

EDITRON

ENGINEERING  
TOMORROW

*Danfoss*

# 2025/09/11 BF Veturi – Danfoss Fossil Free Future program

Tommi Kankaanranta, Global Technology Manager / R&D



# Danfoss at a glance



Worldwide sales  
in more than

**100**  
countries

Three strong business segments  
with leading positions

**Power Solutions**

**Climate Solutions**

**Power Electronics and Drives**

Leading technology  
partner for our  
customers who want to  
decarbonize through  
energy efficiency,  
machine productivity,  
low emissions, and  
electrification

**+39,000**

Employees worldwide.  
People are the foundation  
of our business



Well on the way towards  
carbon-neutral global  
operations by 2030

**97** 

Factories in more than  
20 countries

**1933**

Long track record within  
innovation and engineering

# Danfoss transports you to FOSSIL FREE FUTURE



**Electrification of the all forms of transportation is critical for carbon neutrality.** This includes moving machines, heavy traffic, and marine transportation, since a major part of CO<sub>2</sub> is produced by them.

**Carbon neutral fuels** are also crucial. Their development includes power to X (PtX) solutions in which production of green hydrogen has a critical role.

Danfoss Fossil Free Future and **Intelligent Power Electronics ecosystem** concentrate on the technologies enabling fossil free transportation and smart management of energy.

**We are looking for innovative partners to join our ecosystem for all areas of transportation and smart energy, and invite you to join our ambitious journey towards Fossil Free Future**

## MISSION:

To **lead, guide and support** an ecosystem in which power electronics form the basis for developing fossil free solutions for electric transportation at all levels

## VISION:

Tomorrow's transportation is **intelligent, sustainable and effective** by virtue of new fossil free solutions

# Intelligent power electronics are a vital part of Fossil Free Future transportation



**Intelligent Power Electronics Ecosystem will drive smart, sustainable, and cost-effective use of energy and strengthen the Ecosystem's competitive advantage in the global market**

**POWER ELECTRONICS ARE A CRITICAL ENABLER FOR ELECTRIFICATION AND PTX SOLUTIONS**

WITH POWER ELECTRONICS WE CAN MAKE THE ENERGY CONVERSION INTELLIGENT AND OPTIMISED, AND THEREFORE SIGNIFICANTLY INCREASE ENERGY EFFICIENCY, REDUCE ENERGY CONSUMPTION, AND OPTIMISE OUR USE OF ENERGY

WITH SMART POWER ELECTRONICS WE CAN OPEN SIGNIFICANT NEW POSSIBILITIES TO CRITICALLY IMPROVE ELECTRICAL PROCESSES

ENERGY PROVIDERS AND USERS ARE TYPICALLY UNABLE TO PROVIDE SMART INTELLIGENCE

**SMART POWER ELECTRONICS**

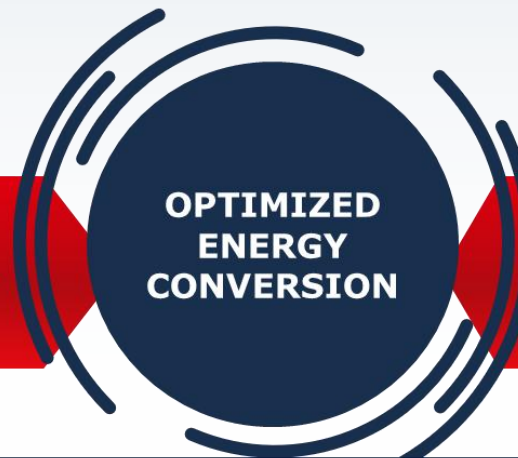
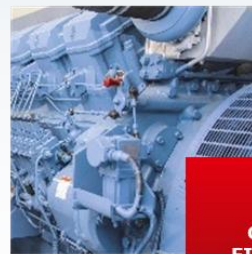
PROVIDE THE INTELLIGENCE AND OPTIMIZATION REQUIRED BY NOVEL ELECTRIFICATION SYSTEMS

ENERGY USERS GET TO EMPLOY INTELLIGENTLY OPTIMIZED ENERGY SYSTEMS



**ENERGY PROVIDERS, GRID**

MOTORS, BATTERIES, SUPERCAPACITOR, RENEWABLE ENERGY SOURCES, ETC.



**ENERGY USERS, GRID**

CHARGING, ELECTROLYSERS, BATTERIES, ETC.



# Forefront of Fossil Free Future - New and intelligent solutions

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**HIGHLY EFFICIENT SMART POWER ELECTRONICS,  
DIGITALISATION, AND SUSTAINABILITY**



**OFF-HIGHWAY VEHICLE ELECTRIFICATION, SMART ENERGY  
STORAGE SOLUTIONS, AND CHARGING INFRASTRUCTURE**



**EFFICIENT AND COST-COMPETITIVE GREEN HYDROGEN  
PRODUCTION**

# Emissions



CO<sub>2</sub><sup>1</sup>

- Construction industry machinery estimated ~1.1% of the global emissions



NO<sub>x</sub><sup>2</sup>

- Mobile work machines one of the main sources in transportation sector



Noise<sup>3</sup>

- Construction site emissions originating from e.g. internal combustion engines (ICEs), impact hammers, etc

<sup>1</sup> IDTechEx, 2022. [Electric Construction Machines Vital for Greener Construction](#)

<sup>2</sup> MDPI, 2022. [Research on Mobile Machinery NOx Emission Control Based on a Physical Model and Closed-Loop Control](#)

<sup>3</sup> John Deere, 2023. [Electrification of Construction Equipment | John Deere CA](#)

# Climate Neutrality



## Targets

- Finland 2035
- EU 2050



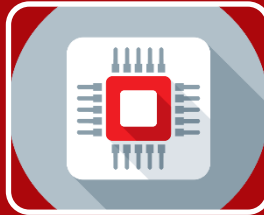
## Implications <sup>4</sup>

- Decarbonization of customer operations
- Fossil-based economy to sustainable one
- Emission reductions

<sup>4</sup> VTT, 2023: [Future Electrified Mobile Machines](#)

# Electrification Journey

Development in phases <sup>5</sup>



## Internal combustion engine (ICE) to hybrid-electric powertrains

- Reduction in CO<sub>2</sub> and NO<sub>x</sub> emissions
- Fuel savings



## Electrically assisted or fully electric subsystems

- Improvements in energy efficiency
- Recuperation of energy



## Transition to fully electric solutions

- Emission free operation

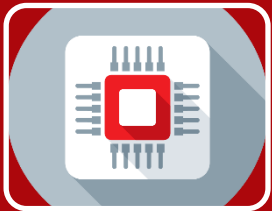
<sup>5</sup> LUT University, 2023. BEACON research plan

# Intelligent Power Electronics Ecosystem - Innovation



## Performance

- Energy consumption and efficiency
- Noise, vibration and harshness (NVH)
- Reliability



## Packaging

- Power electronics architectures/topologies
- Weight and volume
- Thermal management



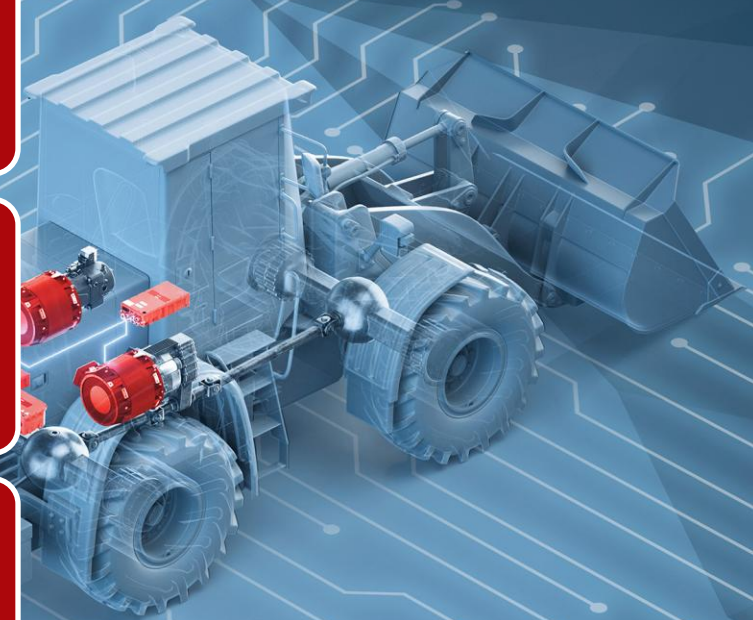
## Integration

- Electrical, mechanical and software
- Vehicle systems

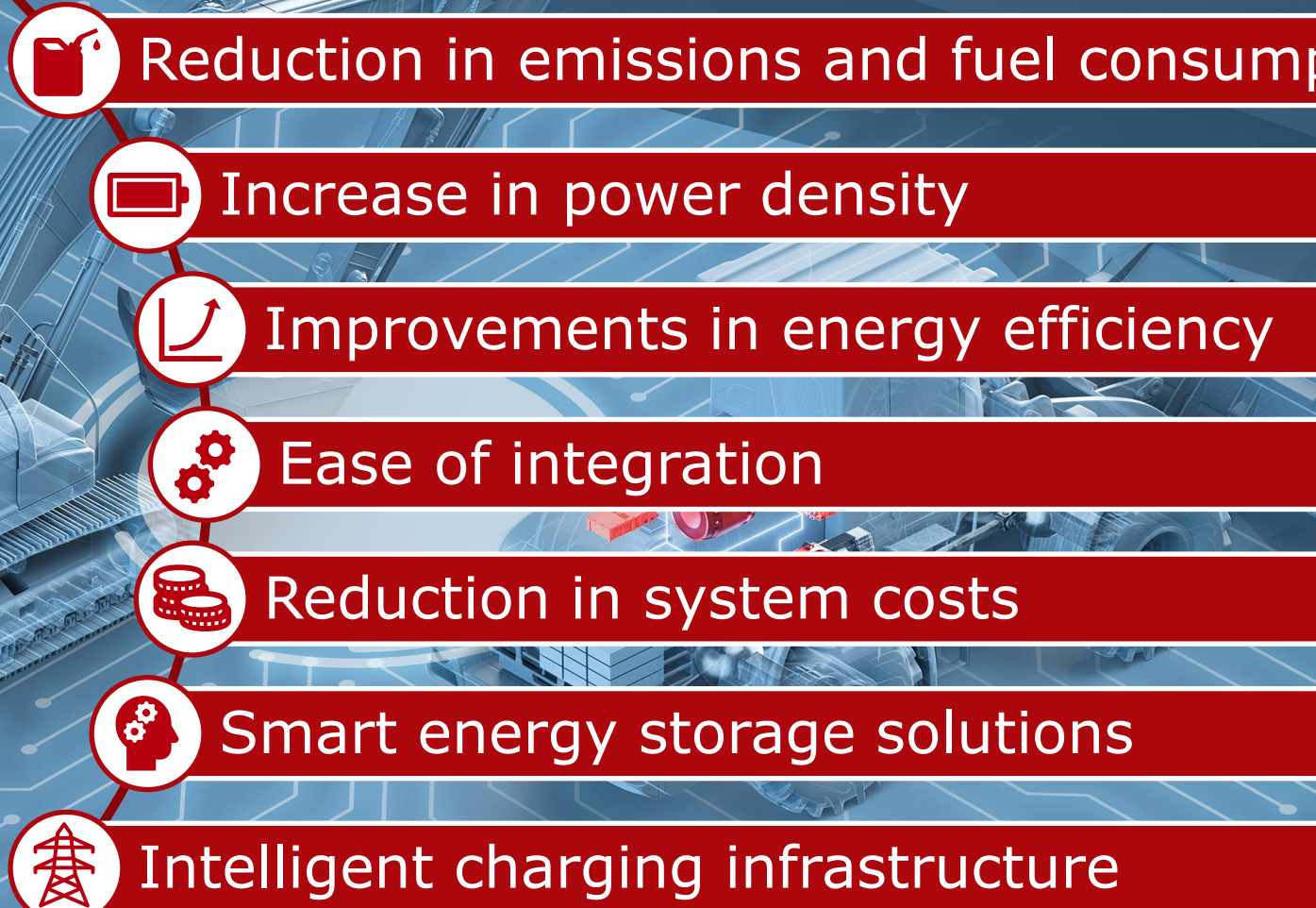









## Sustainability

- Usage of rare-earth metals
- Recovery and circulation of materials
- Life-Cycle Assessment (LCA)



# Power Electronics Ecosystem - Impacts

- 
-  Reduction in emissions and fuel consumption
  -  Increase in power density
  -  Improvements in energy efficiency
  -  Ease of integration
  -  Reduction in system costs
  -  Smart energy storage solutions
  -  Intelligent charging infrastructure

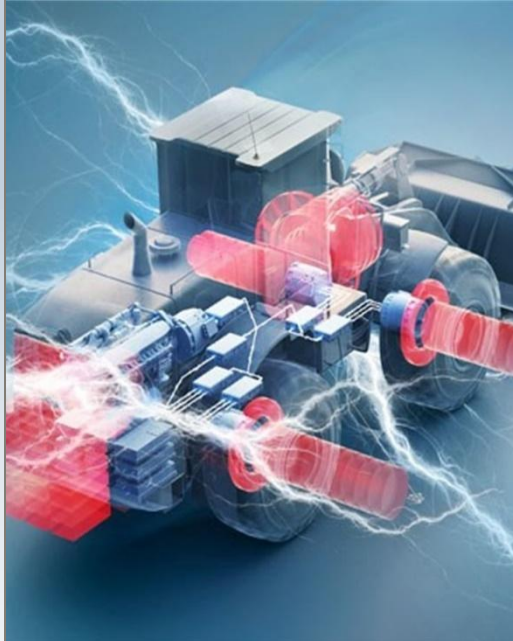


## DIGITALISATION AND SUSTAINABILITY

- Digital services
- Modelling tools, simulations and digital twins
- Data collection and analysis, cloud services
- Novel analysis methods for environmental impacts
- Carbon neutrality and circularity of products and manufacturing

## HIGHLY EFFICIENT SMART POWER ELECTRONICS

- Novel power electronics, materials and components
- Outdoor solutions
- High power solutions
- Optimised connection to grid
- Thermal management
- Smart solutions for reliability, maintenance and safety



## OFF-HIGHWAY VEHICLE ELECTRIFICATION

- 25% fuel savings through electrification
- Novel solutions for powertrain and hydraulics
- Increased power density with efficient cooling solutions
- Intelligent integration for 'plug and play'

Reduction of rare earth materials  
Classified as Business

## SMART ENERGY STORAGE AND CHARGING INFRASTRUCTURE

- Charging solutions for heavy duty vehicles and marine applications
- To reduce the cost of charging <25€/kW
- Fast and high power charging
- Grid services and improved power electronics
- Energy storage solutions
- Novel battery technologies and materials

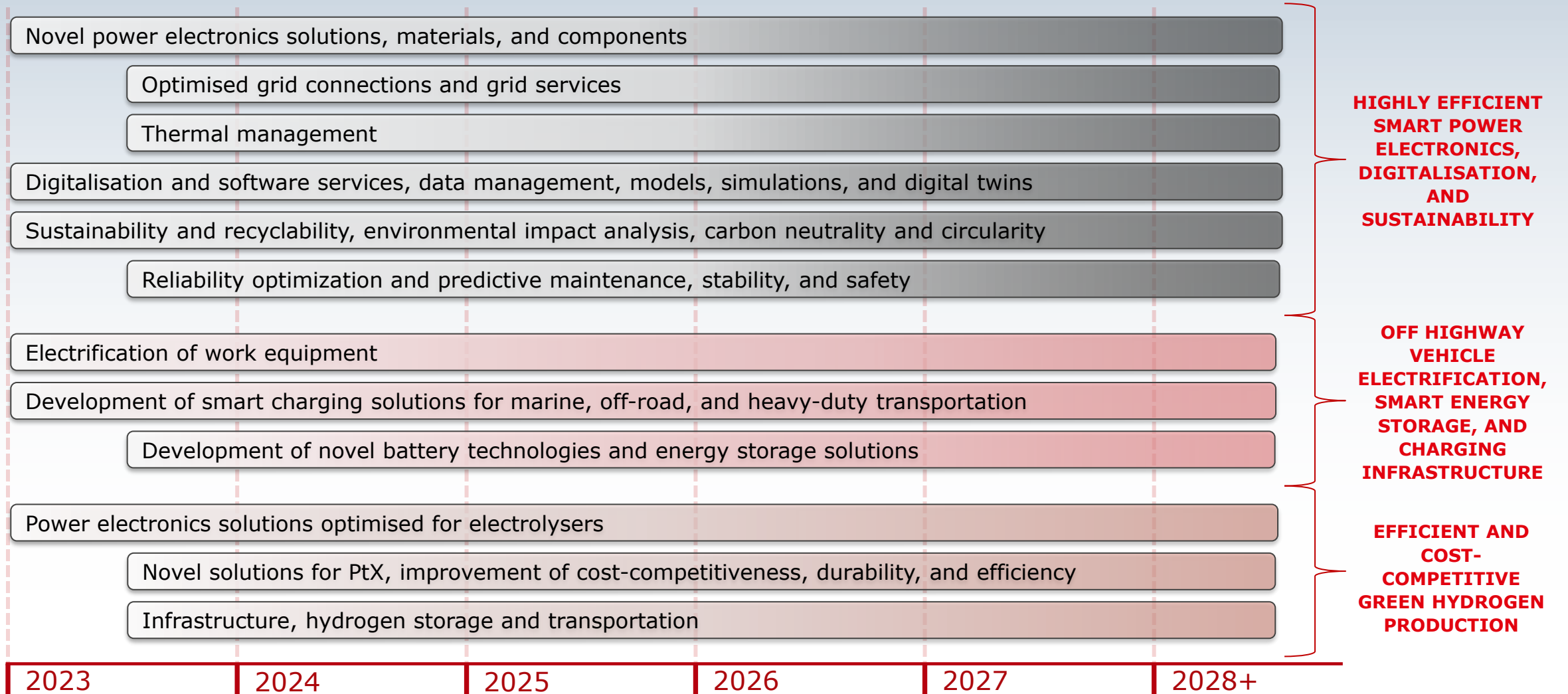


## EFFICIENT AND COST-COMPETITIVE GREEN HYDROGEN PRODUCTION

- Solutions enabling green hydrogen production with less than 2€/kg
- Technical solutions improving cost-competitiveness, durability, and efficiency of electrolyser facilities
- Optimised grid connection and grid services
- Novel solutions for hydrogen storage and transportation



# Fossil Free Future Roadmap





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