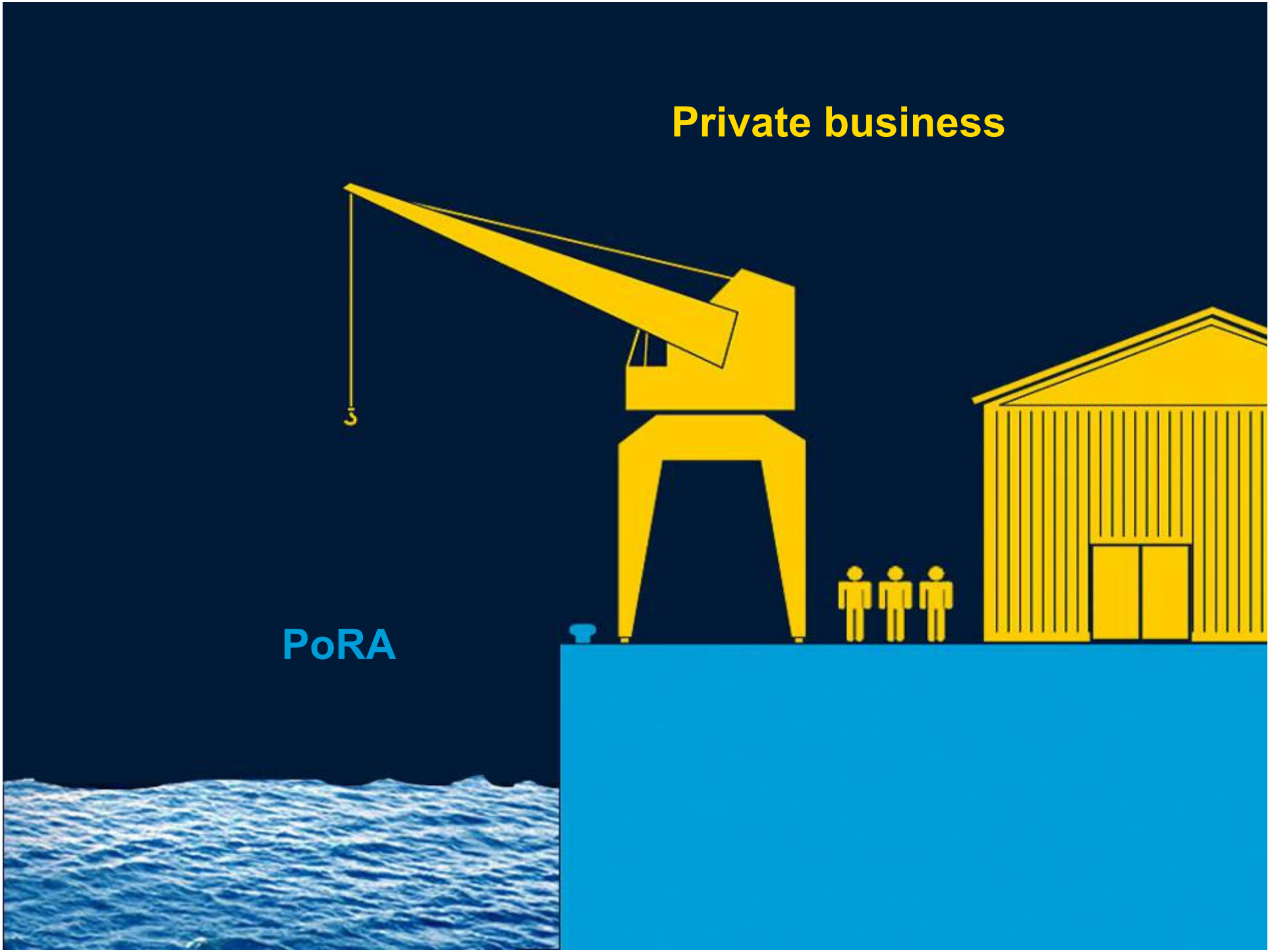


ROPAX others (all 50 Hz systems)

- Port of Kotka (Finland),
- Port of Kemi (Finland),
- Port of Oulu (Finland),
- Port of Göteborg (Sweden),
- Port of Lübeck (Germany)
- Port of Helsinki (Finland)
- Port of Zeebrugge (Belgium)
- feasibility study Cruiseferry DFDS line IJmuiden-NewCastle

ROPAX Rdam

- Feasibility study StenaLine Hoek van Holland and Benelux-harbour, P&OFerries Benelux-harbour
- All terminals are asked about their HVSCP ambition
- Investment costs shore installation (also lesson learned)
  - Initial cost indication shore = 2 * actual indication
  - Initial cost indication vessel ≈ actual indication
  - (inland vessels system = 75% initial cost indication)
- Prepare business case
- Commitment ferry operators, terminals and PoRA


Private business
PoRA

Future Rdam

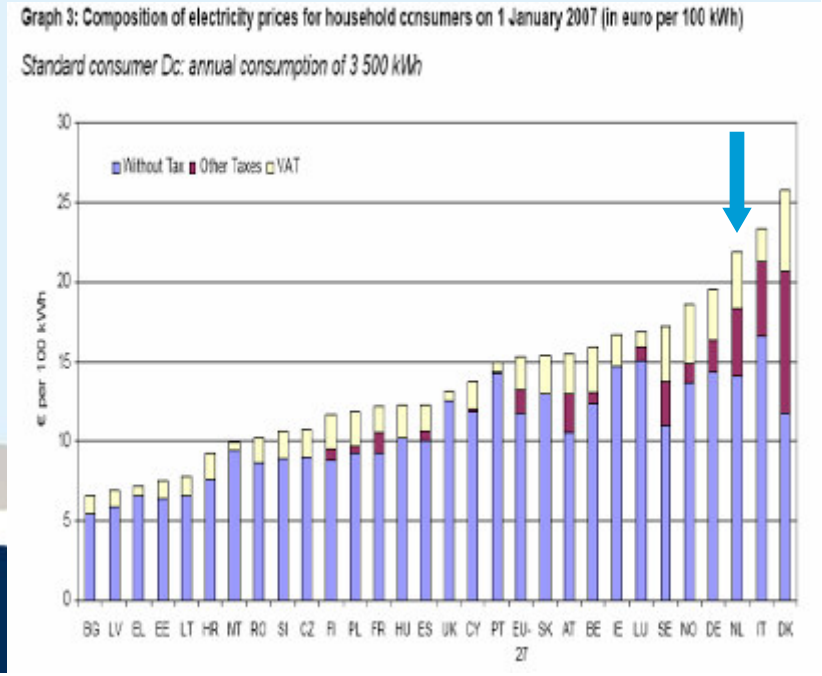
- Consider to prepare new quays for HVSCP infrastructure:
  - ‘gedempte Hartelkanaal’ area, destinated for bulk/generalcargo vessels
  - Extension port area (Maasvlakte 2)
  - 1 standard for every quay (undependant power required)

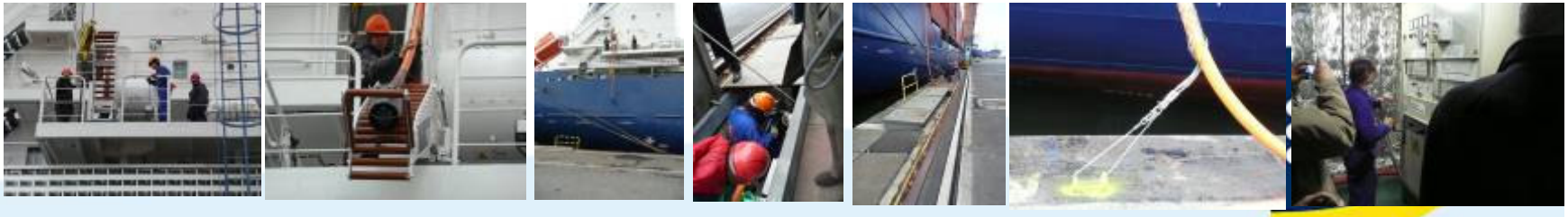
Mobile Clean HV Power Systems (future)

- LNG power plant
  - Trucks
  - Barges
- Fuel Cell power plant (< 1 MVA)
  - Barges
  - Supply vessel

Remaining issues

- Converting 50 Hz → 60 Hz: ship or terminal
- Sulphur content after 1-1-2015 in ECA (1.5% now) and port 0.1%
- Adoptation concept shipowners versus other green technologies
- Financing
- Energy or electricity tax
- EU ETS





Lessons learned

- ICL Antwerp visit **(1st 50/60 Hz installation)**
  - Noise reduction on board
  - Vessels stay for 3 days
  - Investment on board 350 kUS$ (2005) with 1 cable wheel on board; extra wheel would cost 100kUS$ (2005)
  - Max power demand: 1 MVA per vessel
  - Average demand: 420 kW per vessel.
  - Lease construction are also possible
  - Central conversion is possible, transformation to board electric current per connection (vessel)
  - The time needed to connect: 45 minuten.

Global investmentcosts installation shore (w/o civil workings)

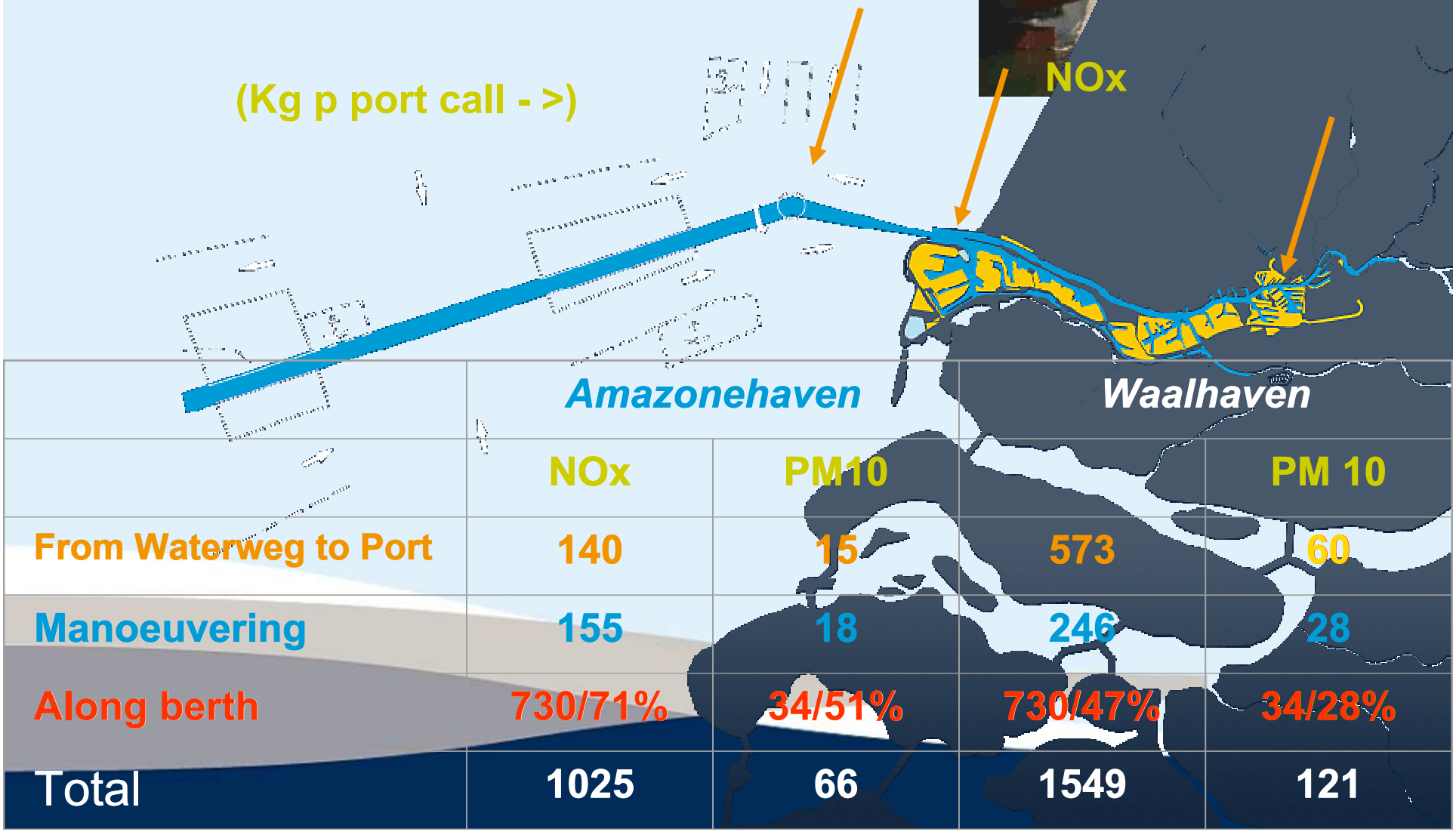
MVA	M€ (w/o civil work)	Number of conncet ions
1	1.0	1
2	1.6	1
3	2.4	1
4	3.2	2
5	4.0	2
6	4.8	2
7	5.6	3
8	6.4	3
9	7.2	3

PoRA cooperation

- NL seaports for inland OPS
- NL seaports
- Discussions with suppliers HV SCP
- Discussion with shipowners
- [WPCI (Gothenburg)]

Emission reduction potential SCP

MSC Alessia



	Amazonehaven		Waalhaven	
	NOx	PM10		PM 10
From Waterweg to Port	140	15	573	60
Manoeuvering	155	18	246	28
Along berth	730/71%	34/51%	730/47%	34/28%
Total	1025	66	1549	121