



**The greenest  
energy** is the energy  
we don't use

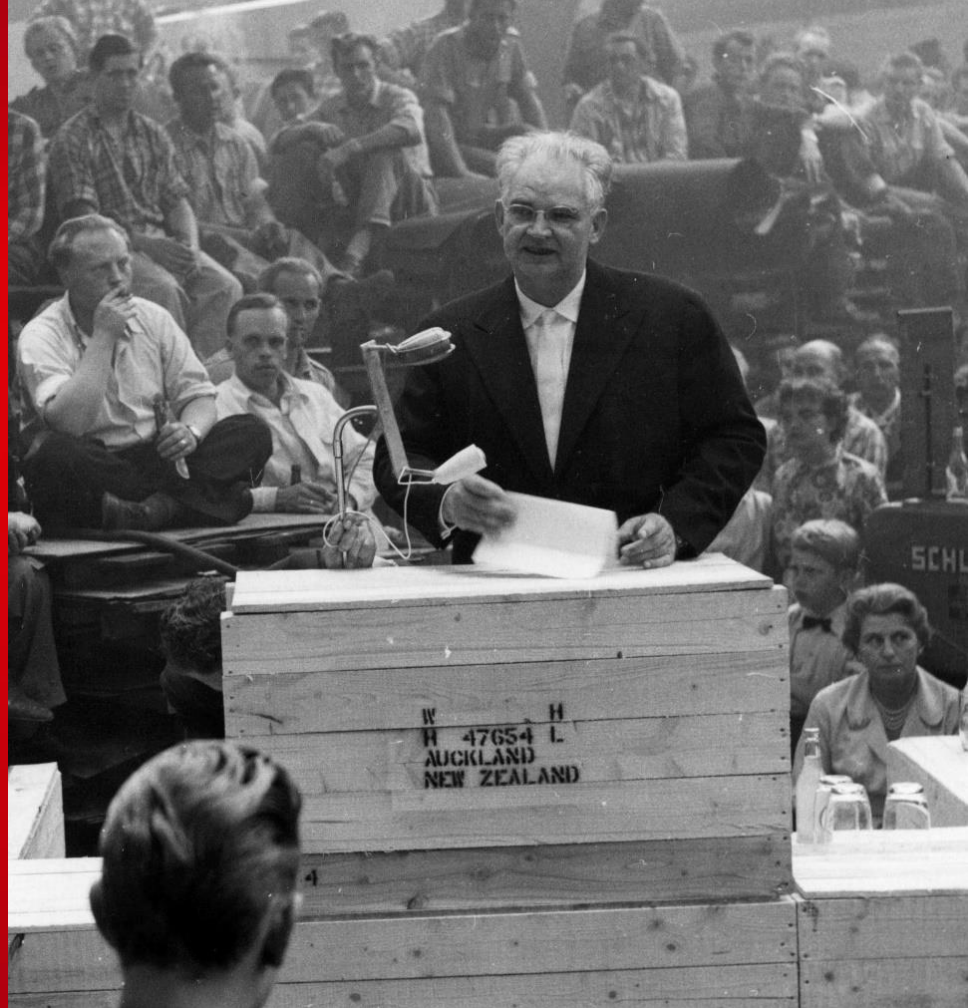
**Welcome to Danfoss**

ENGINEERING  
TOMORROW

*Danfoss*

# “Action speaks louder than words”

Mads Clausen





# Our Purpose

## – Decarbonizing with our customers

**Our unique products and solutions provide real value to our customers** through sustainable innovation and leading application know-how, to support them in their journey towards decarbonization in an **intelligent and cost-efficient way.**

We continue on **our own decarbonization journey.**

# Danfoss at a glance

Three strong business segments with leading positions

Danfoss  
**Power Solutions**

**1933**

Long track record  
within innovative  
engineering

Danfoss  
**Climate Solutions**

Worldwide sales in  
more than  
**100 countries**

Danfoss  
**Drives**

**40,043**

employees

**95**

factories

Preferred partner in **helping our customers** decarbonize



# Our world

## Danfoss Power Solutions



Construction



Industry



On-Highway



Agriculture

## Danfoss Climate Solutions



Residential Heating



Cooling



District Heating

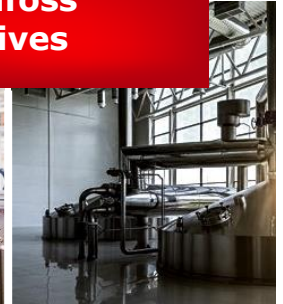


Air Conditioning

## Danfoss Drives



Industry



Brewery

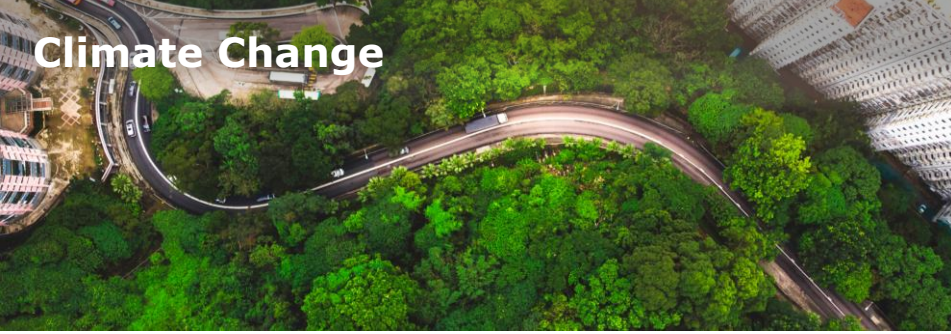


Automotive

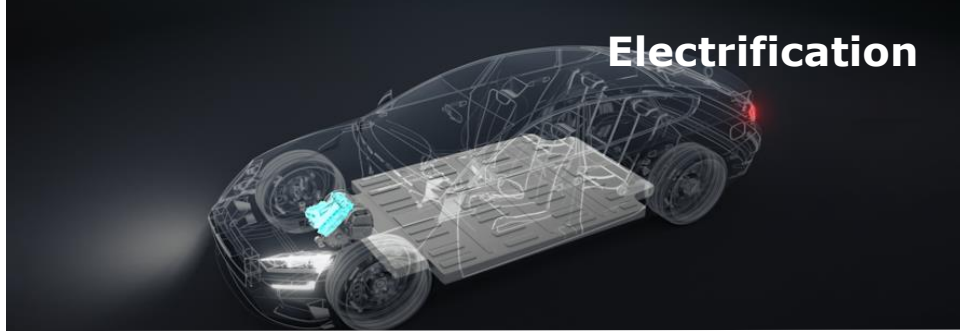


HVAC

**Climate Change**



**Electrification**



**Urbanization**



**GLOBAL MEGATRENDS**

Transforming our world

**Food & Water Supply**



**Digitalization**



# Danfoss Power Solutions

– Strong organic growth of 30% and additional sales from Eaton Hydraulics

## Highlights

**3.2**

Sales, EURbn  
(2020: 2.0)

**489**

EBITA, EURm  
(2020: 329)

**15.3**

EBITA margin, %  
(2020: 16.8)

**19,061**

Employees  
worldwide

**53**

Factories in  
19 countries

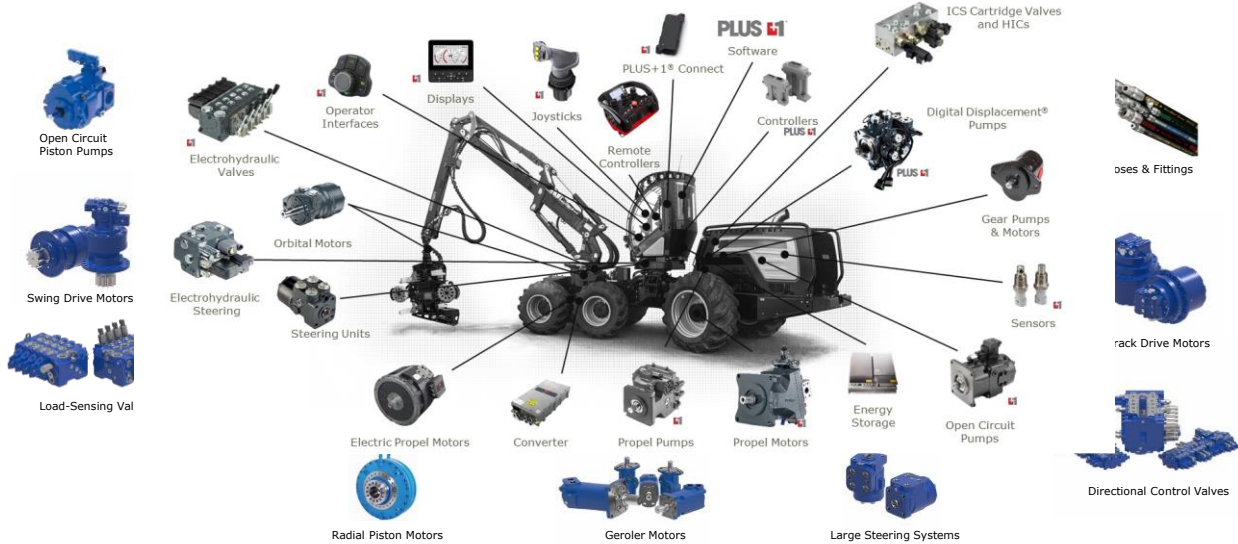
**Focus  
2022**

- People
- Supply chain
- Product portfolio



# Danfoss: Innovative solutions for the future

Unmatched systems capability with hydraulics, fluid conveyance, electrification, and software



### Industrial hydraulics

### On-highway & Marine





ENGINEERING  
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# Danfoss EDITRON

EDITRON



## MARINE

- SUPER YACHTS (max. 100 m)
- FERRIES (small and middle, tugboats, river ferries, catamarans)
- WORK BOATS (fishery, patrol, special and rescue)



## OFF-HIGHWAY

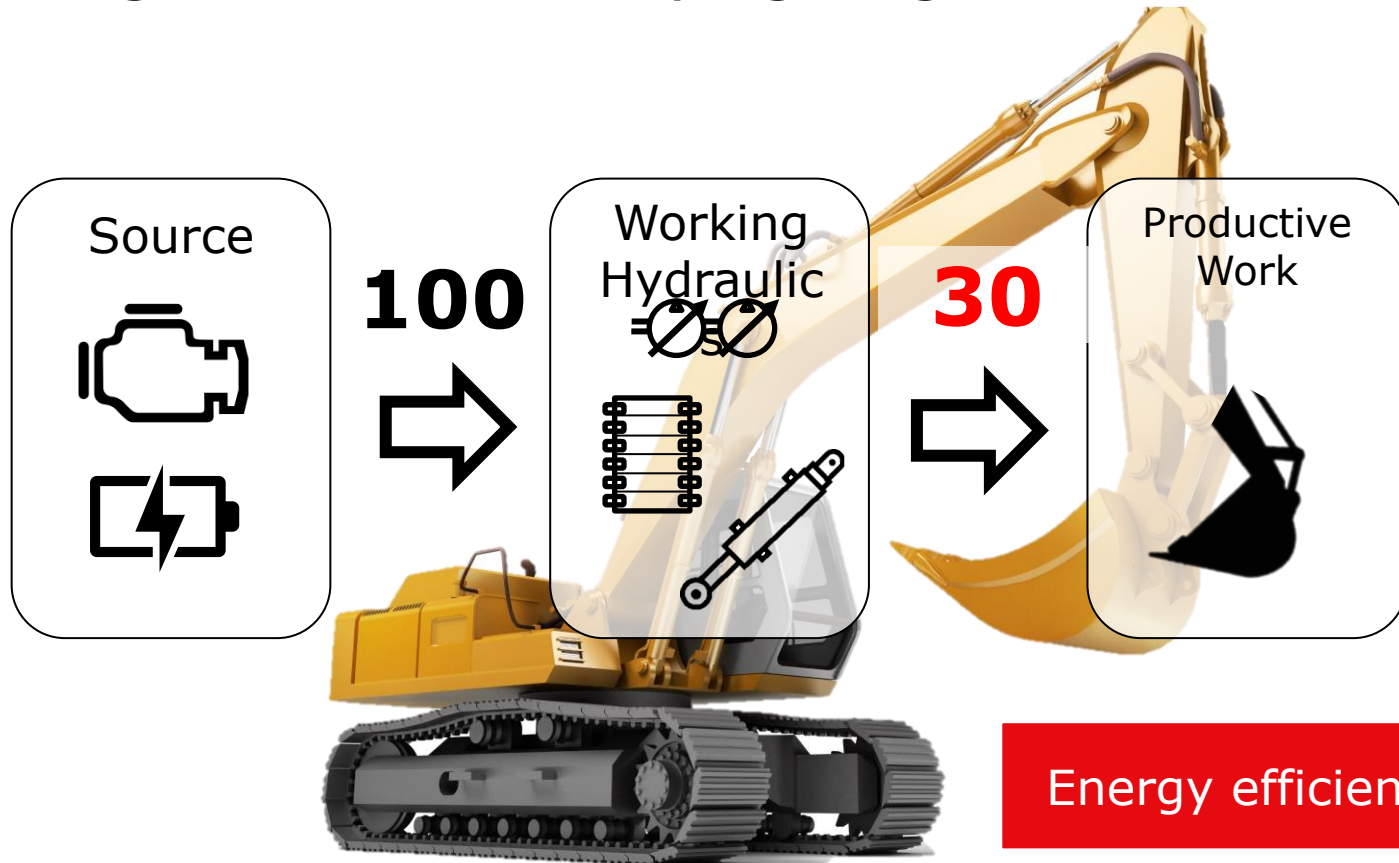
- CONSTRUCTION SITE EQUIPMENT (wheel loaders and excavators)
- HARBOUR and AIRPORT EQUIPMENT
- MINING
- MARINE, OIL AND GAS



## ON-HIGHWAY

- BUSES (coach, school, transit)
- TRUCKS (MD, HD)

# Challenges when electrifying larger machines

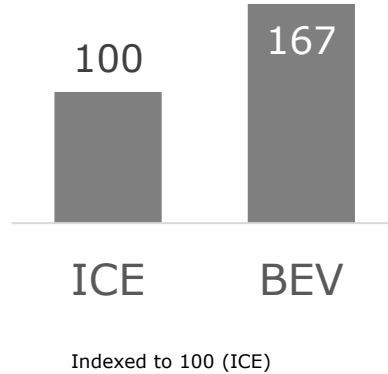


# What is the barrier towards electrifying medium and heavy construction machinery?

Total Cost of Ownership:

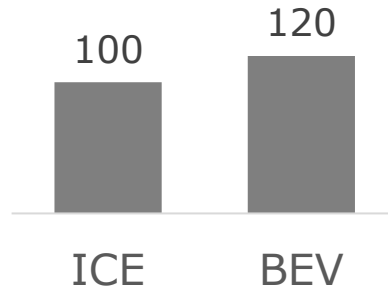
## Current State

Low Volume  
Dealer Conversions  
High battery cost  
(€500/kWh)



## Future State

High Volume OEM Production  
Lower battery cost  
(€300/kWh)



## Example: 25t Excavator



Danfoss with solutions to improve hydraulic efficiency!

# Offering: EDITRON SYSTEMS

Full electric and hybrid systems

## SYSTEM BENEFITS:

- Lower fuel/energy consumption
- Reduced CO2 and small particle emissions
- Space and weight savings
- Allows integration into various different systems

## ELECTRIC CONVERTERS



## SOFTWARE PLUS

## ELECTRIC MACHINES



## SUB SYSTEMS



## THE EDITRON SYSTEM

ELECTRIC  
CONVERTERS  
EC

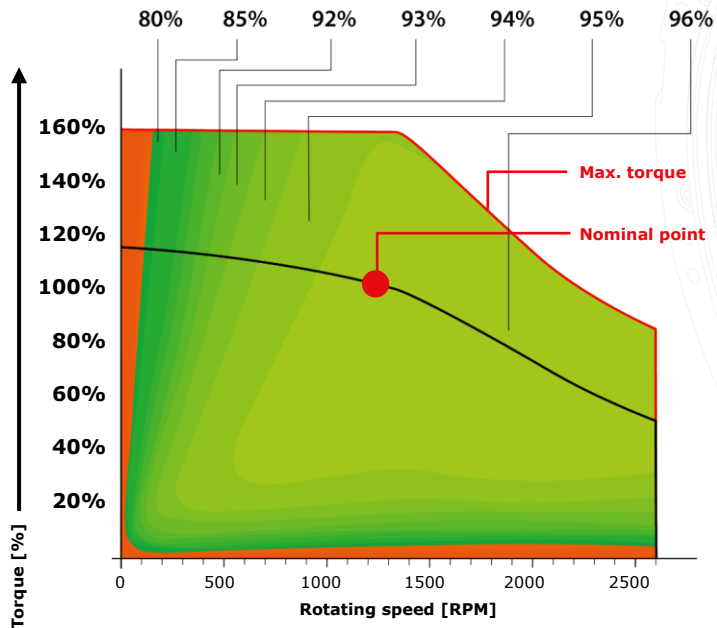
ELECTRIC  
MACHINES  
EM

SW  
SOFTWARE

ED  
SUB SYSTEMS

# Electric Machines

Highest efficiency on the market!



- High efficiency on wide operating range
- Loads are usually cyclic and machines are operated at different speeds and torque loads
- Efficiency should be looked at over the whole operation and not only a single operating point
- Higher efficiency: **less batteries** or **less fuel** for same operation

PRODUCTS

APPLICATIONS

DELIVERY TRUCK

CITY BUS

# Danfoss Editron | Applications

# ON-HIGHWAY



# DELIVERY TRUCK

## FULL ELECTRIC

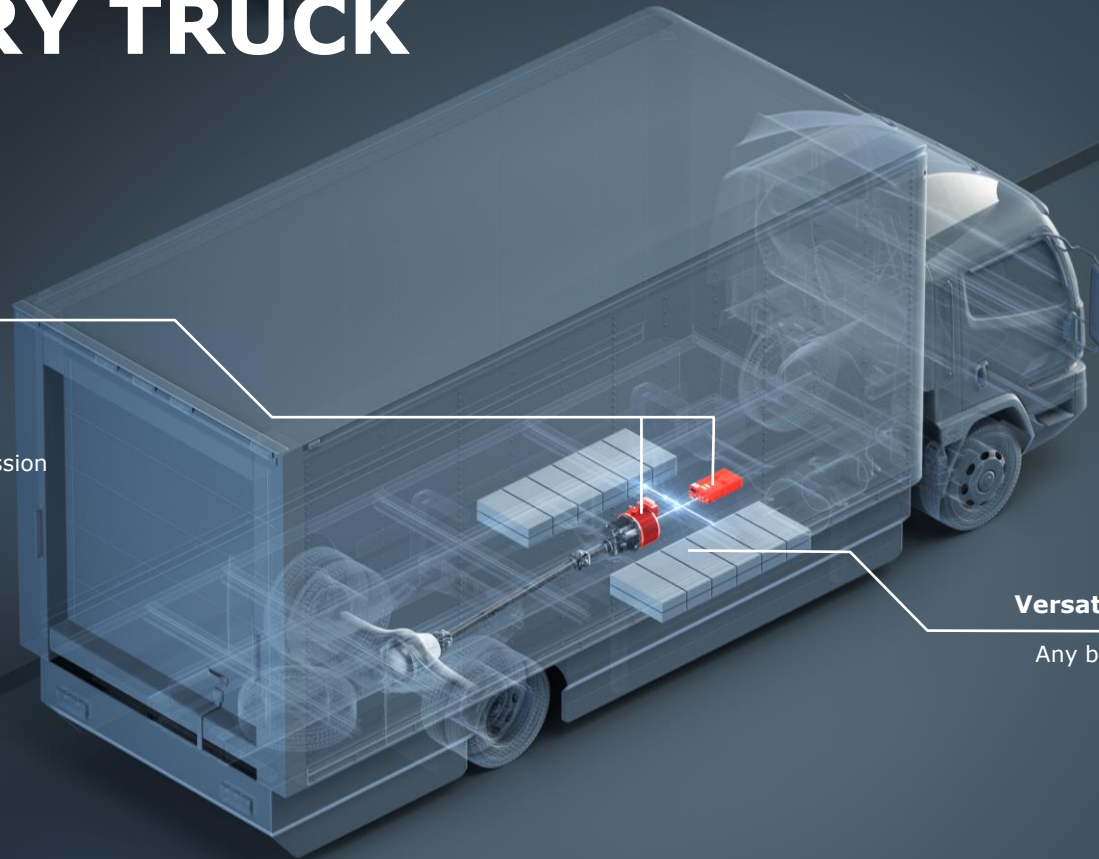
### Traction System

ED-DT (Drivetrain) system

1x **EM-PMI**

1x **EC-C**

Single or multi-speed transmission



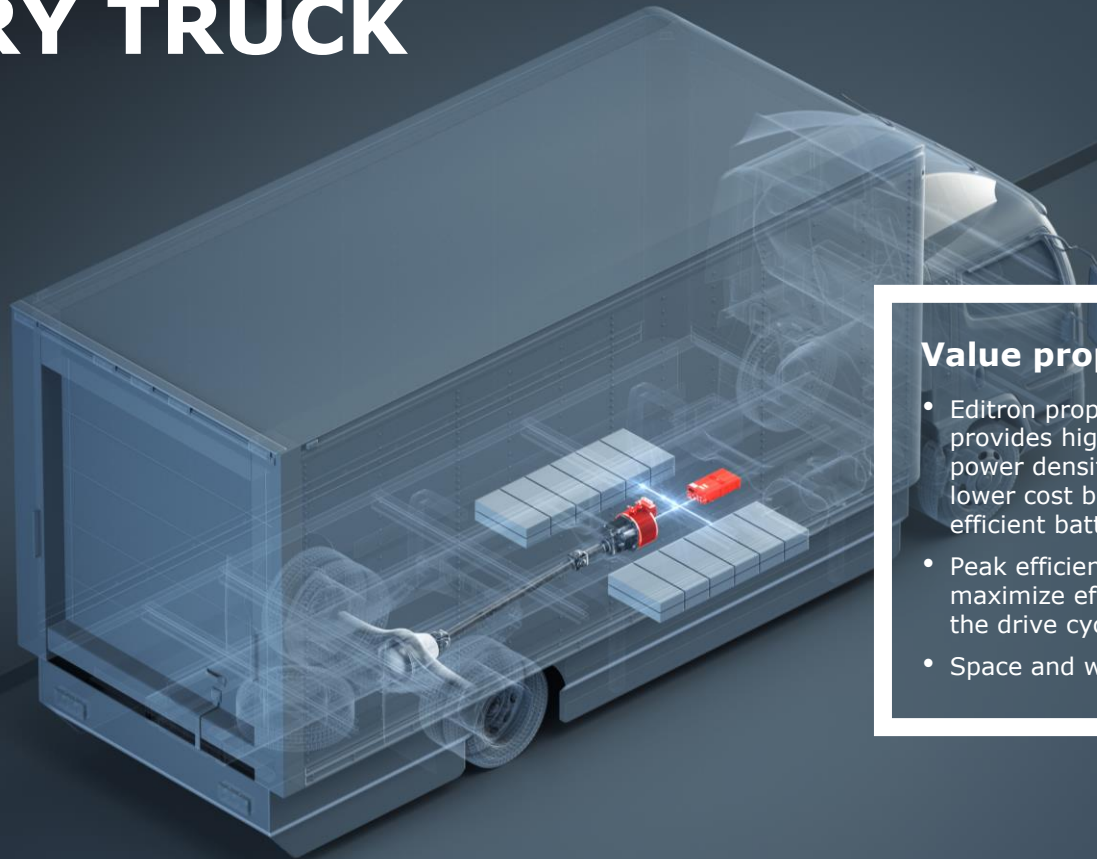
### Versatile energy storage

Any battery type or fuel cell



# DELIVERY TRUCK

FULL ELECTRIC



## Value proposition

- Editron propulsion system provides high torque and power density and leads to lower cost basis and more efficient battery use.
- Peak efficiency designed to maximize efficiency throughout the drive cycle
- Space and weight savings

# Accelerating **electrification**

Today more than 24% of global CO<sub>2</sub> emissions come from the transport sector

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Electrification technologies have the potential to significantly lower emissions

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Danfoss manufactures and delivers the world's most sophisticated hybrid and fully electric drivetrains for the on- and off-highway and marine sectors

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Danfoss is part of developing the next-generation, zero-emission electric powertrain for heavy-duty vehicles, providing the high-power electric motor and high-efficiency silicon carbide inverter



**> 24%**  
global CO<sub>2</sub>  
emissions are  
from transport  
sector

# TAIWAN'S FIRST ALL-ELECTRIC BUS ROUTE

**100%**  
**Reduction**  
**in carbon**  
**pollution**

**75%**  
Efficiency  
improvement  
(kWh/100km)

# Danfoss Editron | Applications

# OFF-HIGHWAY



# WHEEL LOADER

## FULL ELECTRIC

### Work function

- 1x **EM-PMI** motor
  - Power range up to **750kW**
- 1x **EC-C** inverter
  - Power range up to **1200kW**

### HYDRAULIC PUMP

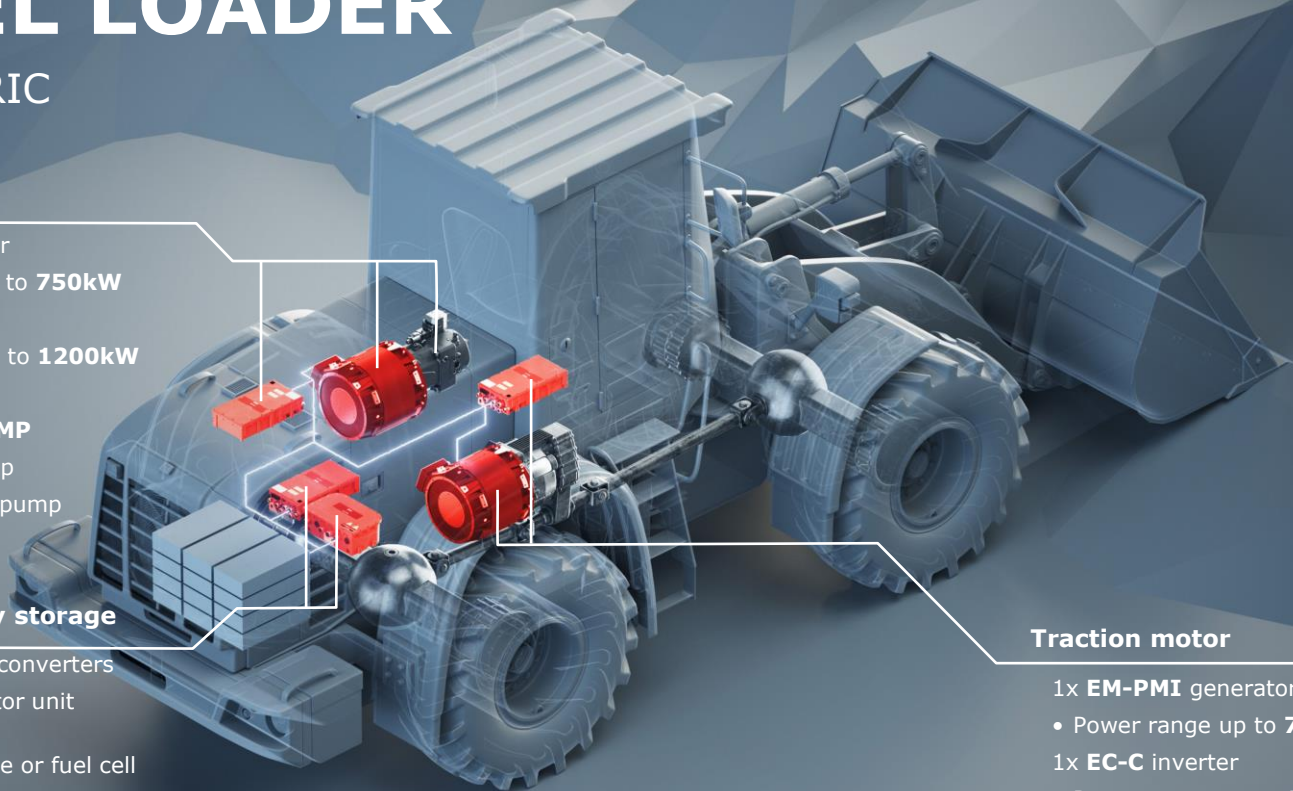
- Open** circuit pump
- or **Closed** circuit pump

### Versatile energy storage

- 1x **EC-C DC/DC** converters
- 1x **EC-LTS** inductor unit
- Energy storage
  - Any Battery type or fuel cell

### Traction motor

- 1x **EM-PMI** generator
  - Power range up to **750kW**
- 1x **EC-C** inverter
  - Power range up to **1200kW**



# WHEEL LOADER

FULL ELECTRIC

**INCREASED  
OVERALL  
PRODUCTIVITY**

## Value proposition

- Editron propulsion system provides highest torque and power density, which leads to lower cost basis and more efficient battery use
- Peak efficiency designed to maximize efficiency throughout the drive cycle
- Space and weight savings

# ZERO EMISSION CONSTRUCTION SITES IN NORWAY



Cities expand  
**10,000 m<sup>2</sup>**  
every minute

**20%**  
of all CO<sub>2</sub>  
emissions in Oslo  
come from diesel  
use in  
construction  
machinery

## Minca 5.1. Second generation electric mine vehicle

**Manufacturer: Hermann Paus  
Maschinenfabrik GmbH (Germany)**

Type: Electric  
In market since 2019

### **SCOPE OF DELIVERY**

- EM-PMI motor
- EC-C inverter
- EC-IDC battery charger

### **MAIN BENEFITS**

- Health protection for workers through emission-free mobility
- Total Cost of Ownership improved through lower fuel and ventilation costs
- Up to 50 percent lower fuel costs





# Electrification demo projects at the ADC's



## Electric Wheel Loader

Nordborg, Denmark



## Electric Backhoe Loader

Ames (IA), USA



## Electric Roller

Haiyan, China



## Danfoss Application Development Centers

- Nordborg, Denmark
- Ames (Iowa), USA
- Haiyan, China

PRODUCTS

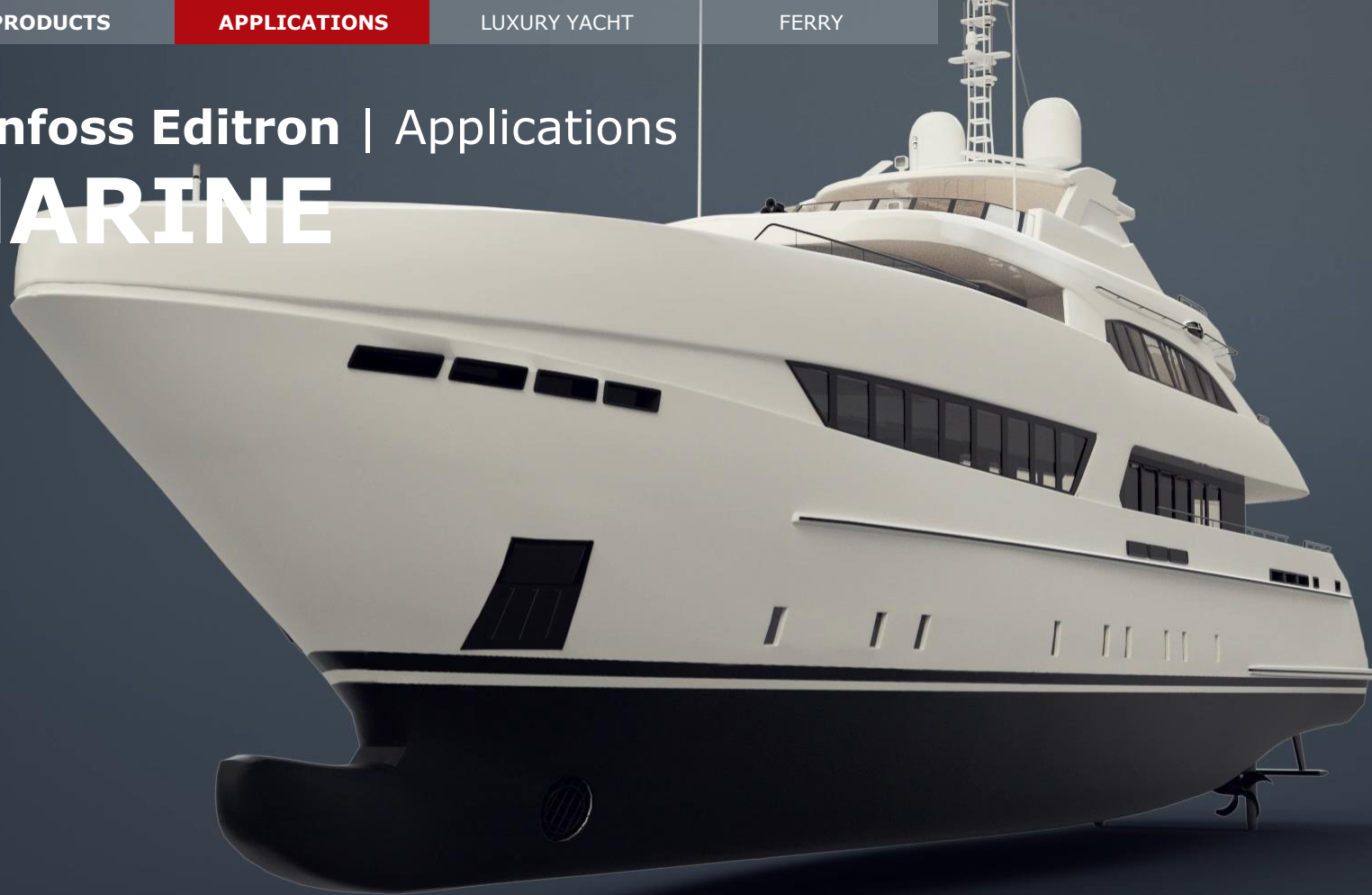
APPLICATIONS

LUXURY YACHT

FERRY

# Danfoss Editron | Applications

# MARINE



# FERRY

## SERIAL HYBRID

### Variable speed diesel genset

- 2x **EM-PMI** motors
  - Power range up to **6 MW**
- 2x **EC-C** inverters
  - Power range up to **1.5 MW**

### Propulsion drive

- 2x **EM-PMI** motors
  - Power range up to **6 MW**
- 2x **EC-C** inverters
  - Power range up to **1.5 MW**

### Versatile energy storage

- 2x **EC-C DC/DC** converter
- 2x **EC-LTS** inductor unit
- Energy storage
  - Any battery type or fuel cell

# FERRY

## SERIAL HYBRID

Reductions in  
weight and  
space up to

**50%**

### Value proposition

- Compact and lightweight
- Fuel savings achieved with variable speed generators and efficient propulsion machines
- Enables many different type of propulsion and power plant configurations
- Class approved decentralized DC-grid design
- Significant reductions in
  - weight
  - footprint
  - cabling
  - and fuel compared to traditional AC based systems in hybrid vessels



**2,000**  
ton CO<sub>2</sub>  
reduction

Ellen,  
the longest  
ranging fully  
**electric ferry**  
in the world

The world's most powerful fully electric ferry will save 2,000 tons CO<sub>2</sub> per year and is powered by a Danfoss drivetrain

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# Reducing emissions at sea

Danfoss Editron division is partnering with Volvo Penta on electrification at sea

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We are delivering the highest quality future-proof technology customers and helping our customers decarbonize

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Hybrid ships can be operated using only electric power from battery for a limited time or by using battery and diesel engines



**20%**

reduced fuel consumption and CO<sub>2</sub> emissions

# Reducing emissions at sea

Danfoss Power Solutions' Editron division has been chosen to provide drivetrain systems for three hybrid passenger ferries that will operate on the Elbe River in Hamburg, Germany.

Hamburg is part of the Carbon Neutral Cities Alliance and has set a goal of achieving a 55% reduction in emissions by 2030, with a minimum reduction of 95% by 2050.

**29%**

2018 transport sector contribution (carbon emissions)





**ENGINEERING  
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