



TERMINAL VALENCIA S.A.U.



Jornada

5 de junio
de 2024

Acciones Vinculadas a Cero Emisiones en Empresas Portuarias

Organiza:

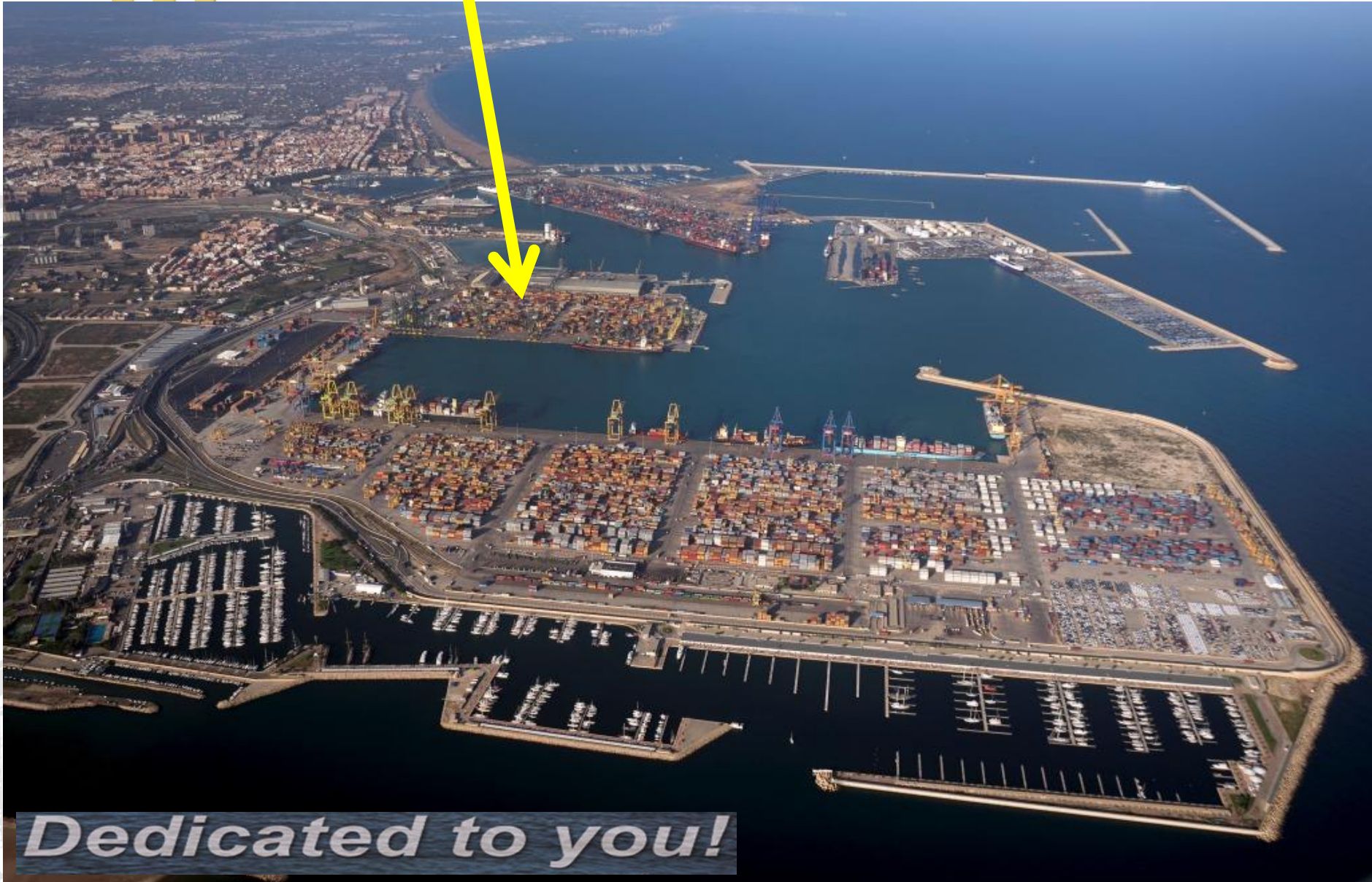


Muelle MSC, s/n · Puerto de Valencia · 46024 Valencia · España

www.msctv.es



MSCTV in the Port of VLC - 2024



Dedicated to you!



Activity Statistics 2012-2023

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ship Moves	1.104.973	1.065.331	1.084.052	865.110	775.711	848.724	733.466	947.838	1.068.203	981.696	867.002	865.562
Teus	1.619.197	1.622.109	1.643.926	1.326.607	1.174.524	1.281.305	1.123.547	1.455.177	1.634.634	1.543.765	1.372.578	1.392.101
Gate Moves	205.929	235.856	251.119	310.335	281.980	321.504	299.413	314.160	342.424	397.680	357.571	337.371
Ship Calls	1.076	1.068	1.109	950	851	868	752	899	931	808	670	735

Main Projects and Prototypes reducing CO2 Emissions

- Electrification RTG operations in Yard: 2016-2022
- Installation of Solar Panels: 2020-2021
- Testing KALMAR electric Reachstacker August 2024-September 2025
- Preparing 2 mobile OPS Installations with VPA-FVP:
- Testing electric Yard Tractor???

RTG operations% in total Yard Operations

2020	tot RTG's	RTG's	eRTG'	RS	ECH	TOTALS	MVS/RTG	MVS/RS	MVS/ECH
January	103015	6500	96515	17579	13282	133.876	4.121	2.197	3.321
february	108340	3497	104843	18479	12100	138.919	4.334	2.310	3.025
March	95328	2910	92418	18072	8448	121.848	3.813	2.259	2.112
april	99915	3340	96575	17025	10479	127.419	3.997	2.128	2.620
may	94942	4172	90770	16866	14448	126.256	3.798	2.108	3.612
june	117655	4183	113472	19402	17918	154.975	4.706	2.772	4.480
july	121437	4341	117096	22943	17225	161.605	4.857	3.278	4.306
august	112315	1035	111280	19549	17287	149.151	4.493	2.793	4.322
septemb	110050	1081	108969	17440	19351	146.841	4.402	2.491	6.450
october	119070	2566	116504	18730	14075	151.875	4.763	2.676	3.519
novemb	117548	1296	116252	17966	17528	153.042	4.702	2.567	4.382
decemb	114400	2095	112305	14645	18886	147.931	4.576	2.092	4.722
TOTALS	1.314.015	37.016	1.276.999	218.696	181.027	1.713.738	50.539	31.242	45.257
%	76,7%	2,2%	74,5%	12,8%	10,6%	30,536			
TIL KPI's mvs/Eq/year							50.000	40.000	60.000
utilization%							101%	78%	75%



- eRTG's = 78%-80% of total Yard container moves

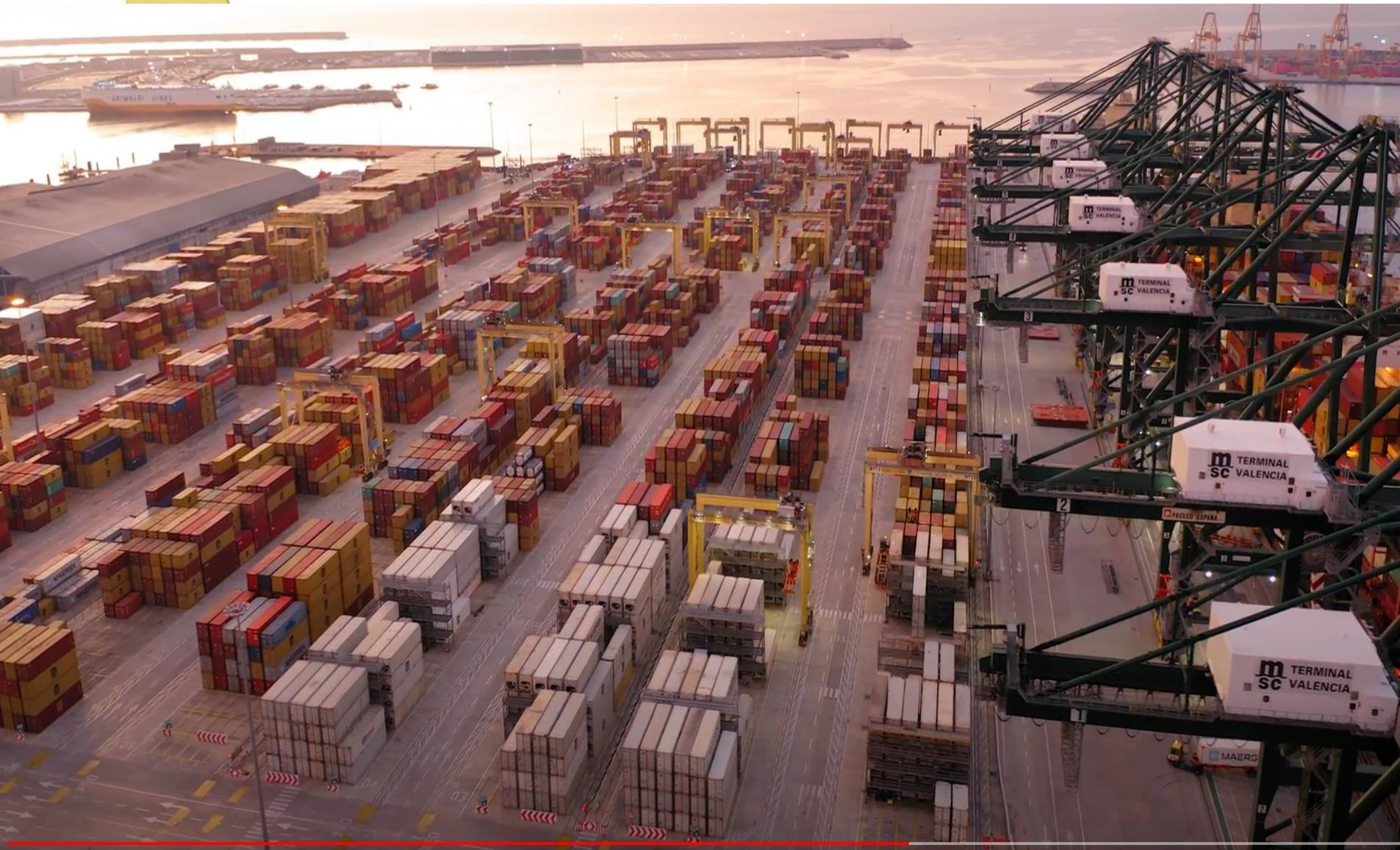
2023	tot RTG's	RTG's	eRTG'	RS	ECH	TOTAL Ymvs	MVS/RTG	MVS/RS	MVS/ECH
TOTALS	1.093.553	0	1.093.553	148.882	169.097	1.411.532	42.060	21.269	28.182
%	77,5%	0,0%	77,5%	10,5%	12,0%				
TIL KPI's mvs/Eq/year							50.000	40.000	60.000
utilization%							84%	75%	47%

2024	tot RTG's	RTG's	eRTG'	RS	ECH	TOTAL Ymvs	MVS/RTG	MVS/RS	MVS/ECH
January	93244	0	93244	12311	15492	121.047	3.885	1.539	2.582
february	113156	0	113156	13409	14269	141.834	4.715	1.676	2.545
March	118212	0	118212	11591	12710	142.513	4.926	1.449	2.118
april	118029	0	118029	11574	15823	146.226	4.918	1.547	2.637
TOTALS	442.641	0	442.641	49.685	59.294	551.620	17.025	7.098	9.882
%	80,2%	0,0%	80,2%	9,0%	10,7%				

- **Reachstackers = 12%-10%**

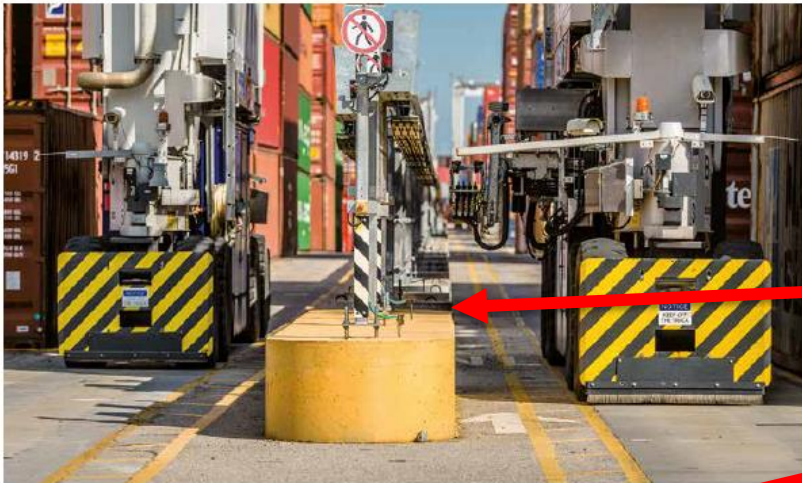


Yard View MSCTV: 30,000 Teu capacity



- **Capacity: +/-1,7M Teu?? (theoretical capacity, based on 72 rotations at 80% occupation)**

m MSCTV : >>> Konecranes eRTG's: 2017-2029??



Busbar system in action with Konecranes RTGs at the Garden City Terminal, Port of Savannah, Georgia Ports Authority (GPA), USA. There are over 160 Konecranes RTGs working at this terminal, the largest single container terminal in the USA.

- Busbar system used in USA with L-arm
- Overhead electrical trolley
 - = trains/locomotives(China)
- Cable Reel systems:
 - Tested 2014-2015 at MSCTV
 - TOO INFLEXIBLE!!



A Konecranes Noell RTG in action with an additional power option: overhead electrical trolley power.

THE STEADY PERFORMER

Konecranes Noell RTG

8 or 16 wheels



Konecranes RTG at DP World Yarimca in Turkey, in fully electric operation powered by a cable reel system.

THE BEST PERFORMER

Konecranes RTG

8 or 16 wheels

CABLE REEL NOELL/FANTUZZI RTG'S ELECTRIFICATION RTG'S - CABLE REEL



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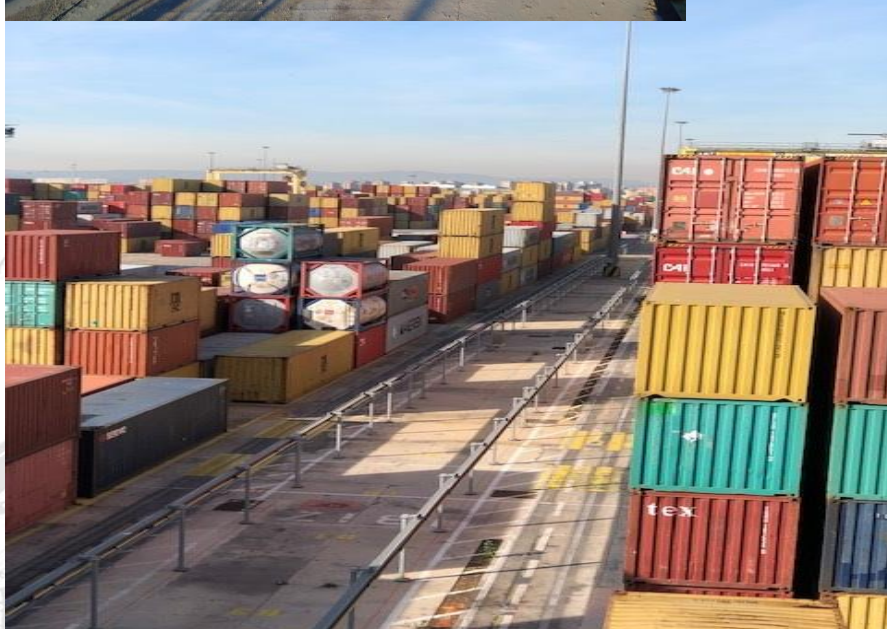
Phases evolving from 28 dRTG's to 28 eRTG's: 2016-2022



1. March 2016: Strategic Decision: conversion of 15 diesel RTG's >>> eRTG's
2. 2016 May-June: after traveling to different ports(England, Turkey, Togo) that were doing similar projects, MSCTV decided to **electrify the RTG blocks with the bus bar system**.
3. 2017: March 31st >>> invested in 3 new eRTG's (value = 4.7M€);
4. 2017-2018 retrofit 15 diesel RTG's >>> e RTG's (value +/- 1.9M€)
5. 2019 May 30th: TiL/MSCTV >>> investment in 7 new eRTG's (value = 11.5M€);
6. 2021 Sept 5th: TiL/MSCTV >>> investment in 4 new eRTG's (Value +/-7.1M€)
7. Sept 2022: MSCTV >>> another 4 eRTG's >>> 28 eRTG's operational

Electrification Project = +/-13M€

- Civil Works
2 x 3
months,
2017-2018.
- BB Solution:
Conductix
Whampfler
- E-RTG's
Konecranes

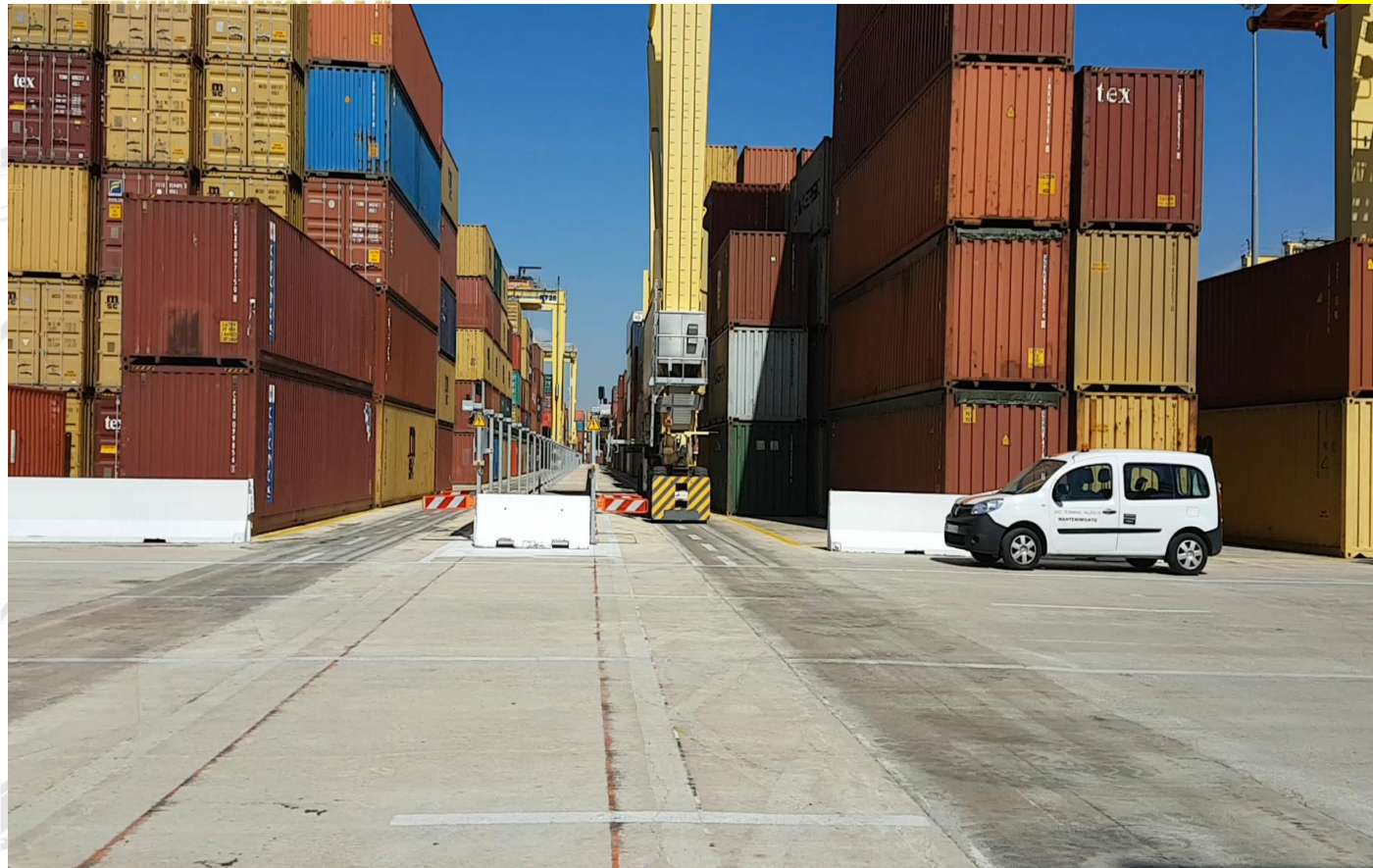


- installing 6 km of conductors rails, MSCTV migrated from diesel powered RTG yard cranes >>>> low carbon concept, by mid-2018.



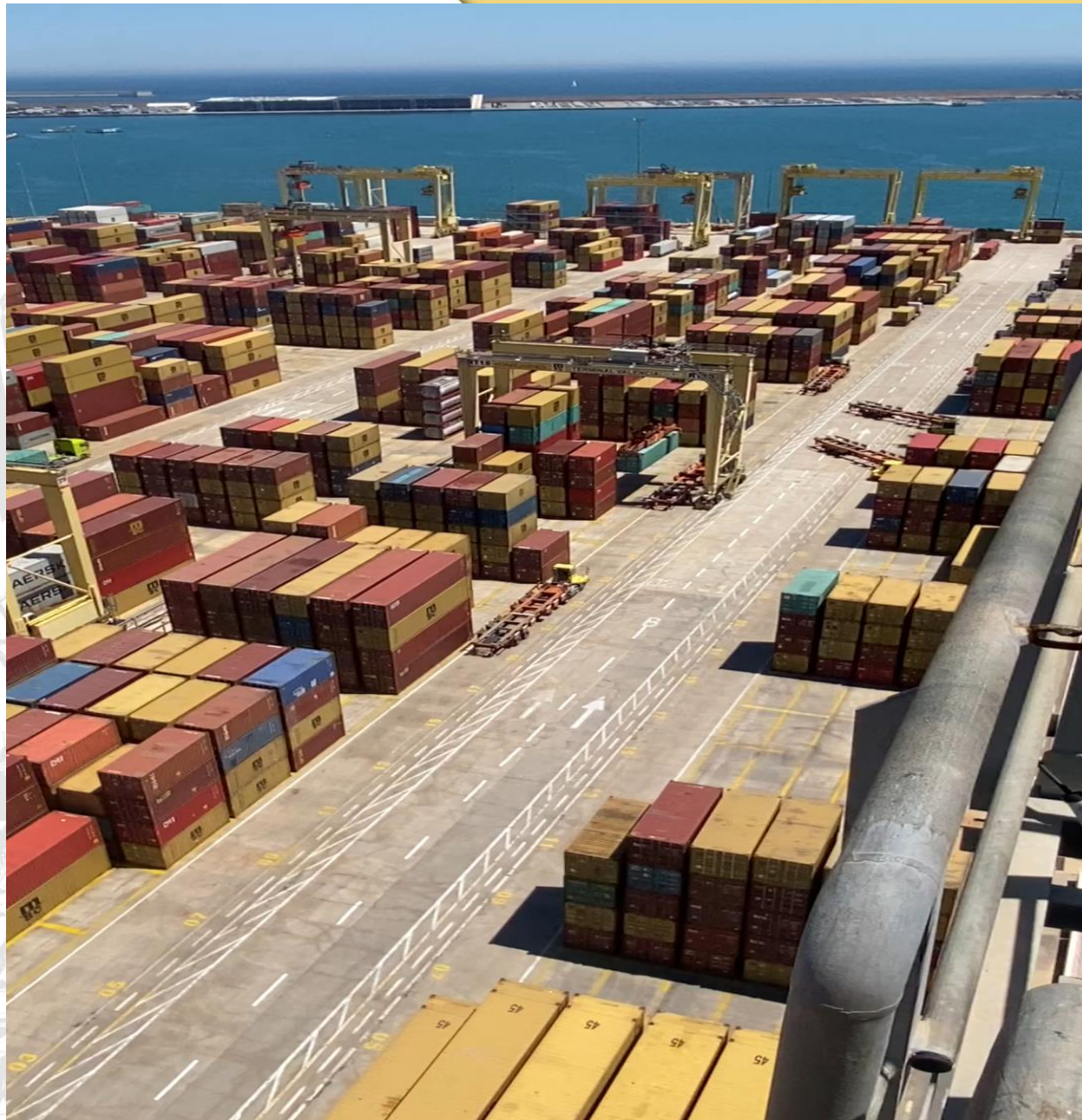
MSCTV eRTG in operation

- eRTG connects L-arm to Bus Bar (conductor rail)





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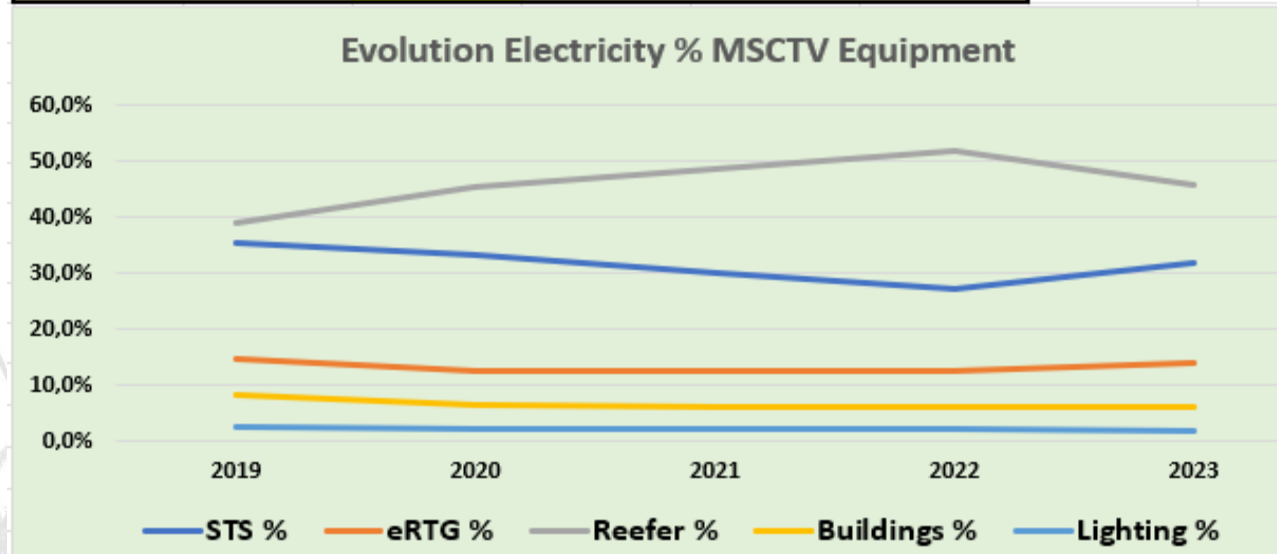


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ELECTRICITY consumption MSCTV eRTG %

Evolution Electricity Consumption Share MSCTV Equipment					
	STS %	eRTG %	Reefer %	Buildings %	Lighting %
2019	35,6%	14,6%	39,0%	8,2%	2,6%
2020	33,2%	12,6%	45,6%	6,4%	2,2%
2021	30,0%	12,7%	48,7%	6,3%	2,4%
2022	27,2%	12,5%	51,9%	6,1%	2,3%
2023	32,0%	14,2%	45,8%	6,0%	1,8%

- eRTG electricity consumption = 13% of global consumption

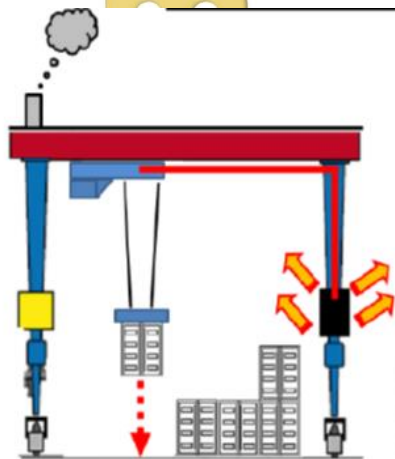


Evolution energy use Equipment

	2016	2017	2018	2019	2020	2021	2022	2023
<u>kwh Equip diesel</u>	24.785.661	23.723.057	15.641.872	18.399.341	19.878.204	19.151.053	16.171.293	13.830.299
<u>kwh Equip electricity</u>	4.515.519	5.444.870	6.254.789	7.597.353	8.366.817	8.209.842	7.531.033	7.327.173
	29.301.180	29.167.927	21.896.661	25.996.693	28.245.021	27.360.895	23.702.325	21.157.472
<u>kwh Mag /mov</u>	37,08	33,38	29,12	26,69	25,71	27,15	26,58	20,99
<u>Diff -2016><2023</u>	-1%	-11%	-22%	-29%	-31%	-28%	-29%	-44%

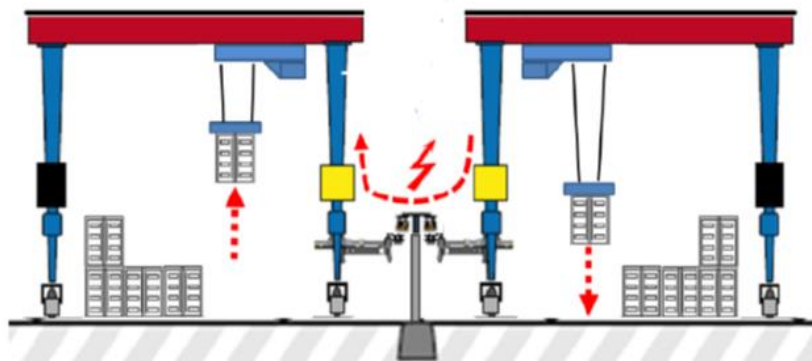
31/05/2024

Energy efficiency eRTG < dRTG



D-RTG => Poor Energy efficiency

During load lowering, the Potential Energy is lost, it's *transformed in "heat"* to the atmosphere by a resistors bank.



E-RTG =>

Capacity for energy regeneration

Potential Energy during load lowering can be *returned to the grid* by installing regenerator inverters.

MSCTV experience (3 units REG E-RTGs)

30,4 Kwh - Standard E-RTG

17,1 Kwh - REG E-RTG

High Investment for Regenerators for existing RTG's = ROI > 10 Years??? = Challenge!!!

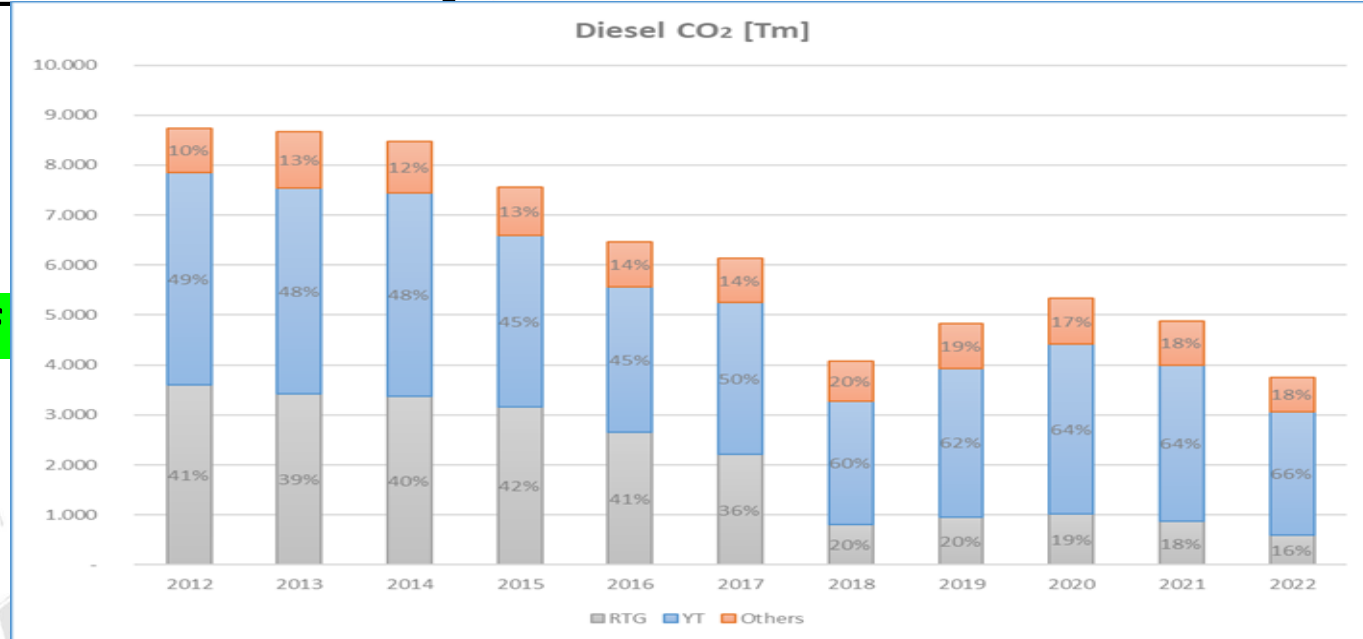
MSCTV E-RTG Project: results



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- 2021/22: E-RTG's : drop from +/-41% of total diesel CO2 emissions >>> 16% in 2022

- RTG operations = 80% electrical



- **2024: MSCTV = only Spanish RTG terminal using e-RTG's reducing CO2 emissions by 60% from 2016-today**

- **conclusion:**

- **Battery technology >>> advancing rapidly!!**

- **>>> Brownfield Terminals invest in Hybrid eRTG's (Battery packs)**

- **NO CAPEX necessary for Busbar system!!**

Project: Testing eReachstacker Kalmar

MSCTV Emissions Reduction Initiatives

Operating hours: Battery sizes vs. drive cycle



Drive cycle

Light

4 h

5 h

6.5 h

9.5 h

Medium

3.5 h

4.5 h

5.5 h

8 h

Heavy

3 h

4 h

5 h

7 h

Battery size

245 kWh

326 kWh

407 kWh

587 kWh

KALMAR

Kalmar eReachstacker is expected to arrive at MSCTV by August 2024.

will be tested in tandem with the currently operational Hydrogen Fuel Cell Reach Stacker.



Charging - what to consider?

Operational considerations

- › Operating hours per day
- › Duty cycle (light/medium/heavy)
- › How many electrical vehicles
- › Possible charging time
- › Charging multiple electric equipment at the same time
- › Future expansion of electric fleet

Technical considerations

- › Type of electric equipment
- › Battery capacity for required productivity
- › Energy consumption per day/hour
- › Available grid power
- › Needed charging power and ports
- › Optimisation of charging time
- › Fleet charging management

- Renting contract 1 year
- eReachstackers currently tested at low volume terminals

IMO 2020 Regulations = Very Low Sulphur Fuel Oil at Sea

Throughput in Spanish Ports in 2019 | New marine fuels

PORTS IMPLEMENT NEW IMO 2020 REGULATIONS

Spanish ports supply marine fuels with lower sulphur content, in accordance with the IMO environmental standard that came into force on 1st January 2020

In 2018, the bunkering sector invoiced sales of €3.5 billion in Spain. The port authorities of Bahía de Algeciras, Las Palmas, Barcelona, Ceuta, Santa Cruz de Tenerife, Valencia, Huelva, Bilbao and Vigo handled more than 90% of the supply of these marine fuels, which exceeded 8.26 million tonnes in 2018, as revealed by Ports of Spain. This volume of fuel corresponds mostly to fuel oil with high sulphur percentage (HSFO). The entry into force on 1st January this year of the International Maritime Organization (IMO) environmental standard for the production of low sulphur fuels has changed the supply of bunkering fuels at Spanish ports. The traditional dominance of HSFO at Spanish ports, maintained until the end of the financial year, is now losing ground. Further use of this resource requires vessels to have scrubber systems installed, which eliminate sulphur oxide emissions.

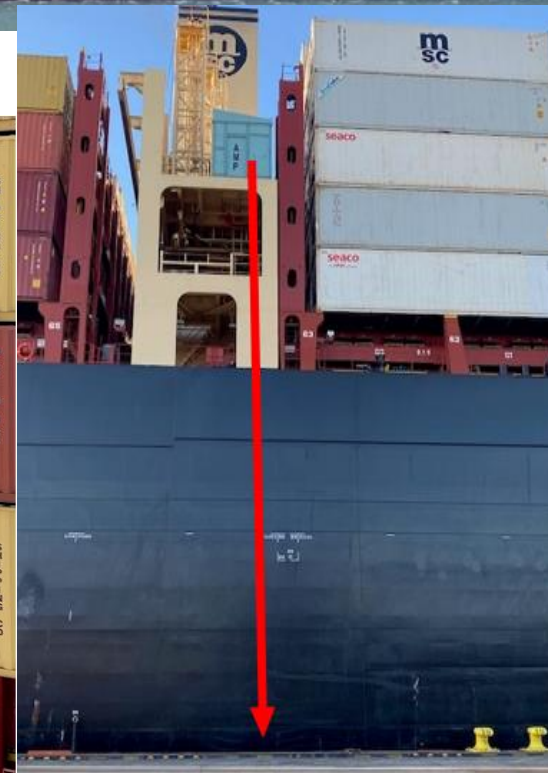
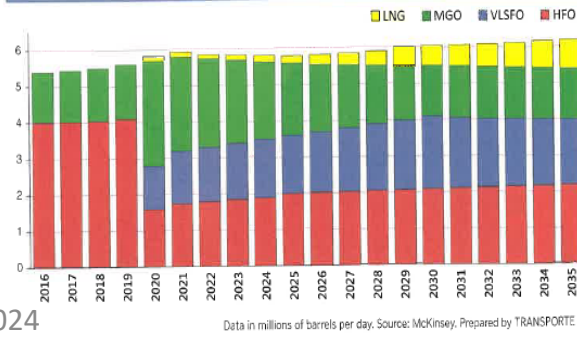
5/31/2024

THREE WAYS TO COMPLY WITH THE IMO 2020 REGULATION

Alternatives	Advantages	Inconvenientes
Fuel with Low Sulphur Content (VLSFO)	<ul style="list-style-type: none"> Installation of scrubbers is not necessary 	<ul style="list-style-type: none"> Much more expensive than HFO Generates CO₂ emissions in its production and desulphurization
Residual fuel oil (HFO) and scrubbers	<ul style="list-style-type: none"> HFO is much cheaper than VLSFO No modifications are needed to tanks or fuel systems 	<ul style="list-style-type: none"> Installing scrubbers on board requires a high investment Additional energy demand
Liquid natural gas (LNG)	<ul style="list-style-type: none"> Competitive price No sulphur emissions and very low NOx emissions 	<ul style="list-style-type: none"> Possible methane emissions Few ports have LNG supply Special fuel systems and tanks Expensive modifications for existing vessels

Source: Anave. Prepared by TRANSPORTE XXI

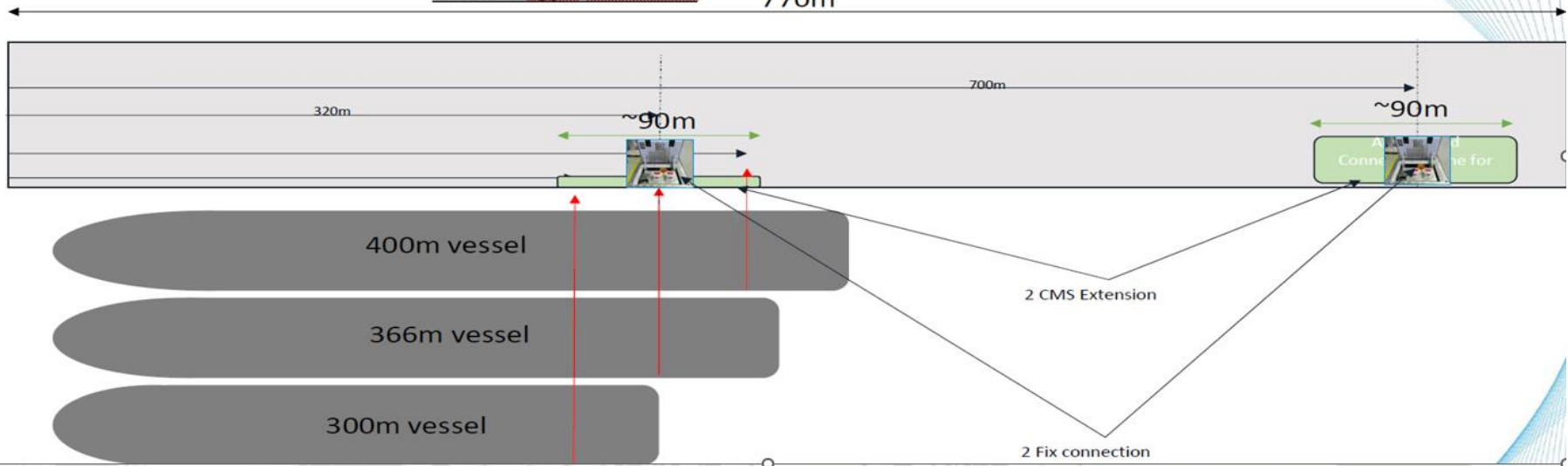
FORECASTS FOR THE EVOLUTION OF THE CONSUMPTION OF MARINE FUELS



CI/AMP/OPS Prototype at MSCTV by September 2026??

Proposed OPS Shore Side

- proposal discussed in March 2023 with MSCTV and FVP: we see this as the best solution for MSCTV-type terminals 770m



Project financed by the VLC Port Authority:
MSCTV = first terminal in VLC

POTENCIA MÁXIMA DEMANDADA EN EL PUERTO			
ESCENARIOS POSIBLES DE ATRAQUES			
ZONA DE ATRAQUE	BUQUE	POTENCIA DEMANDADA (MVA)	INTENSIDAD DEMANDADA (A)
Muelle Transversal de Costa	1 Portacontenedores de 5 MVA	5	547 A
	1 Portacontenedores de 7,5 MVA	7,5	820 A
	2 Portacontenedores de 5 MVA	10	1.094 A

Prepare documents 03-06/2023

start Study Concept and Implementation - 2023

2024-2025: VPA >>>availability Substation + construction works

2026: Testing Period OPS Installation: 8.000-24.000 Teu ships connect to M-OPS

2027-2029 Commercial service CI MSCTV??

Possible Project: Testing e Yard Tractor???

- MSCTV: fleet of 58 diesel Yard Tractors
- Test electric Yard Tractor?
- Test H2 Yard Tractor?
- Challenges: Infrastructure (charging/refueling)
- CAPEX (+/-200% more expensive)



- Can we reduce/eliminate the emissions of the Yard Tractors?

- >>> We need partnership with Manufacturers:
- >>> MSCTV can not do this alone!!
- >>> MSCTV needs support from Authorities/Institutions

- GRI in VLC = H2 Prototype for RoRo Tractor >>> reference for YARD Tractors
- If H2 successful >>> big market for Yard Tractors in VLC!!
- Terberg Hydrogen Yard Tractor being tested in Antwerp and Rotterdam!!!
- VLC Port Authority >>> reduce CO2 emissions >>> involve all terminals!
 - Create H2 Fuelling station in the Port área for trucks

Terminal Expansion in Valencia

MSCTV shifting to the Northern Expansion of Valencia in 2029





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THANKS FOR YOUR ATTENTION!!

VNPT Project: Go Live Phase I 2029



Zero Emissions

The Terminal has been designed under the strictest environmental criteria and will be fully electrified with 100% of energy coming from renewable sources.



Key Specifications

Operations

Total capacity: 3m+ moves (5m TEU)

Max vessel size: Megamax (24k TEU+)

Mode of operations:

- Remotely operated quay & fully automated yard
- Fully electrified with 100% renewable energy consumption

Infrastructure

Quay length: 2 km

Yard area: 140 Ha

Rail terminal: On-dock 1km with 6 tracks

Gate: Automated gate processes

Equipment

Ship-to-shore cranes: 22

Automated stacking cranes: 100

31/05/2024