



Decarbonization and Digitalization on port handling equipment

Mediterranean Ports and Logistics 2024, Trieste

29 May 2024

SIEMENS



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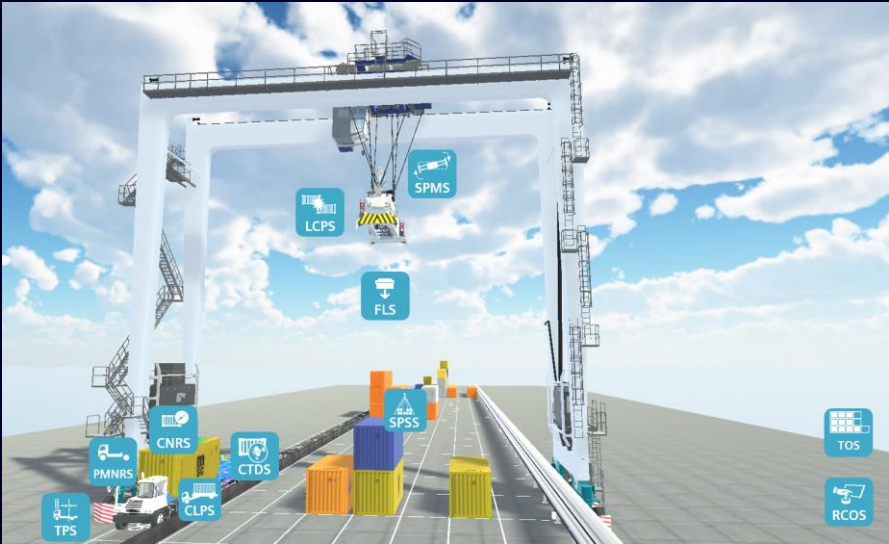
4 Decarbonization



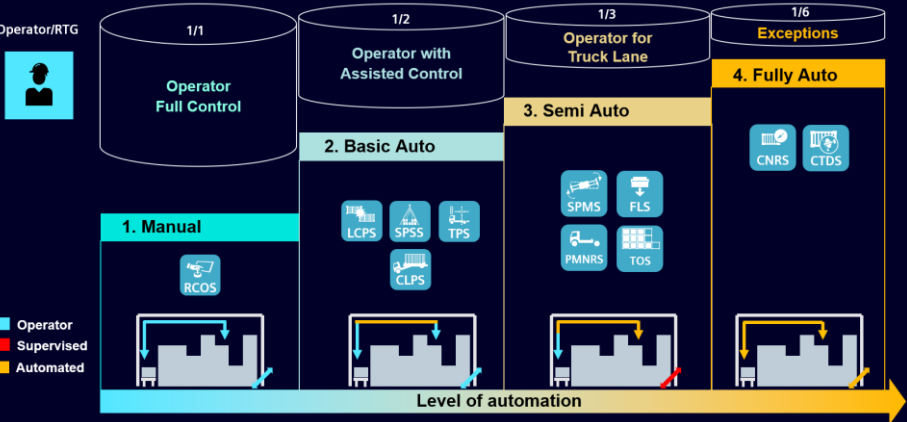
Crane Automation



Combination Sway control, active skew control, truck positioning



Automation steps ARTG



Equipment Logistics System (ELS)

Intelligent connection between TOS and equipment

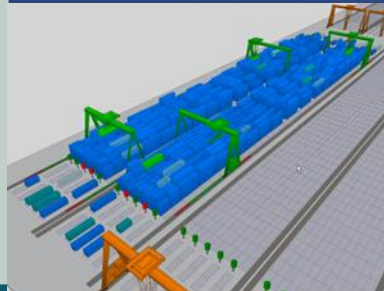
- Increased terminal performance
- Manage (pool of) move instructions
- Scheduling and dispatch in ELS
- Optimal use of resources
- Reduced waiting times
- 2D/3D visualization
- Real time KPI / status Reporting
- Silent system
- Modular – Scalability for growth

TOS



ELS – Equipment Logistics System

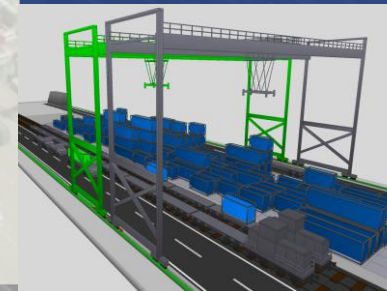
ELS Yard



ELS Quay



ELS Intermodal



ELS HT



Why Siemens remote operations?

Productivity comparable to
conventional cabin-controlled cranes



(Semi) Automation systems
New systems do not require human
operator 100% of the time



Comfortable environment



Operator's mobility: time
required to arrive at cranes (on
crane: no toilets, no coffee
machines)



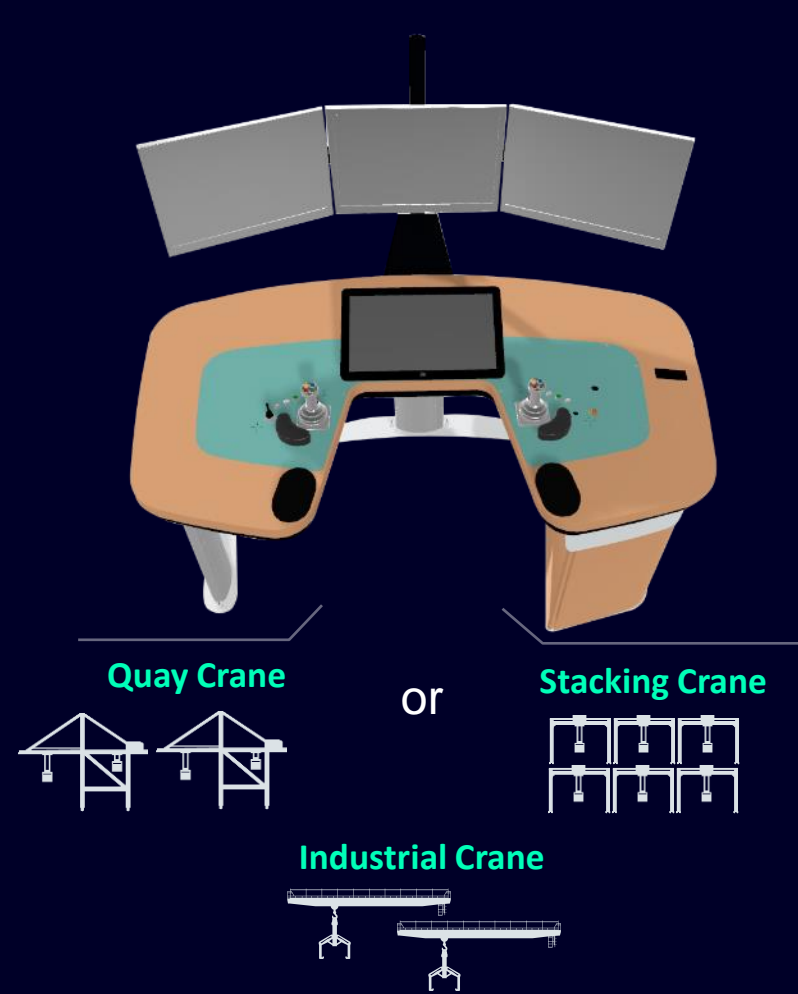
Operator safety - personal health
and welfare





Collaborative work place - crane
operator role becomes multilayered
and flexible




Highlights of Siemens RCOS Functionality




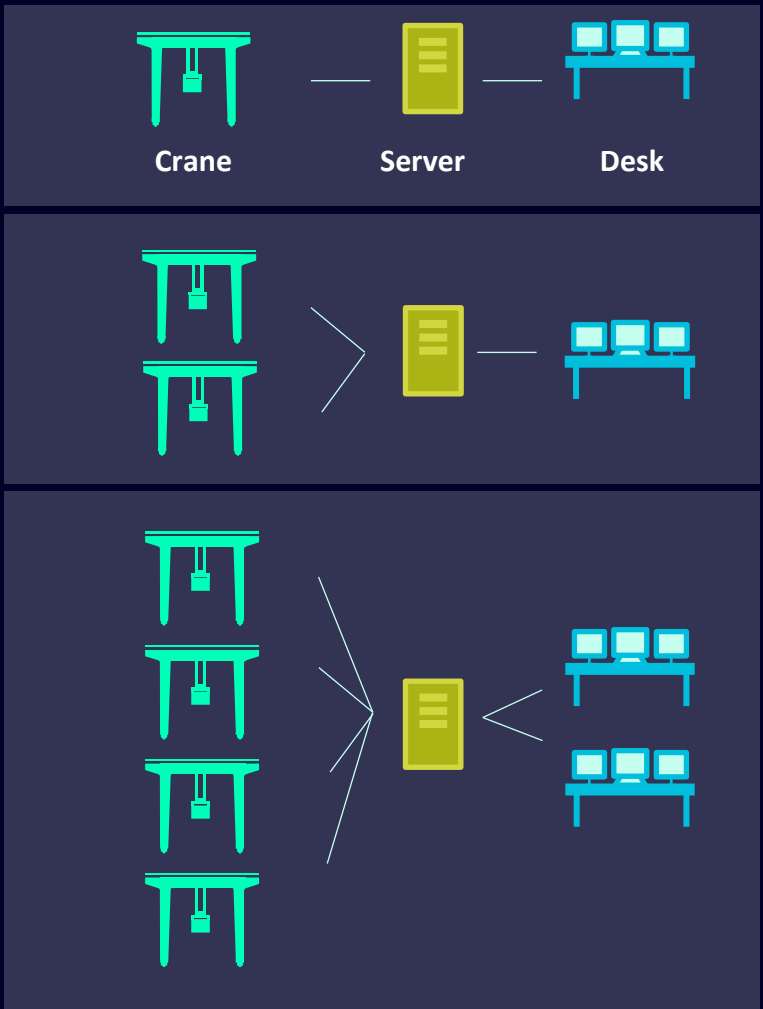
 **“Any to any”** operator connects to any crane from any desk.

 **“Pooling”** connects crane to a free desk when assistance is needed


 **“Decentral Concept”**
Decentral PLC software


- Redundant Server Pair
- No single point of failure


 **“Integration & Interfacing”**
can be applied to non-Siemens PLC’s, offers interfacing with TOS



Remote Control (RCOS) of a Crane


 Stress on human body
(neck/back)


 Transportation from and to cranes
required


 Reduced visuals due to increase
of ship size

 (Semi) Automation systems



 “Any to any” operator
connects to any crane from
any desk.

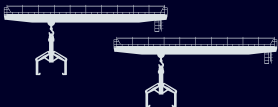
 “Pooling”
connects crane to a free
desk when assistance is
needed

 “Integration &
Interfacing”

Quay Crane



Industrial Crane



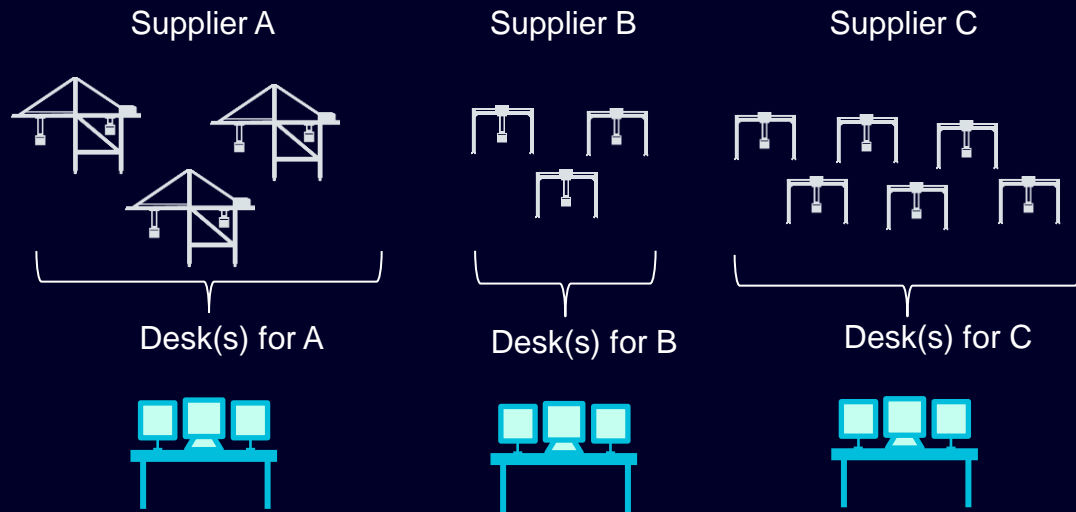
Stacking Crane



Agnostic to Crane supplier

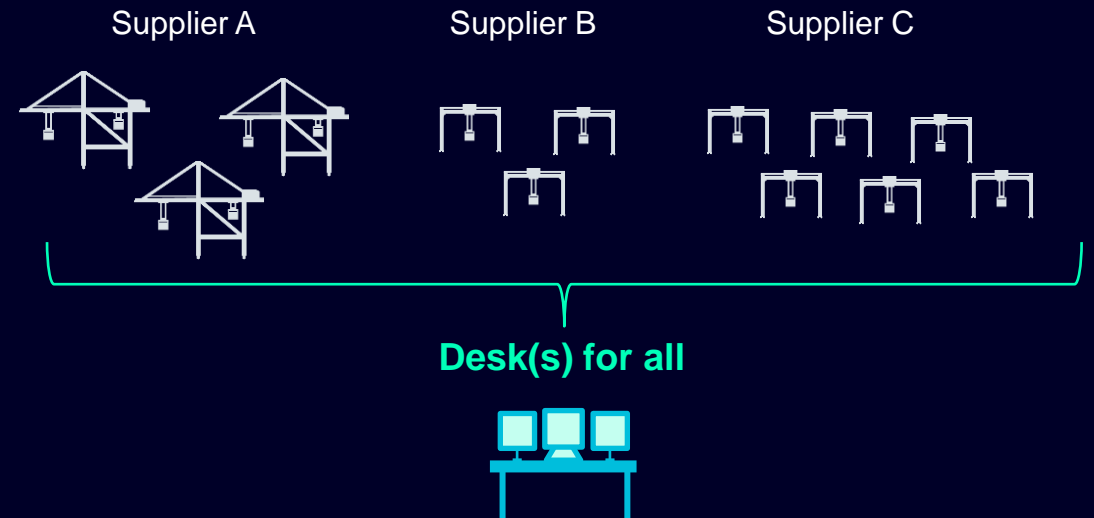
Remote Control Concept

Conventional solution



- End-user accepted proprietary solutions from different crane suppliers
- Desks of one supplier can only control cranes by this supplier
- No any-to-any possible
- No pooling of remote drives for whole fleet
- Multiple maintenance effort
- Higher complexity cybersecurity protection

Crane supplier agnostic solution



- End-user specified to different crane builder Simocrane RCOS module
- Any crane is controllable from any desk
- Pooling of remote drives for whole fleet
- Single system to be maintained
- Best situation for cybersecurity protection

Digitalization

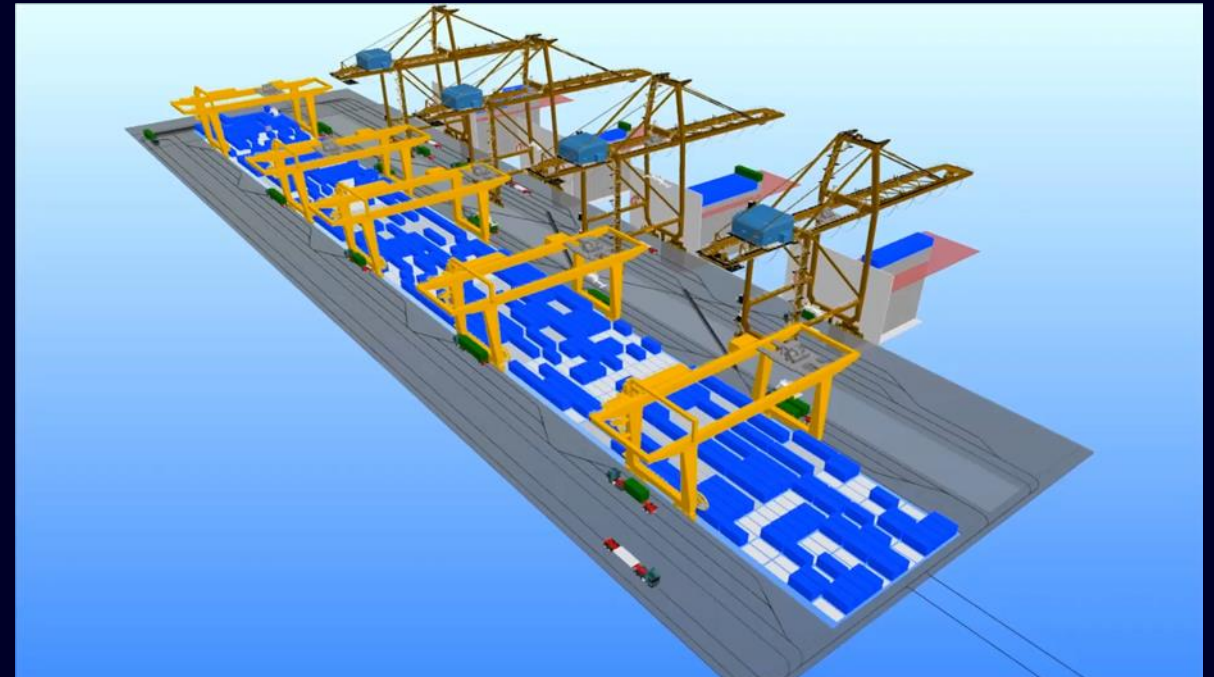
Digital Twin & Cranes simulation

Virtual commissioning, sensors on crane, operator training simulator

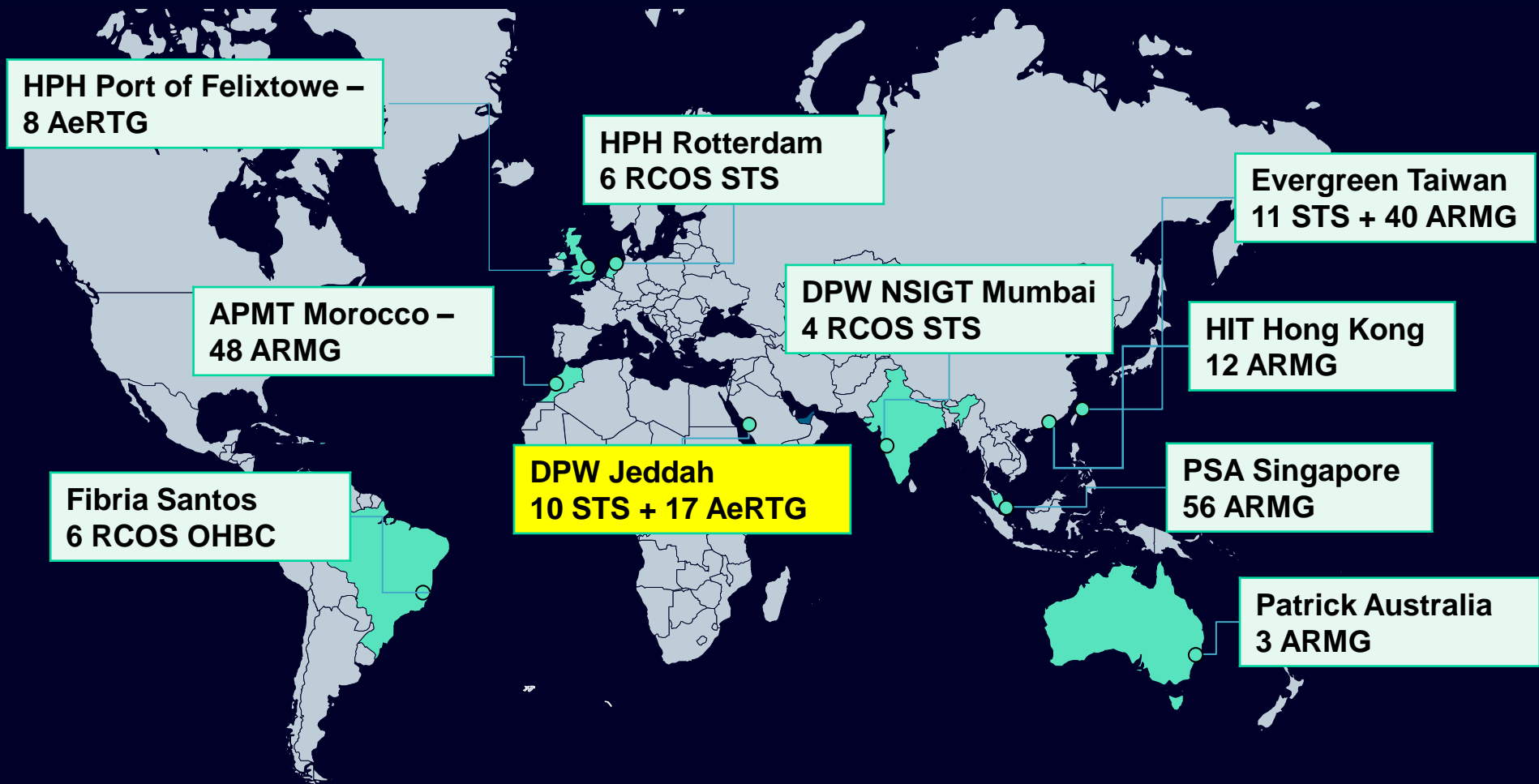


Logistic simulation

Optimize container flow throughout the terminal



Reference Projects



Modernization



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Product life cycle MASTERDRIVES – Notification of product phase-out

With its functionality, performance range and flexibility MASTERDRIVES has for years been a highly successful system for single and multiple motor applications for production machines, in general mechanical engineering and in all industries.

We wish to continue the success story with the new drives family SINAMICS. With SINAMICS you have a drive system with expanded modularity and functionality, e.g. Safety Integrated functions, or Drive Control Chart (DCC) for graphics configuration and extension of device functionality by means of freely available control, arithmetic and logic blocks.

As our partner and customer we wish to inform you of our plans for the coming years, in order to allow you as a user of MASTERDRIVES sufficient time to complete your migration to SINAMICS.

We are therefore giving notice, effective October 1, 2010, of intended product phase-out. On October 1, 2011 active marketing of the MASTERDRIVES range will cease. As from that date our comprehensive spare parts, repairs and after-sales service support will remain fully available. This way we wish to ensure availability of the drive systems installed in the field. The product will then be finally and completely discontinued as from October 1, 2020.

Our aim is to provide you with sufficient investment security for equipping your machines, and to ensure support for the drives installed in the field. Furthermore we wish to offer you an innovative successor product in the form of the new SINAMICS drive system.

U. Frank
Uwe Frank
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Dr. J. Brandes
Dr. Jürgen Brandes
I DT LD
14.07.2010

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At the end of any guarantee

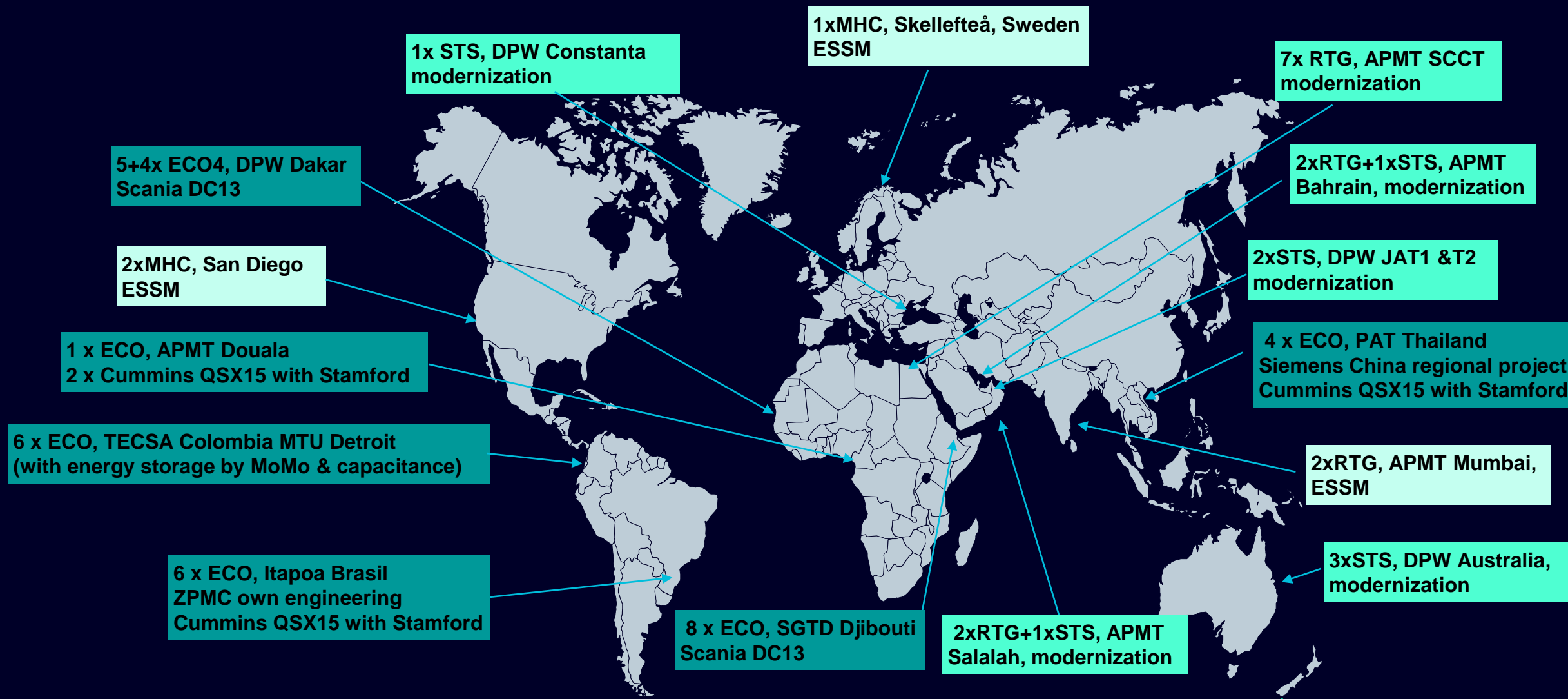
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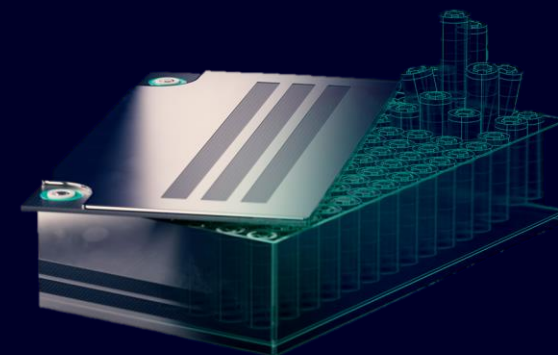
Reference projects





SIMOCRANE – Containerized Energy Storage System Solution

SIMOCRANE ESSM



Energy Storage System Management

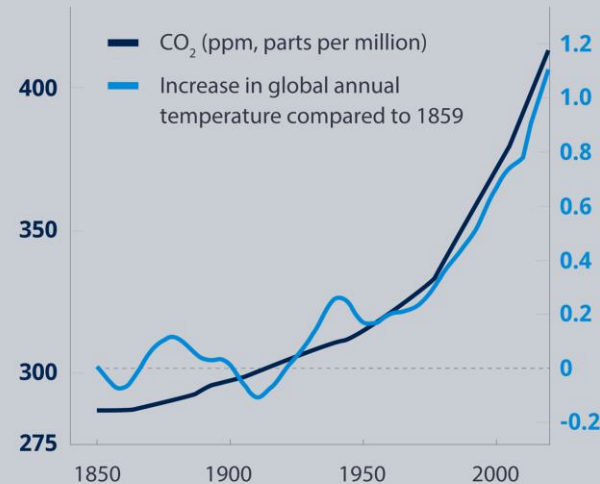
Global situation – the need for change

Global Facts

- Global CO₂ emissions are increasing
- Price per emitted ton of CO₂ is increasing
- Global annual temperature is increasing
- Prices for Lithium Ion Energy Storages at an all time low in terms of \$/ kWh

CO₂ heats the Earth

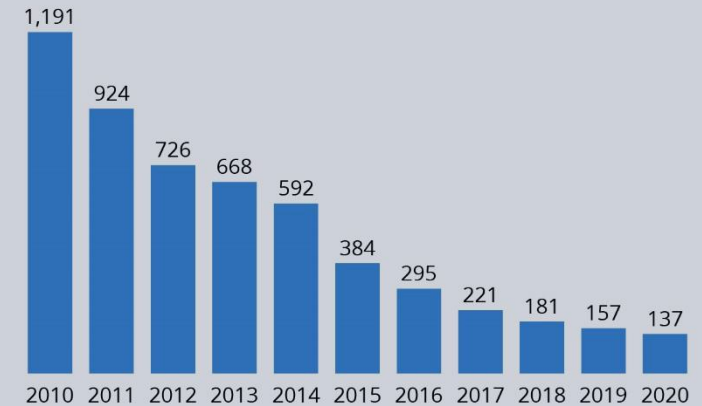
Temperature rise due to increased CO₂ in the atmosphere



Sources: NOAA, WMO, IPCC, Hadley Center / 2020

Lithium Battery Prices Plunge

Volume-weighted average of lithium-ion battery price from all sectors (in USD)



Source: Bloomberg



statista

Energy Storage System Management

Decarbonization of port infrastructure in focus

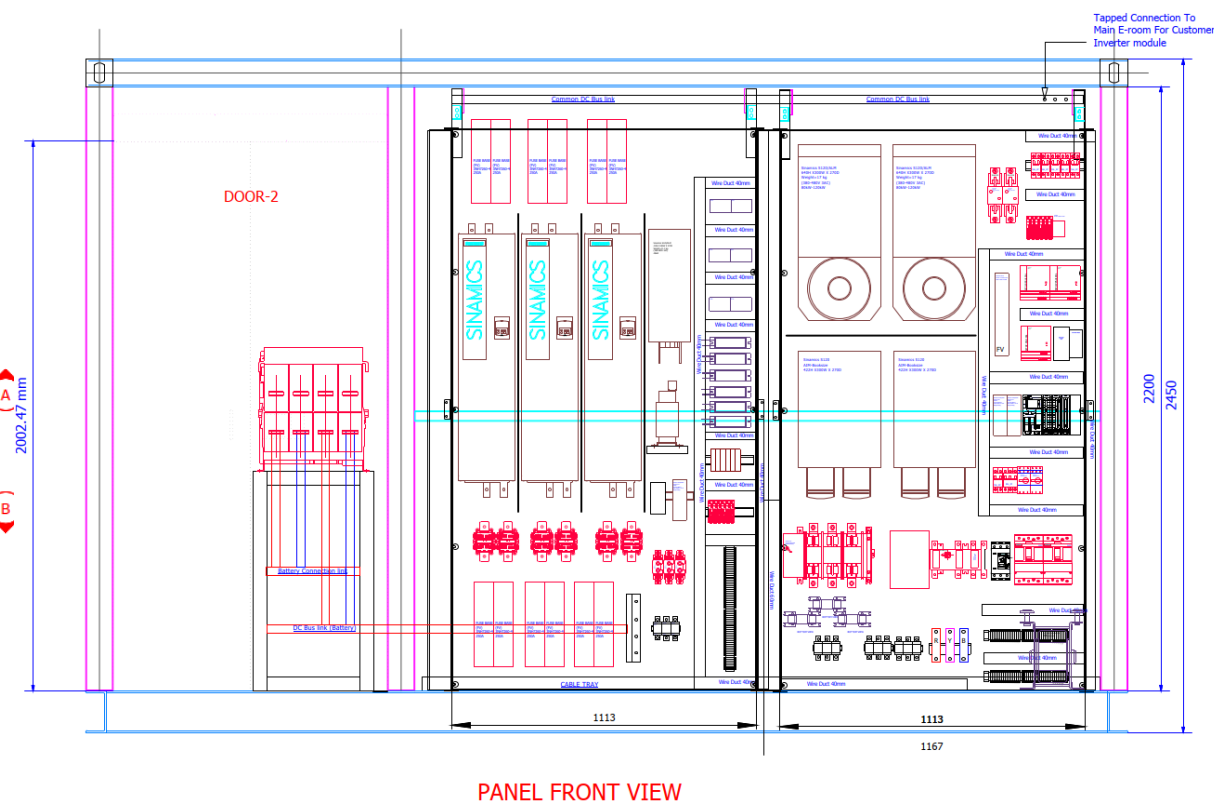
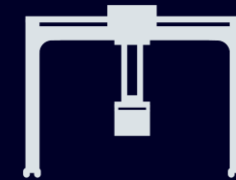
Facts

- RTGs, HMCs & Straddle Carriers represent a major part of the total fuel consumption for a port (~ 50- 60%)
- Each conventional RTG produces ~240 tons of CO₂ per year
- Recuperative energy cannot be reused without energy storage possibility



International Maritime Organization established a goal of reducing GHG emissions from the shipping sector globally by 50 percent by 2050 from the 2008 level.

PRELIMINARY



Decarbonization of 2x RTG

New efficient Volvo Engine with Stamford Generator @125kVA in combination with 90kWh LH-ION Battery installed in the original frame to replace the old 670kVA Gen-set



50,4%

savings achieved

18,4l/h → 9,125l/h
during 24h endurance
test @41t

Performance

- ✓ DG downsized to ~1/6th of the original size. The new DG is running @75kW Start-Stop Automatic (only used for recharging the battery)
- ✓ Total regenerative energy from lowering & braking is recuperated into the battery system
- ✓ Reduced noise emissions
- ✓ No performance change for the customer
- ✓ Emergency operation for operation only on DG with reduced speeds is implemented



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