



4<sup>th</sup> Baltic Ports & Shipping 2021 Conference Luebeck, Germany

Session 6: Emerging port technologies that improve trade connectivity and shape smart digital ports

# Digital technologies to shape smart and eco efficient ports of the future

by Dipl.-Ing. Uwe Pietryga

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# Agenda

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# Driving forces behind eco-efficiency



## Public and internal pressure

Sense of urgency  
Paris agreement  
“Fridays for Future”  
Current & future employees



## Legislation

EU Green Deal;  
EU Climate Law  
Taxation on fossil fuels  
Emission trading schemes



## Customer interest

Customers' commitments and interest  
Customers' customer pressure



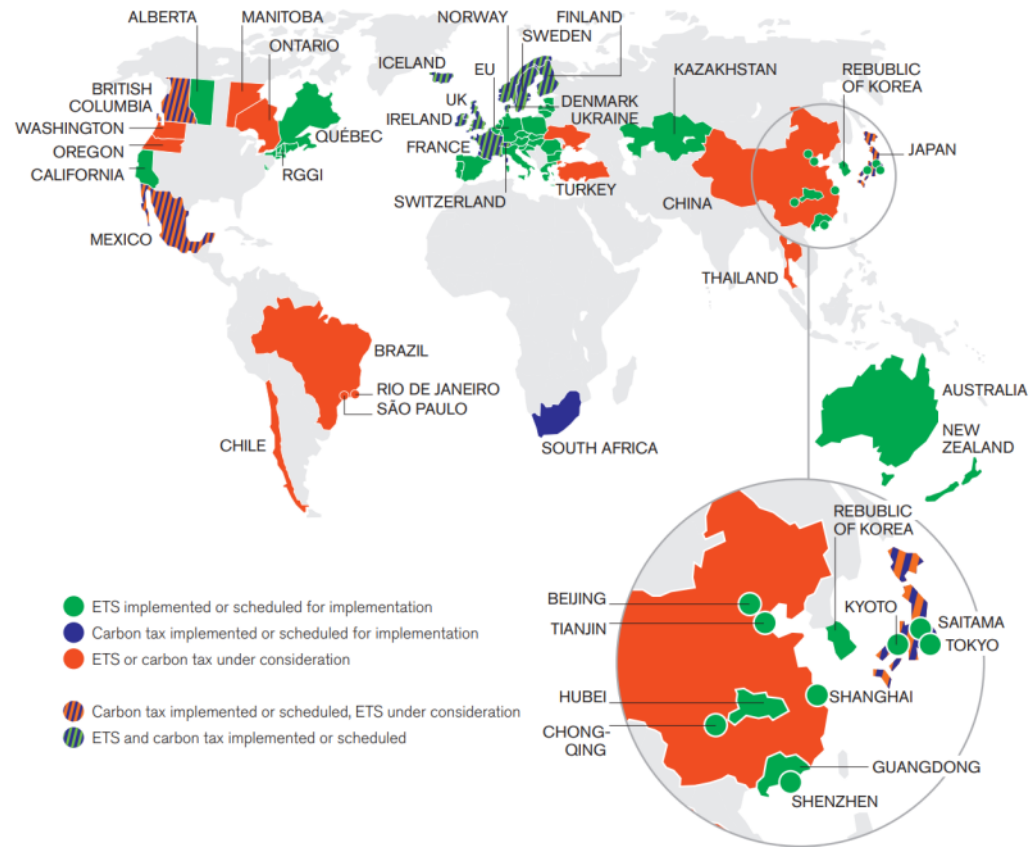
## Investor need

Environmental, Social and Governance (ESG) in investing

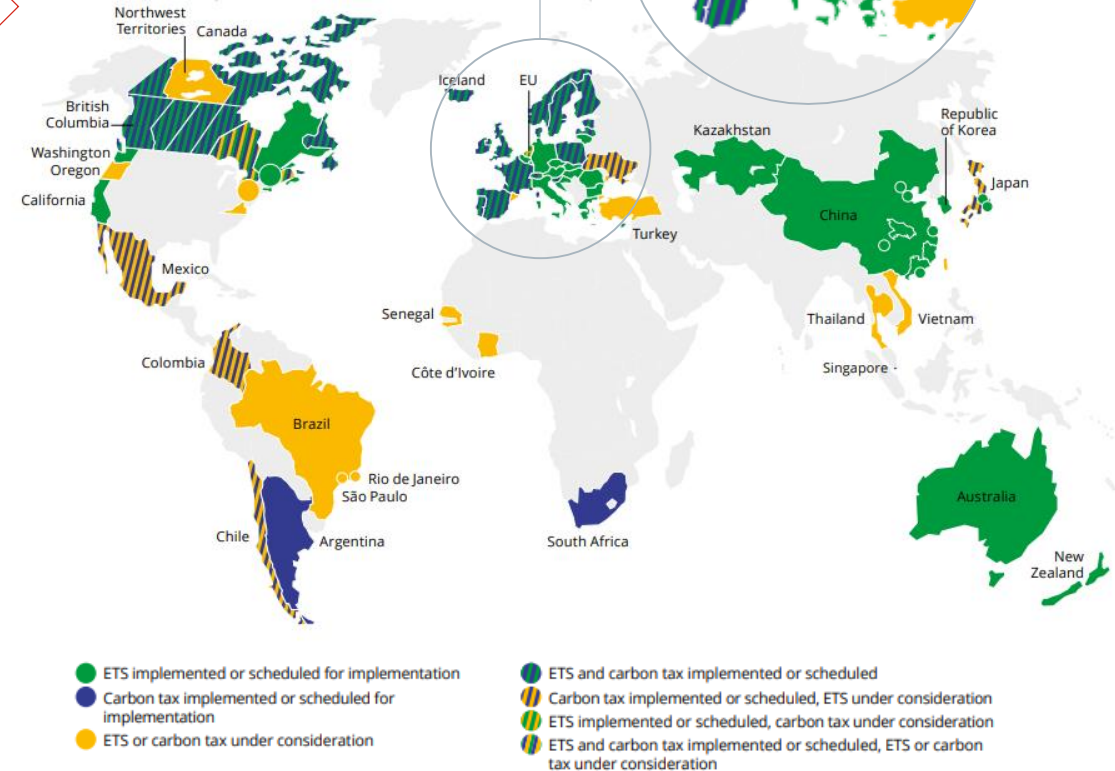


# 'Carbon' taxation development

## Year 2014



## Year 2019



(World Bank 2014; World Bank 2019)  
ETS=Emission trading system





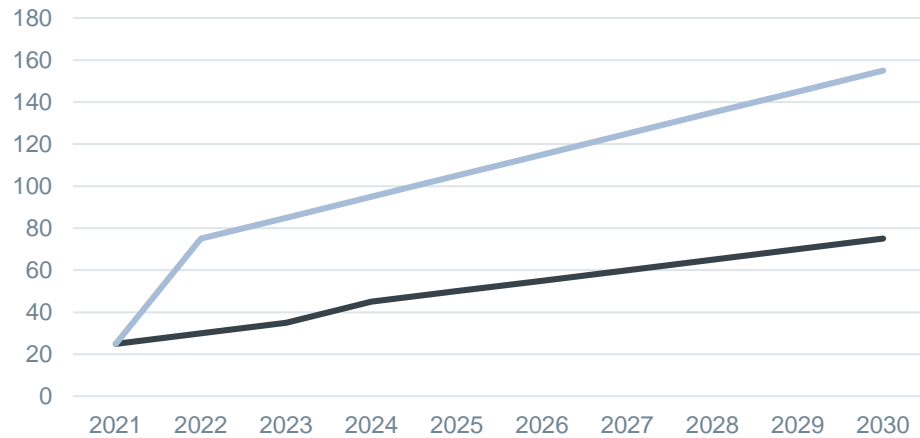
# How can we respond to these needs?

Together for an  
eco-efficient future



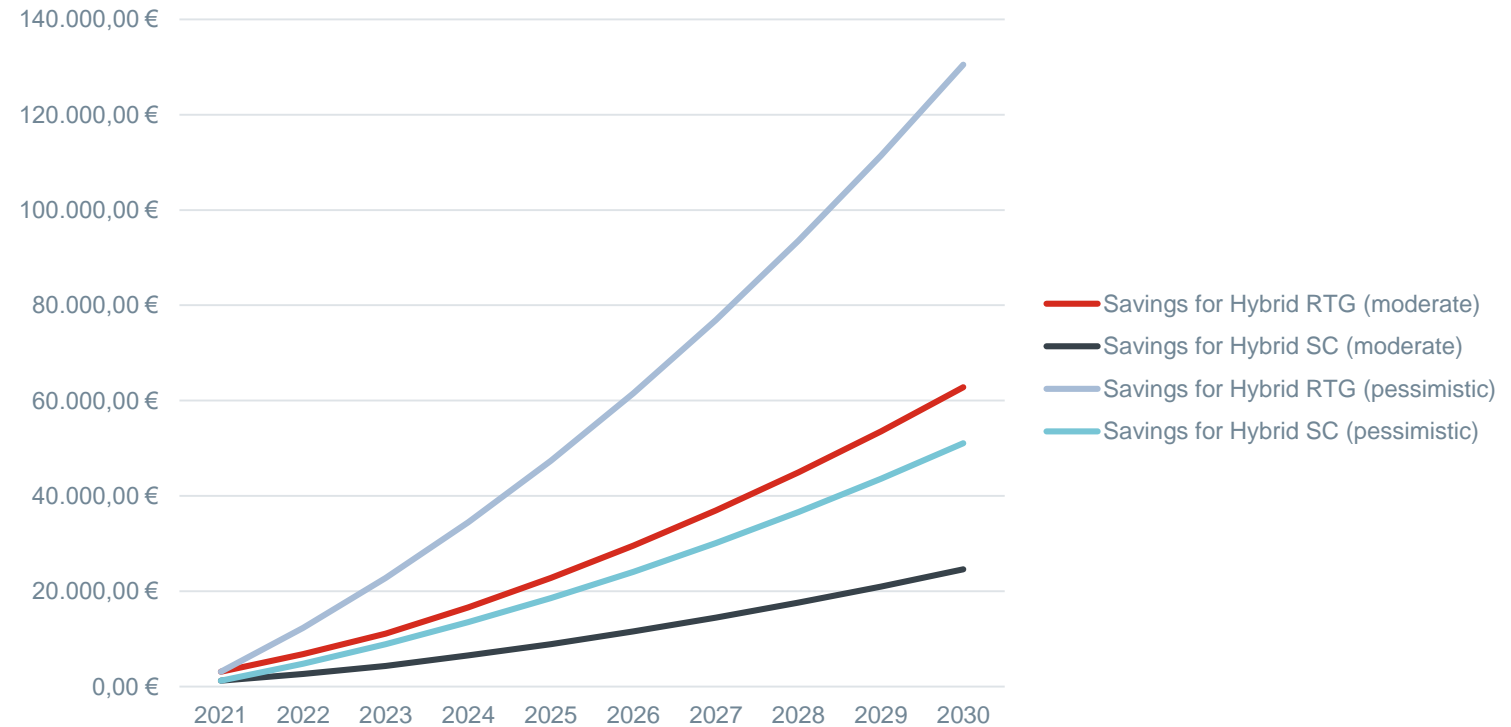
# UPDATE '21: Practical impact 'Carbon' taxation in Germany

€/ Tons CO<sub>2</sub> tax in Germany /moderate pessimistic view



(Source moderate view until 2026: Current German law §10/2 BEHG:)

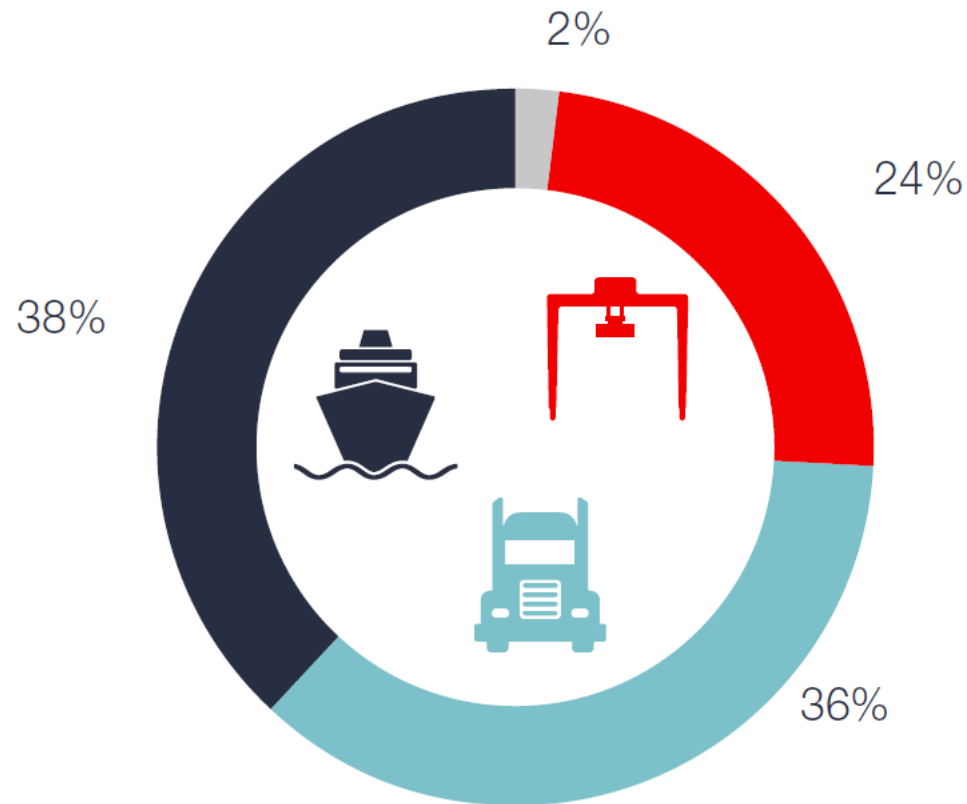
CO<sub>2</sub> Cost savings for hybrid technology w/o fuel savings



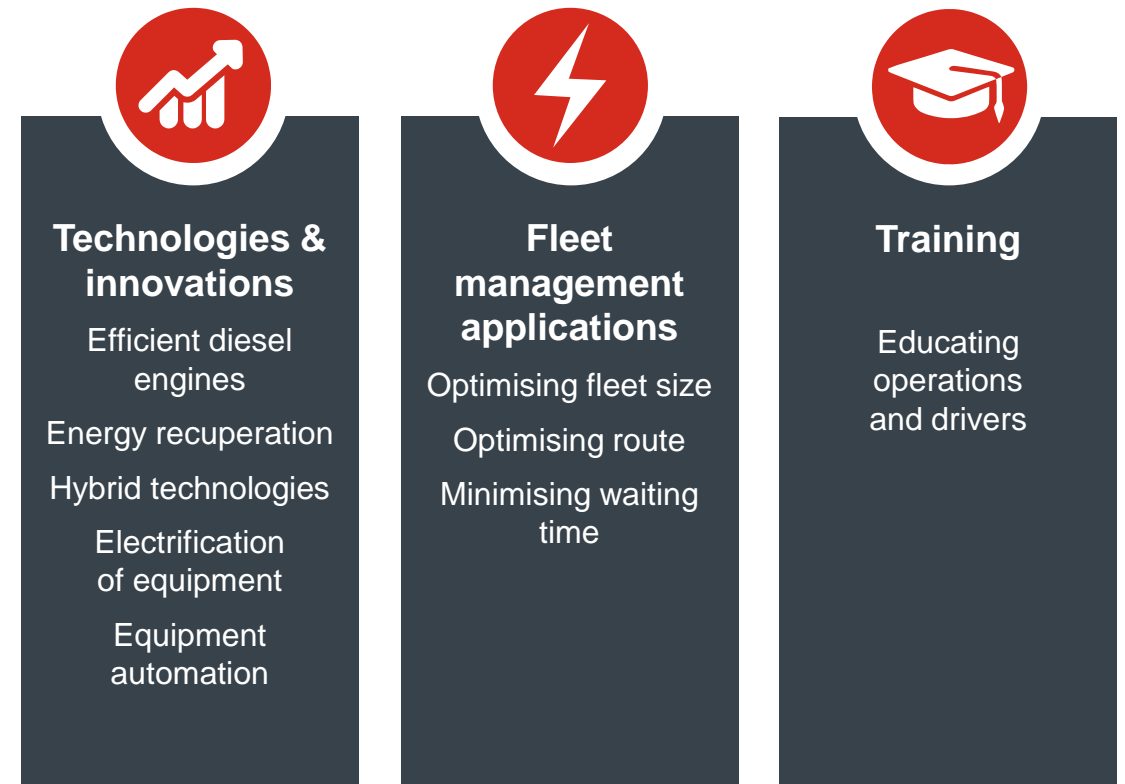
(Sample calculation. Based on 4000h/year OP-time and with average fuel savings cumulated view/ own computation)

# Emissions at container terminals

Average breakdown of emission sources in a container terminal



Typical means to reduce air emissions produced by container handling equipment



Source: Adopted from IMO/[www.nrdc.org/air/pollution/ports1/overview.asp](http://www.nrdc.org/air/pollution/ports1/overview.asp)

# Kalmar Hybrid Straddle Carrier

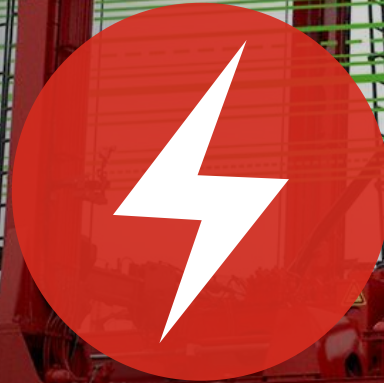
ECO-EFFICIENCY AT WORK 



Up to 40%  
reduction in fuel  
consumption



Up to 50 tons less  
CO2 emissions  
per annum  
compared to ESC



Allow smaller  
engine with  
batteries  
supplying peak  
load capacity



Less noise  
pollution



Higher availability  
because of less  
maintenance  
needed



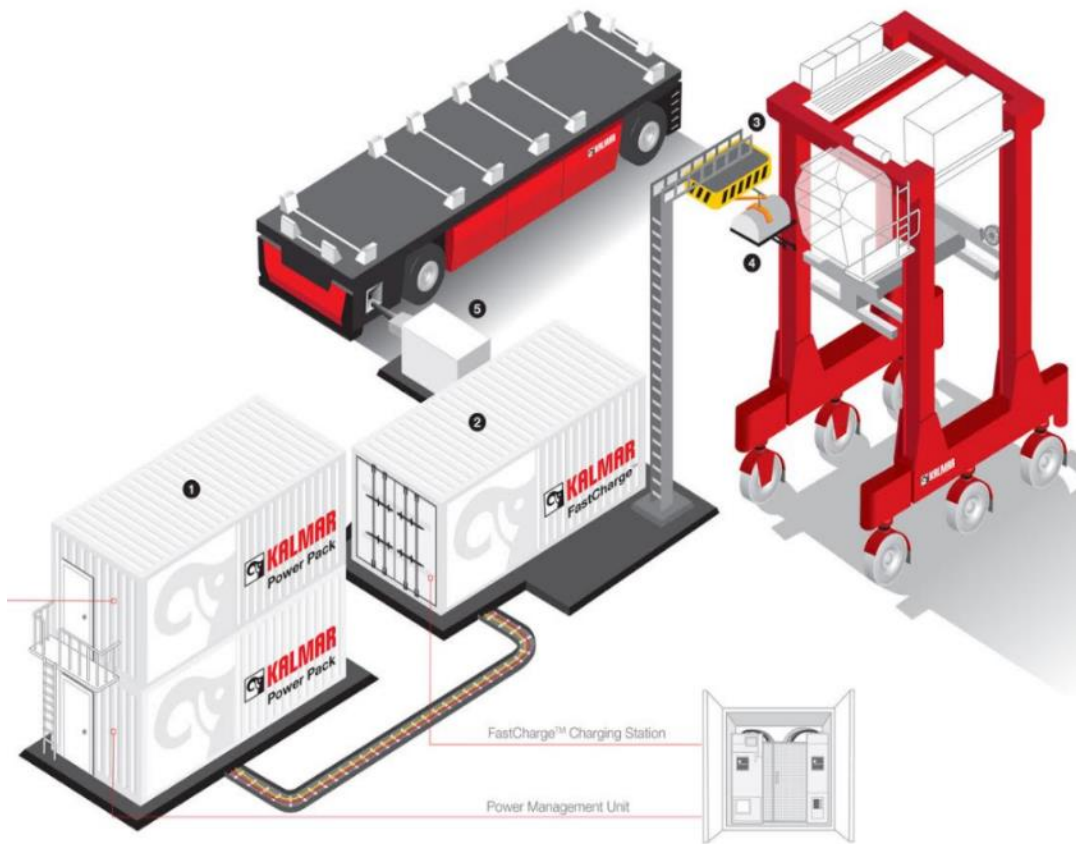
# Kalmar FastCharge™ solution

- Enables 24/7 operation for battery-powered machinery
- Consists of charging station(s) and charging interface(s)
- Zero local emissions
- High-power charge optimises the fleet's utility and availability rates
- Maintains the highest possible battery system health and lifetime for the machinery
- Includes vehicle-to-grid (V2G) and smart grid capabilities

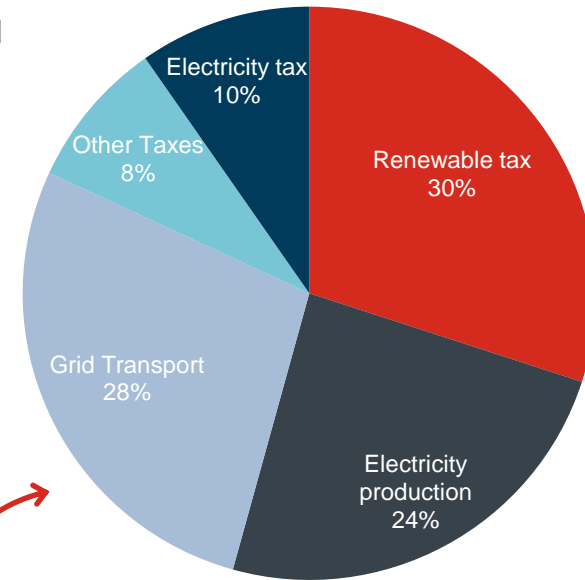




# Kalmar FastCharge™ / Kalmar Power Pack

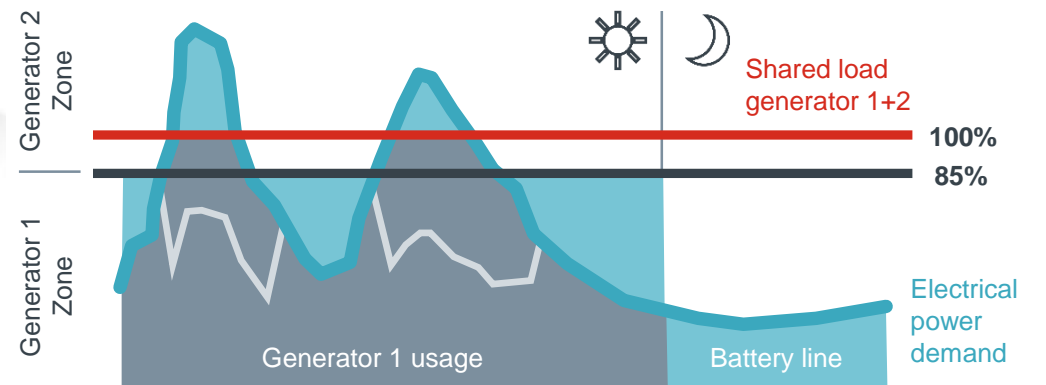


Germany Industrial energy cost types



Reduce the 15min. power max./year value to cut your energy bill

Peak shaving schematic



Typical generator loadcycle

Source: Bundesnetzagentur;  
<https://strom-report.de/strompreise/strompreis-zusammensetzung/>



# RTG Electrification

Rubber-tyred gantry cranes (RTGs) are the most popular equipment choice for container stacking at terminals around the world. With a global installation base of some 8,000 machines, approximately 60% of the world's container terminals use RTGs.

RTG electrification is a major trend at container terminals worldwide.

In addition to cost savings due to reduced fuel consumption at the terminal, RTG electrification significantly decreases emissions on-site.

The two major options for RTG electrification are bus bar and cable reel systems, each with their own benefits. The choice of method depends on the specific requirements of the terminal.





# RTG Electrification

Potential CO<sub>2</sub> emission reduction of RTG electrification

Diesel Electric RTG (5,000 hours per year)				
Consumption l/h	CO <sub>2</sub> kg/hour	CO <sub>2</sub> kg/year	Annual CO <sub>2</sub> reduction in a 5 RTG fleet	Annual CO <sub>2</sub> reduction in a 20 RTG fleet
13 litres/hour	34.8	173,940	869,700	3,478,800
15 litres/hour	40.1	200,700	1,003,500	4,014,000
17 litres/hour	45.5	227,460	1,137,300	4,549,200
19 litres/hour	50.8	254,220	1,271,100	5,084,400
21 litres/hour	56.2	280,980	1,404,900	5,619,600
23 litres/hour	61.5	307,740	1,538,700	6,154,800

Electric RTGs produce zero CO<sub>2</sub>, NO<sub>x</sub>, and PM emissions at the point of use

**Emission factor used for calculations is 2.676 kgCO<sub>2</sub>e/l**



# Future terminal



The right solution for you depends on your specific situation.



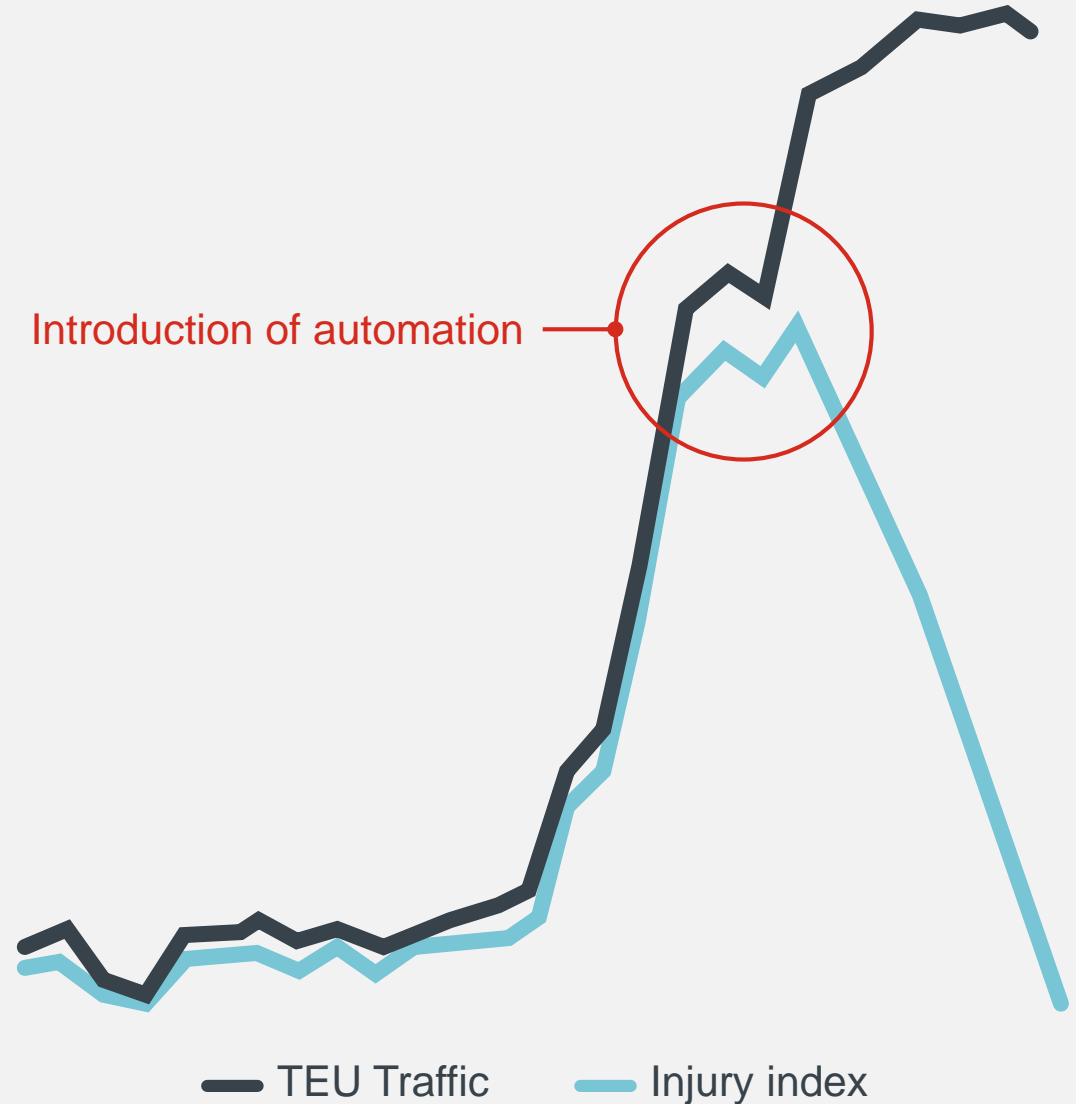
# Example of Safety

Kalmar AutoStrad™ vs manual straddle carrier

- › **Ever increasing focus on safety**
- › Over **90%** lower Loss Time Injury (LTI)
- › Throughput up by **39%**
- › Over **90%** lower employee costs
- › **98%** vessel departure performance
- › Average crane rates over **35 moves/h**
- › Maintenance savings around **\$500k** over the lifetime of a single machine

“ We went 12 months without a single lost time injury among our 160 employees.

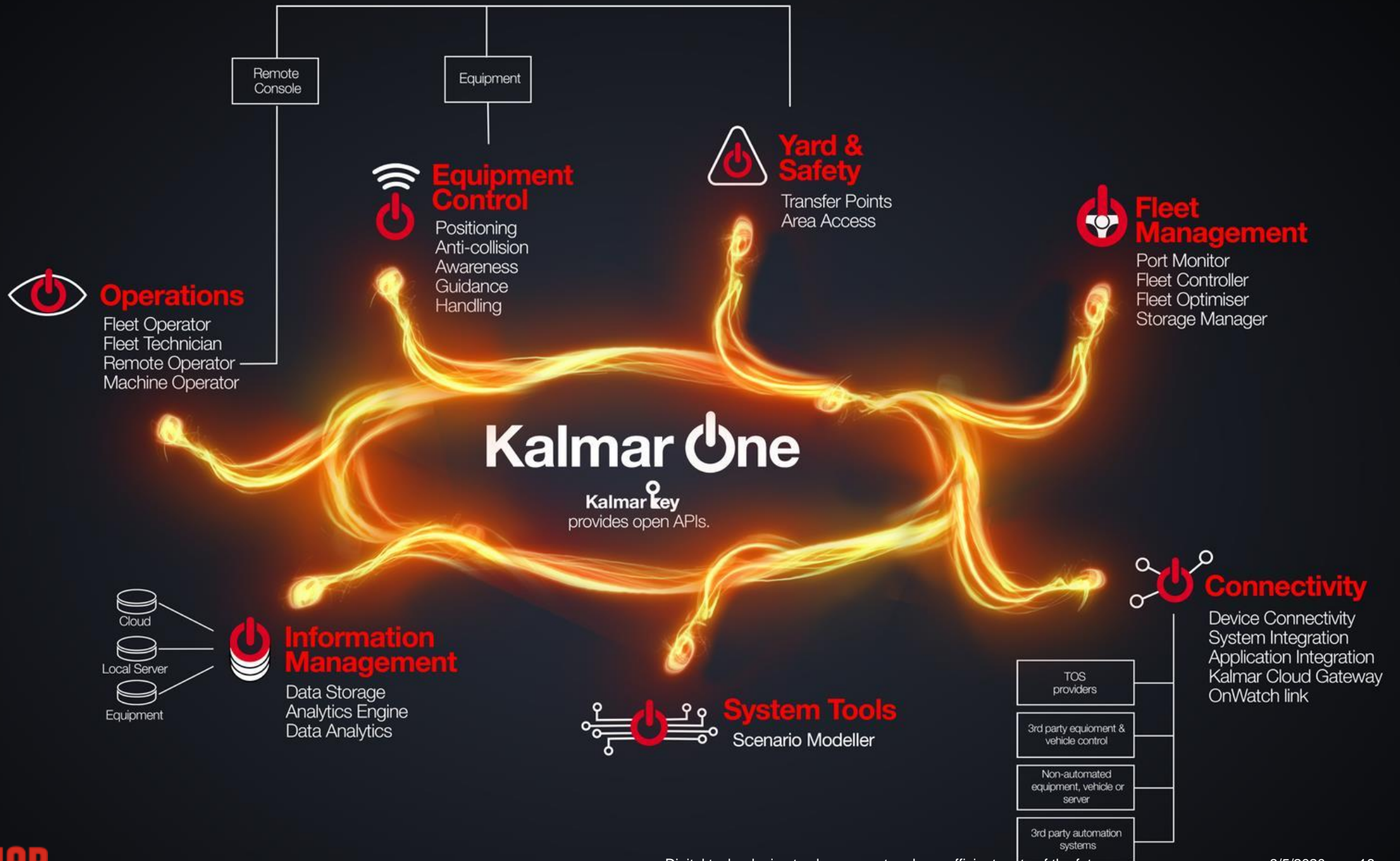
Matt Hollamby, Brisbane manager, terminals division Patrick



A person is seated at a control station, viewed from behind. The station features a curved desk with two joysticks and a tablet displaying a control interface. Five large monitors are arranged around the operator, showing various views of a terminal yard, including container stacks and a yellow crane. The scene is dimly lit, with the primary light source being the screens and the control panel.

# Automated terminal operation



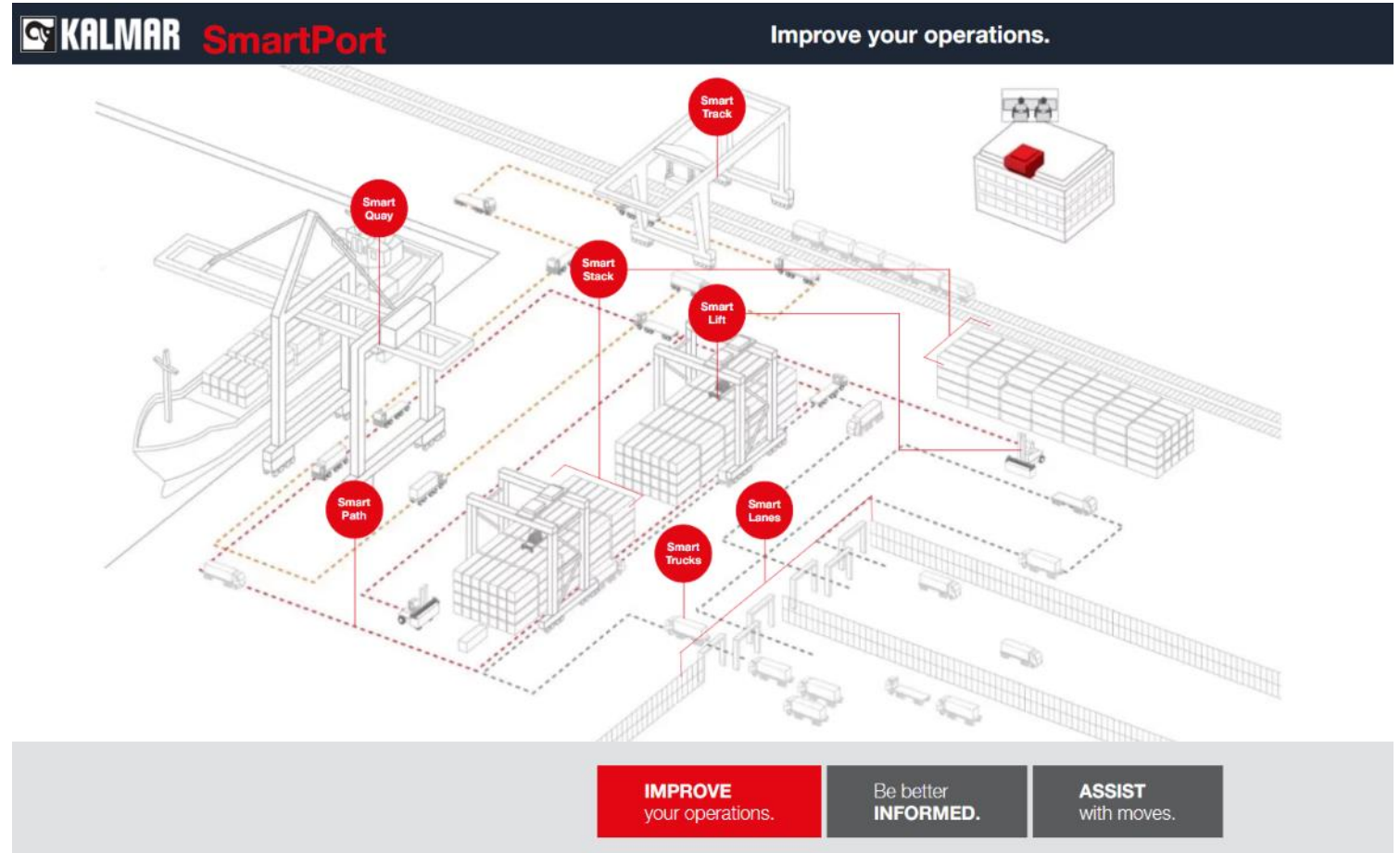


# Process Automation

Kalmar SmartPort is a set of process automation modules and digital services that can be deployed in your terminal to help move containers more efficiently.

SmartPort solutions will track, route and manage containers from the gate through to the quayside, helping to optimise operational productivity, safety, equipment and personnel utilisation rates and ensure that you never lose another container.

VISIT OUR SHOWROOM FOR MORE INFO

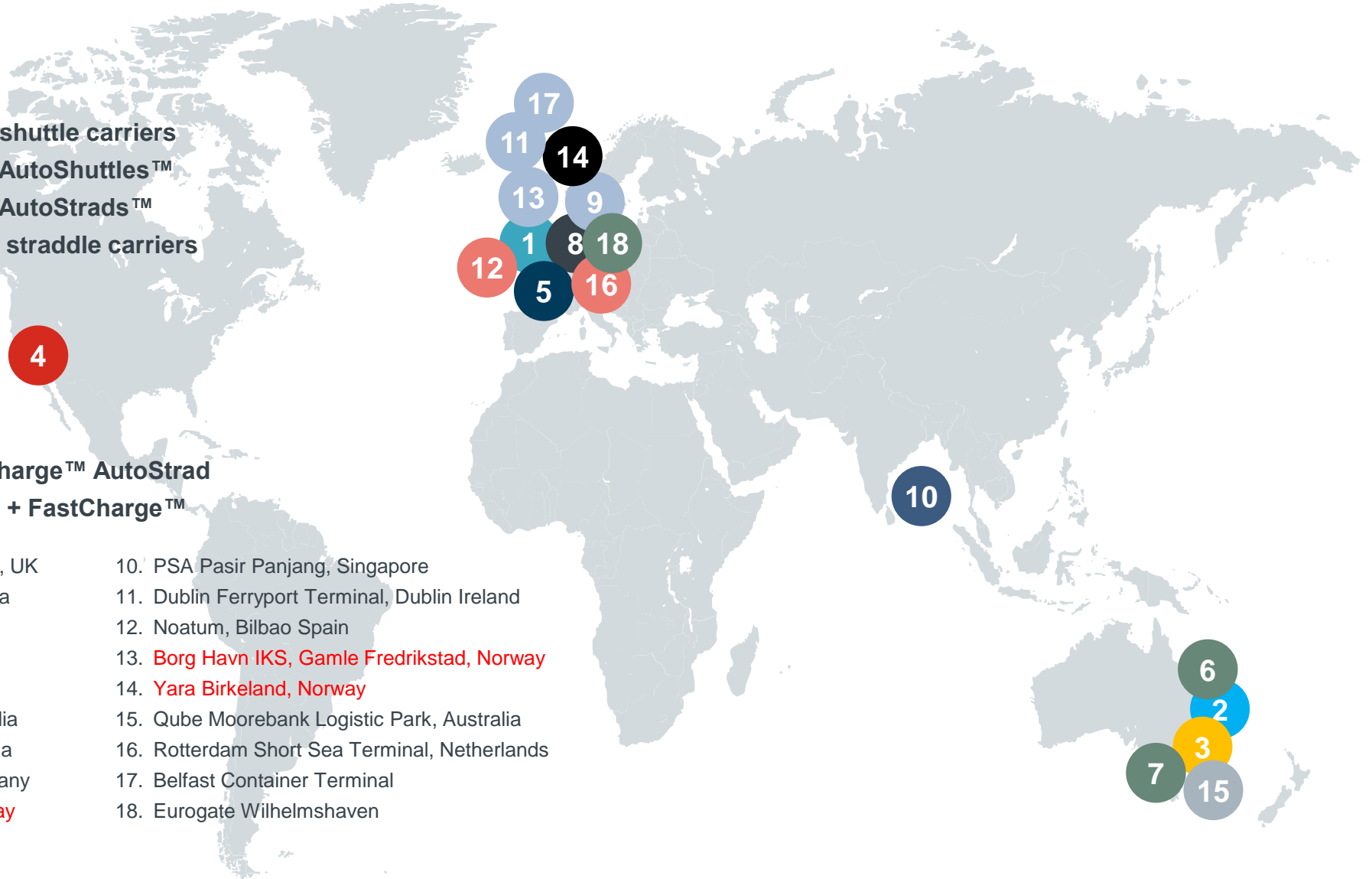




# Kalmar automated terminal references

- Kalmar ASCs and Kalmar shuttle carriers
- Kalmar ASCs and Kalmar AutoShuttles™
- Kalmar ASCs and Kalmar AutoStrads™
- Kalmar ASCs and Kalmar straddle carriers
- Kalmar AutoStrads™
- Kalmar ASCs
- Kalmar AutoRTGs
- Kalmar AGVs
- Kalmar AutoRMGs
- Kalmar AutoRMG + FastCharge™ AutoStrad
- Kalmar ASCs +AutoRMGs + FastCharge™

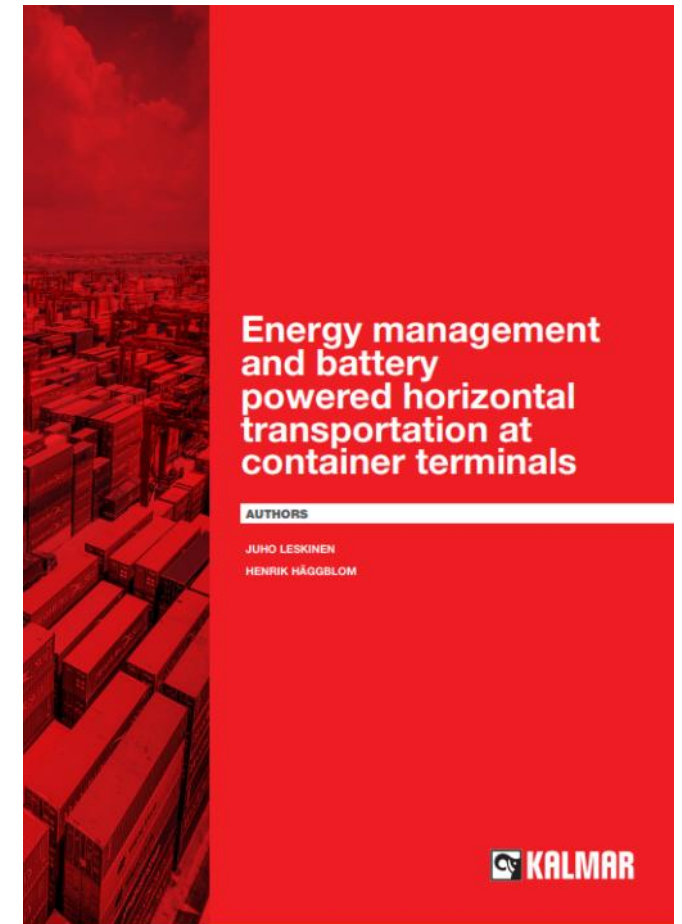
- |   |   |
|---|---|
| 1. DPW, London Gateway Terminal, UK           | 10. PSA Pasir Panjang, Singapore                    |
| 2. DPW Brisbane Terminal, Australia           | 11. Dublin Ferryport Terminal, Dublin Ireland       |
| 3. VICTL Melbourne, Australia                 | 12. Noatum, Bilbao Spain                            |
| 4. TraPac, Los Angeles, USA                   | 13. <b>Borg Havn IKS, Gamle Fredrikstad, Norway</b> |
| 5. ECT Delta terminal, Netherlands            | 14. <b>Yara Birkeland, Norway</b>                   |
| 6. Patrick terminal Brisbane, Australia       | 15. Qube Moorebank Logistic Park, Australia         |
| 7. Patrick Terminal Sydney, Australia         | 16. Rotterdam Short Sea Terminal, Netherlands       |
| 8. HHLA Container Terminal, Germany           | 17. Belfast Container Terminal                      |
| 9. <b>Yilport/Oslo Port Authority, Norway</b> | 18. Eurogate Wilhelmshaven                          |





# White papers for further reading

Kalmar white papers: <https://www.kalmarglobal.com/pressroom/whitepapers/>





# Summary

Our future is full electric and automated.

Three angles to eco-efficiency:

- › Systems efficiency
- › Eco-efficiency
- › Resource efficiency

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Making your every move count.



