

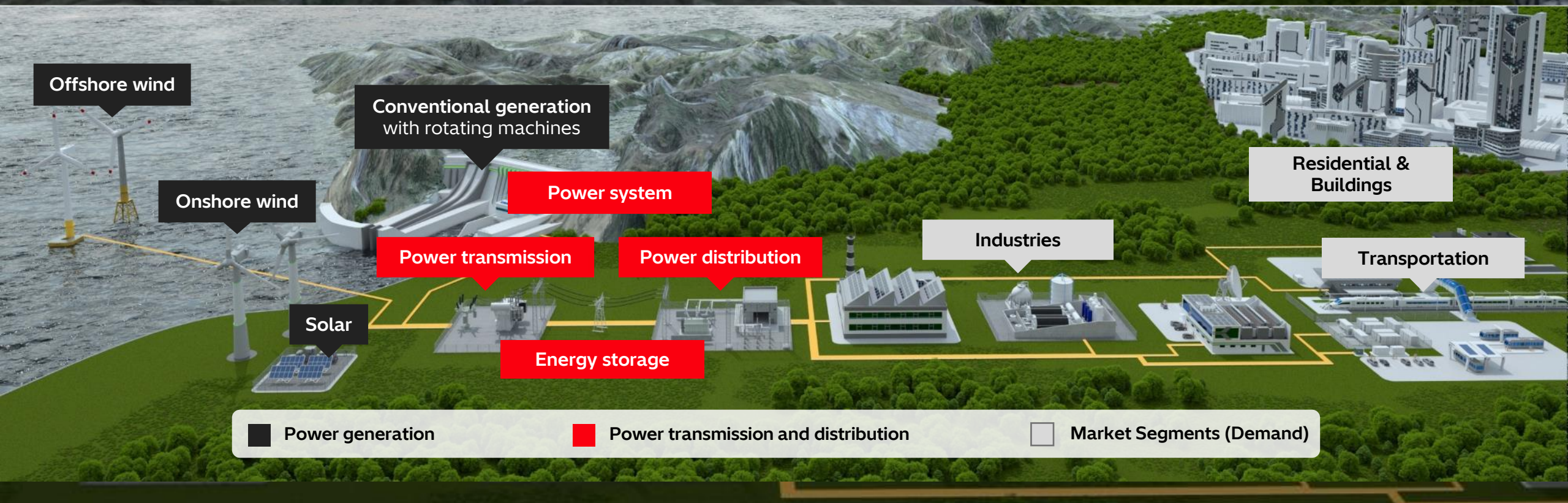
Technologies Powering the Modern Grid

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CTO, Hitachi Energy

Date
October 30, 2025

The Power System Evolution: Our Energy Portfolio

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**Grid Automation**

**Grid Integration**

**High Voltage Products**

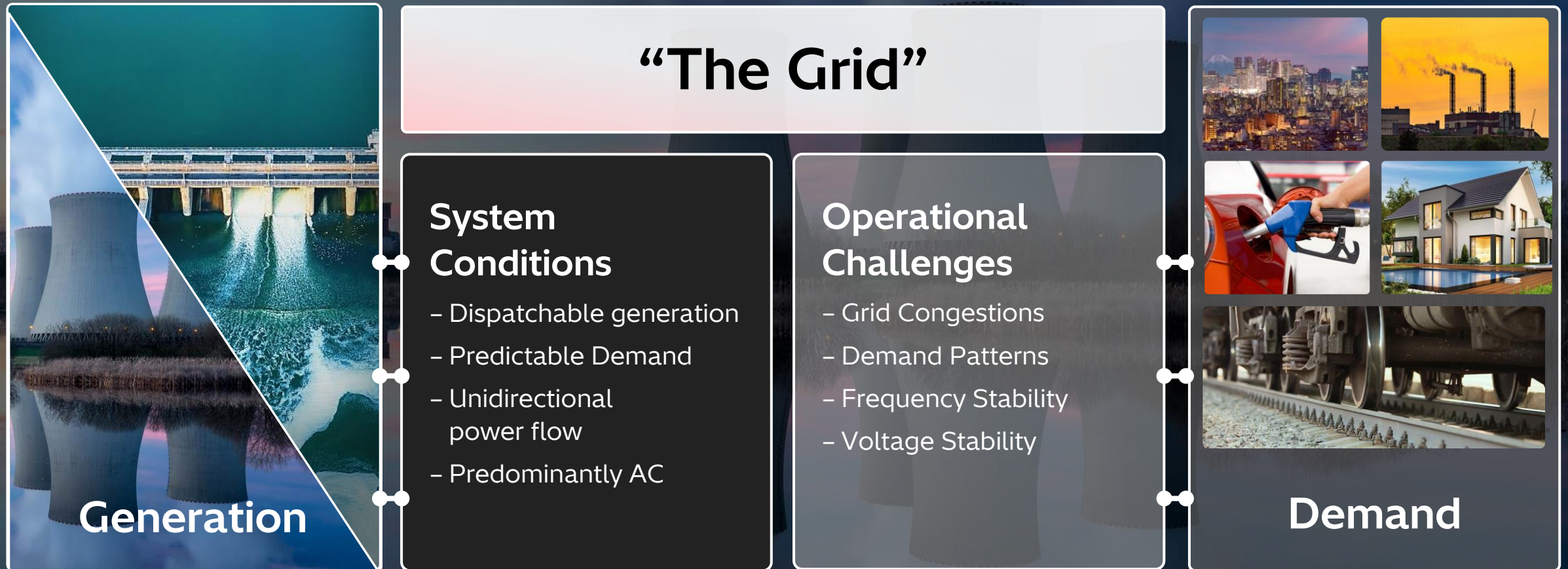
**Service**

**Transformers**

**Nuclear**

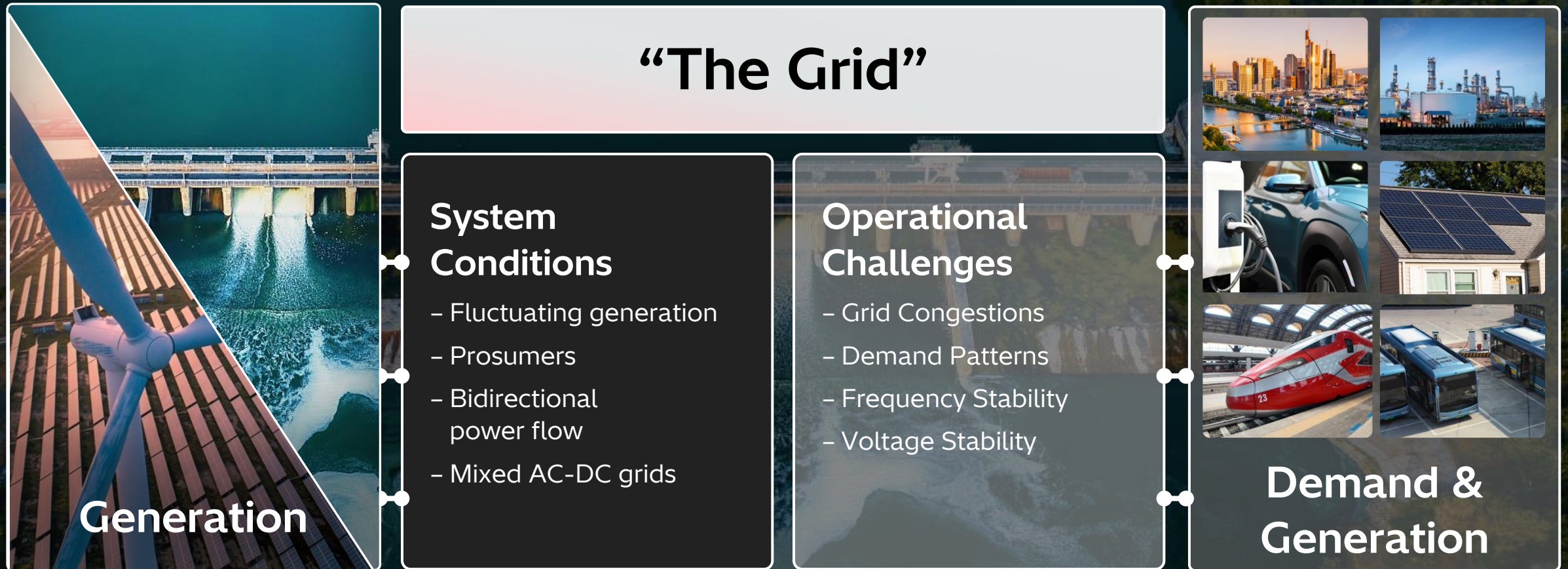
The Classic Power Grid was less complex in the past

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The Future Power Grid will be much bigger, and much more complex

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Operational Challenges: Grid Congestions

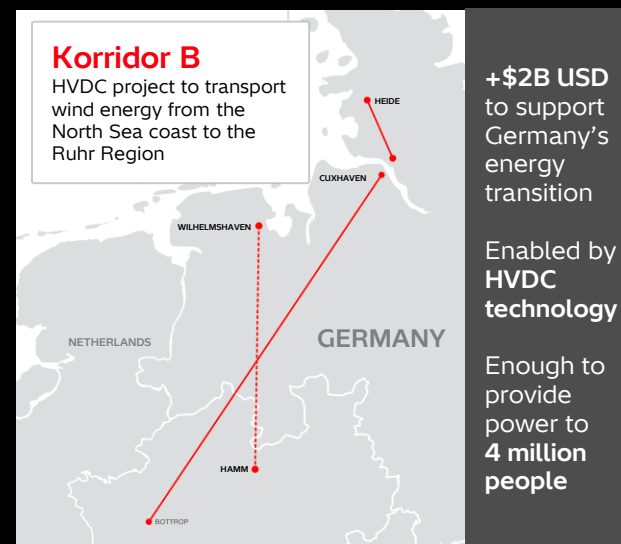
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01 Grid Congestions

02 Demand Patterns

03 Frequency Stability

04 Voltage Stability



Operational Challenges: Demand Patterns

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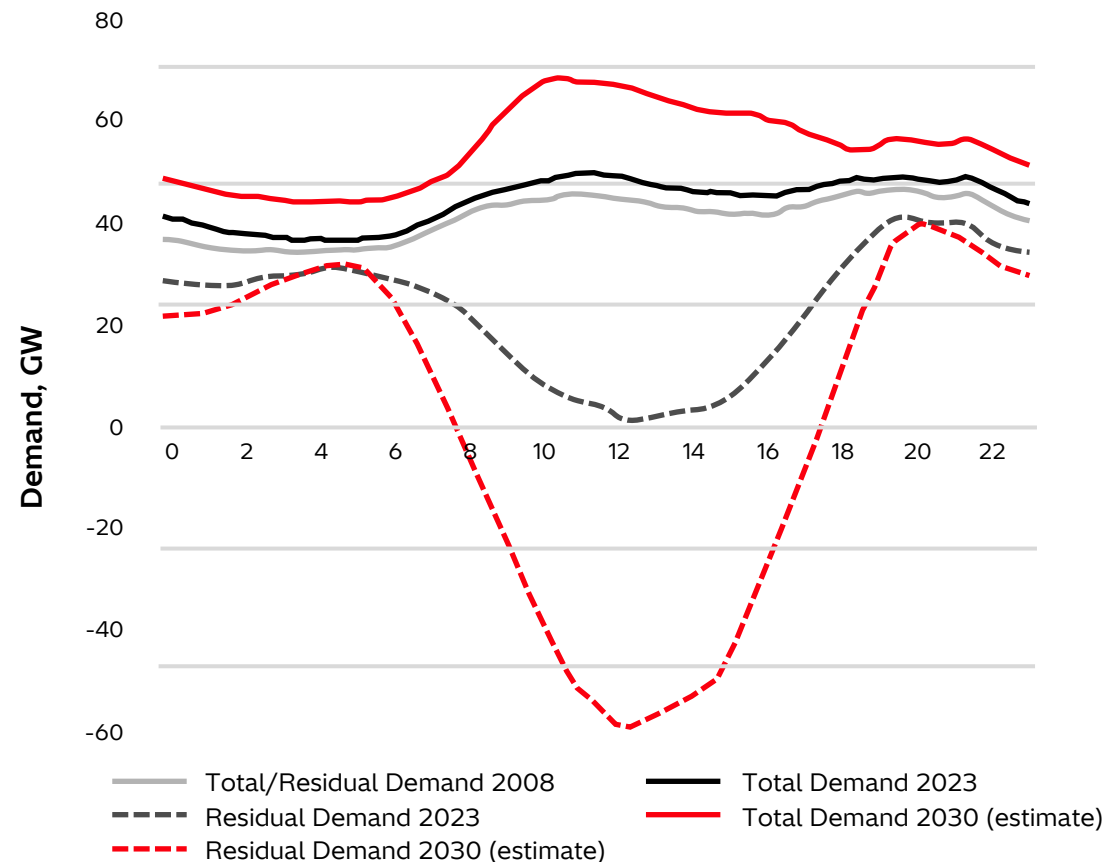
01 Grid Congestions

02 Demand Patterns

03 Frequency Stability

04 Voltage Stability

Example: Germany



1. Total Demand = The sum of all energy demands within a modeled system
2. Residual Demand: Total Demand - (wind + solar photo voltaic generation)

Sources: Hitachi Energy studies, [IEA](#)

Operational Challenges: Frequency Stability

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01 Grid Congestions

02 Demand Patterns

03 **Frequency Stability**

04 Voltage Stability

Frequency Stability requires Inertia

Inertia is acting against change



Operational Challenges: Frequency Stability

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01 Grid Congestions

02 Demand Patterns

03 **Frequency Stability**

04 Voltage Stability

System Inertia is Critical for Frequency Stability

Inertia can be provided by rotating masses, but also via other types of energy storage



Power
Electronics

+



BESS

Operational Challenges: Voltage Stability

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- 01 Grid Congestions

- 02 Demand Patterns

- 03 Frequency Stability

- 04 **Voltage Stability**

Reactive Power



Critical to ensure Voltage Stability

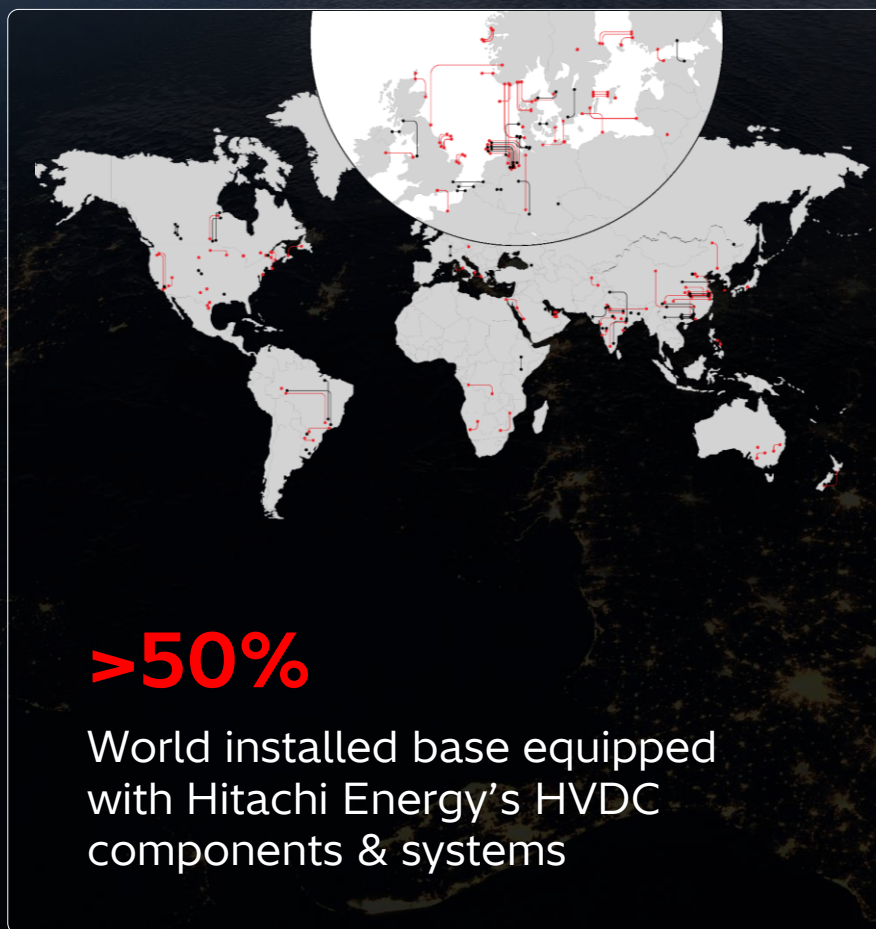


Hitachi has pioneered HVDC >70 years ago, and since then leading the technology development and deployment

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1954

World's first HVDC transmission line (Sweden)



Most powerful & longest HVDC link

12GW, >3,000 km Changji-Guquan, China

1st Ultra-High-Voltage Multi-Terminal

North-East Agra, India

Largest wind farm connection

Dogger Bank Wind Farm, UK

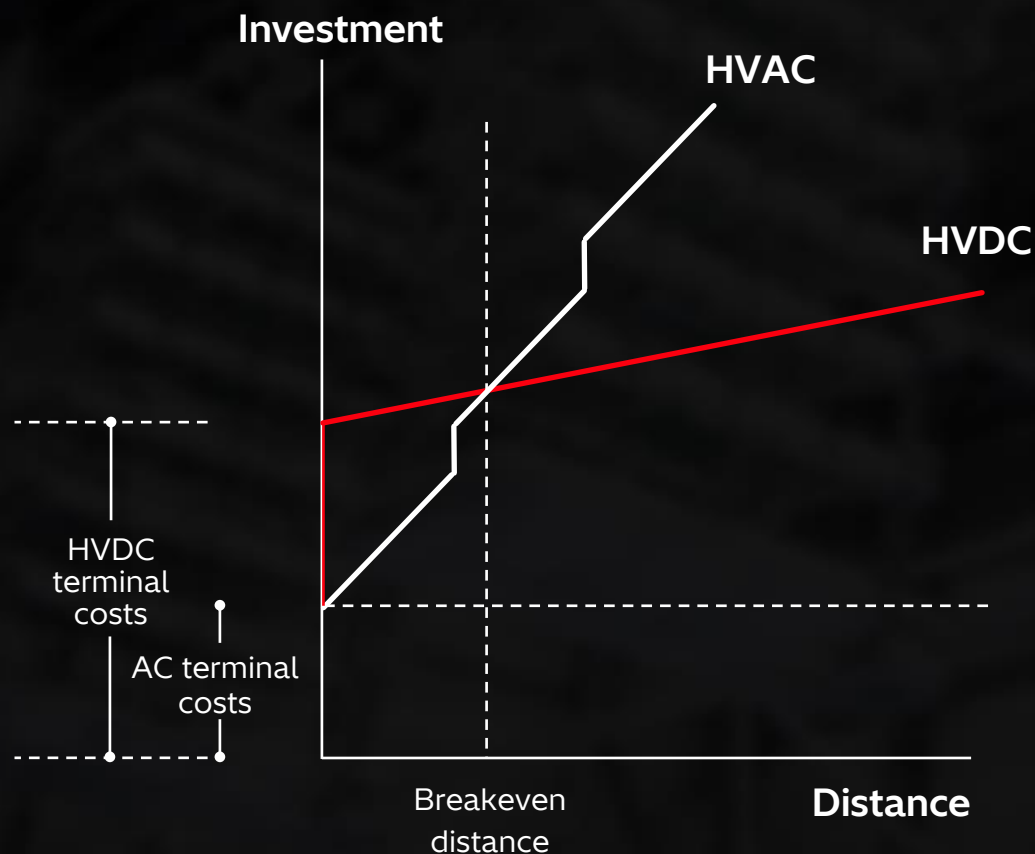
Longest sub-sea interconnector

North Sea Link, UK to Norway, 720 km

1st HVDC grid in Europe

Caithness-Morray Shetland Multi-Terminal solution

Hitachi has all solutions for interconnecting countries, regions and markets



In 2030, we expect to **2x** our HVDC project pipeline compared to today¹

HVDC technology advantages

50% less transmission losses than HVAC (over 1,000 km)

Higher power transmission capacity or **>30%** lower footprint

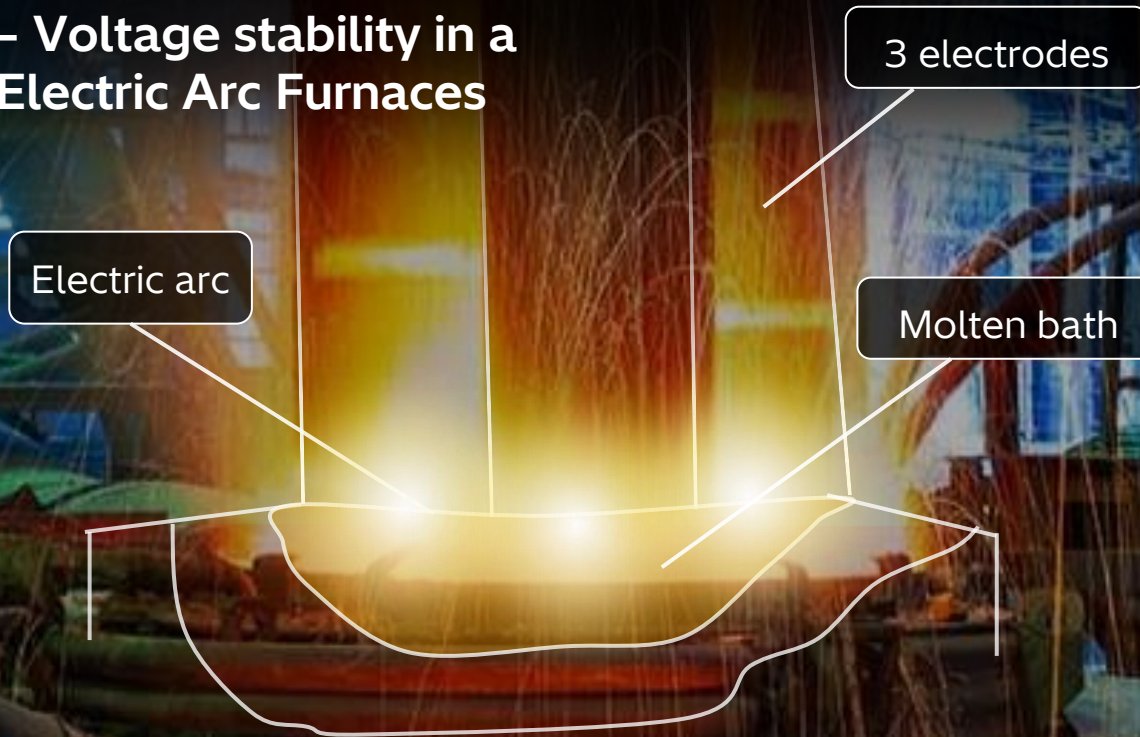
~500 km breakeven distance for transmission overhead lines

~90 km breakeven distance for underground cables

STATCOM Value proposition for the Steel Industry: 14% increase in steel production²

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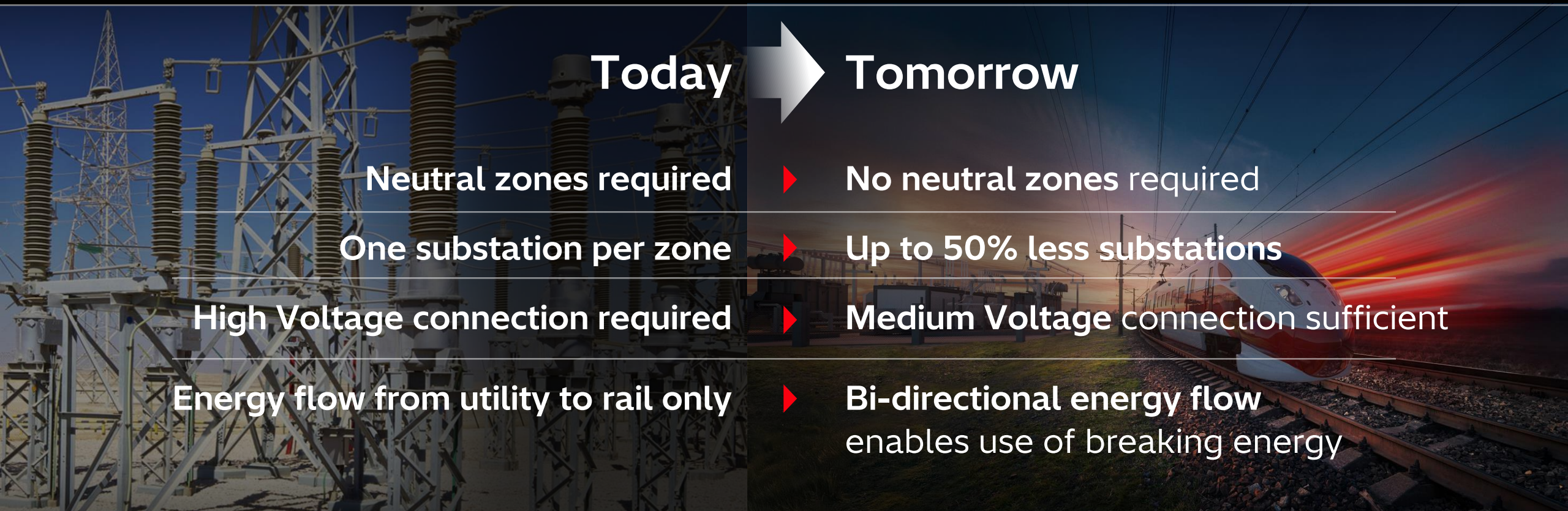
Reactive Power – Voltage stability in a Steel plant with Electric Arc Furnaces



In 2030,
we expect to

>2x

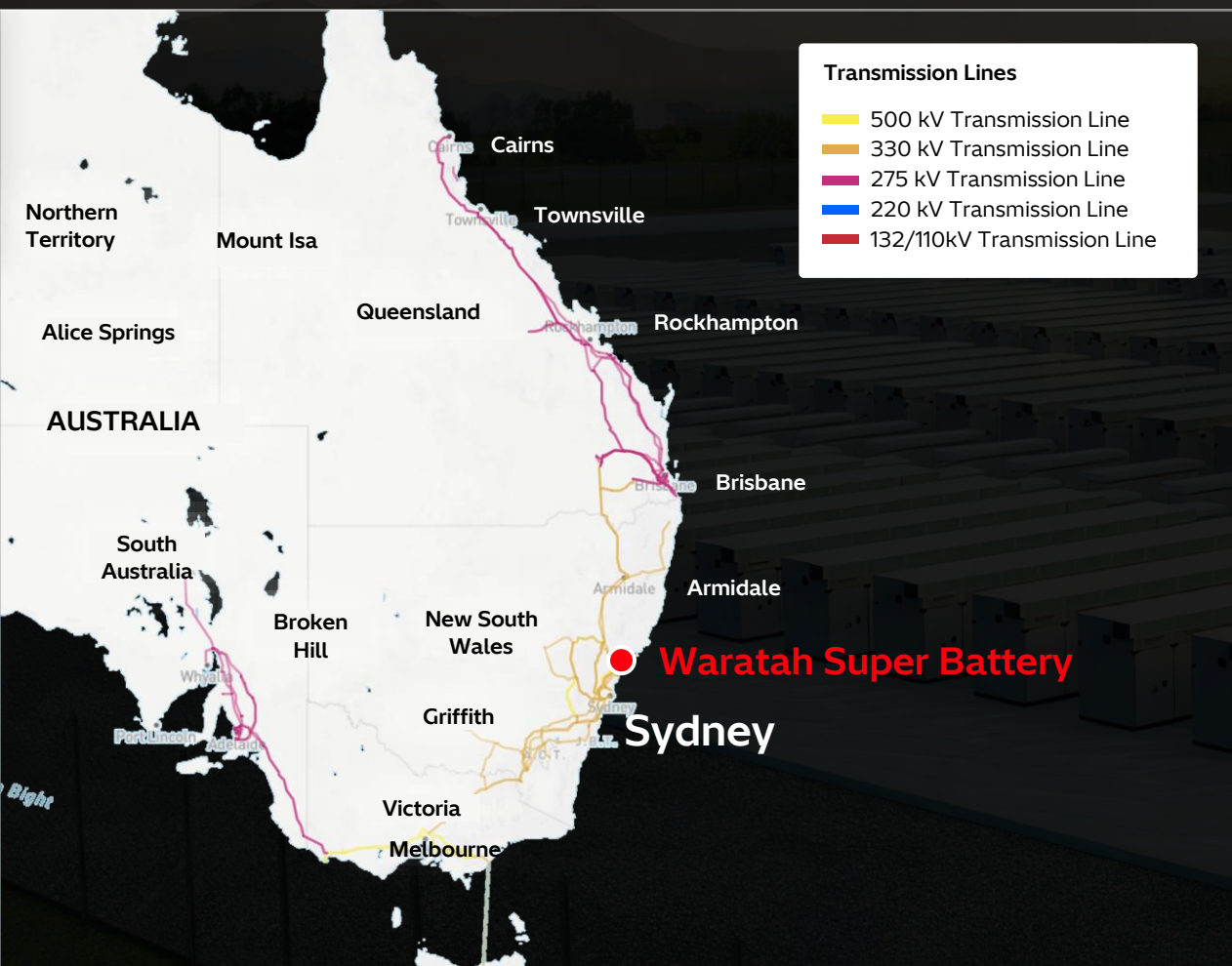
our annual
orders compared
to today¹



In 2030, we expect to **2x** our annual orders compared to today¹

Australia: Waratah Super Battery, an 850 MW 2-hour project

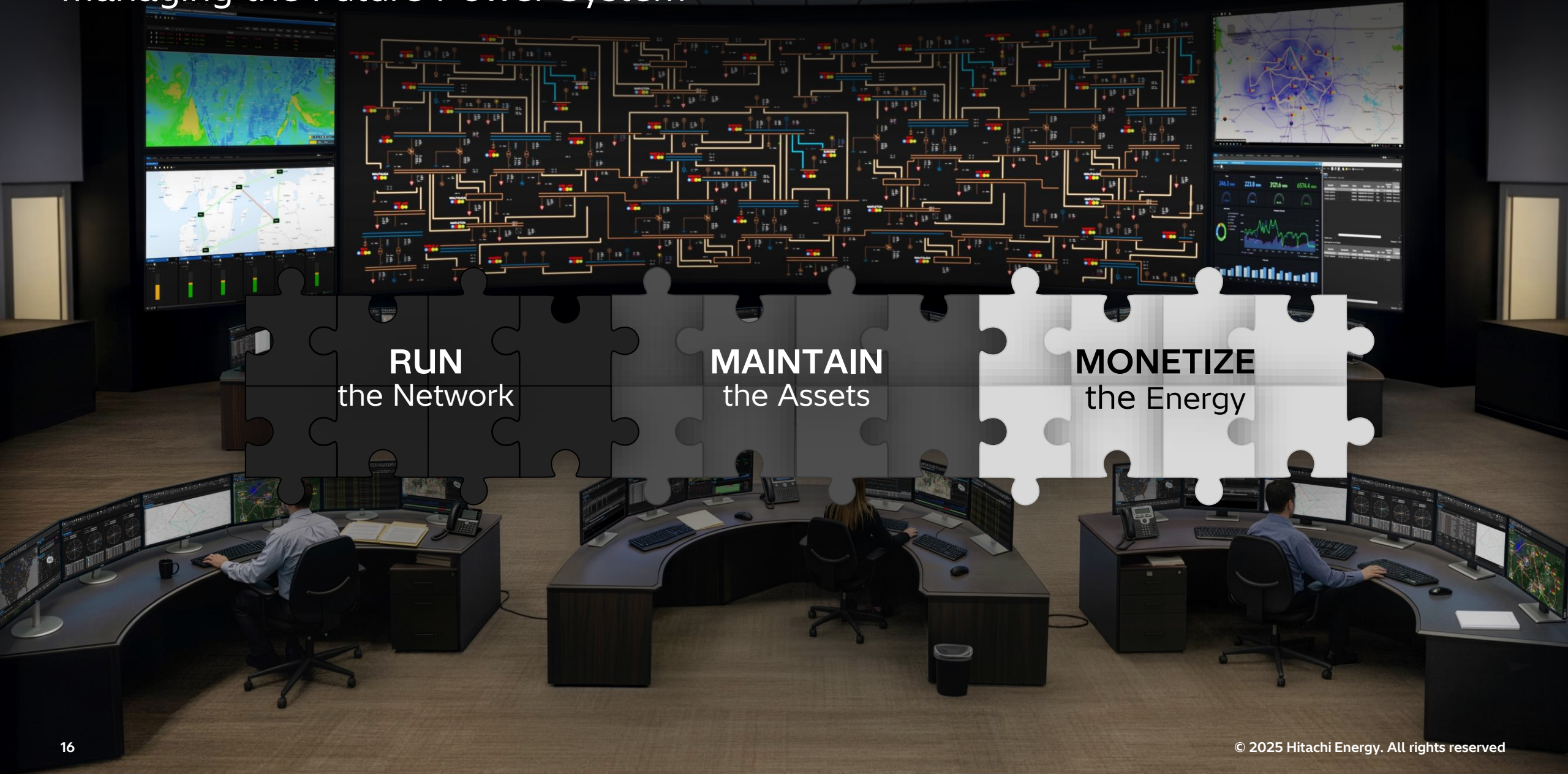
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In 2030, we expect to
2x
our annual orders
compared to today¹

Managing the Future Power System

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Managing the Future Power System

HITACHI

ONE HITACHI

RUN
the Network

MAINTAIN
the Assets

MONETIZE
the Energy

Offering IT, OT, and products
The Completeness of Our Portfolio

ONE HITACHI

RUN
the Network

**>120 Customers are
trusting Network Manager**

In 2030, we expect to

2x

our annual orders compared
to today¹

Offering IT, OT, and products
The Completeness of Our Portfolio



The space Air-insulated Switchgear (AIS) requires
is **too big for space-constrained installations**

Powering New York with
AIS substations would
take up the equivalent of

1/7 of Central
Park



Hitachi Energy spearheaded the future more than 50 years ago



We pioneered the high-voltage Gas-insulated Switchgear (GIS)

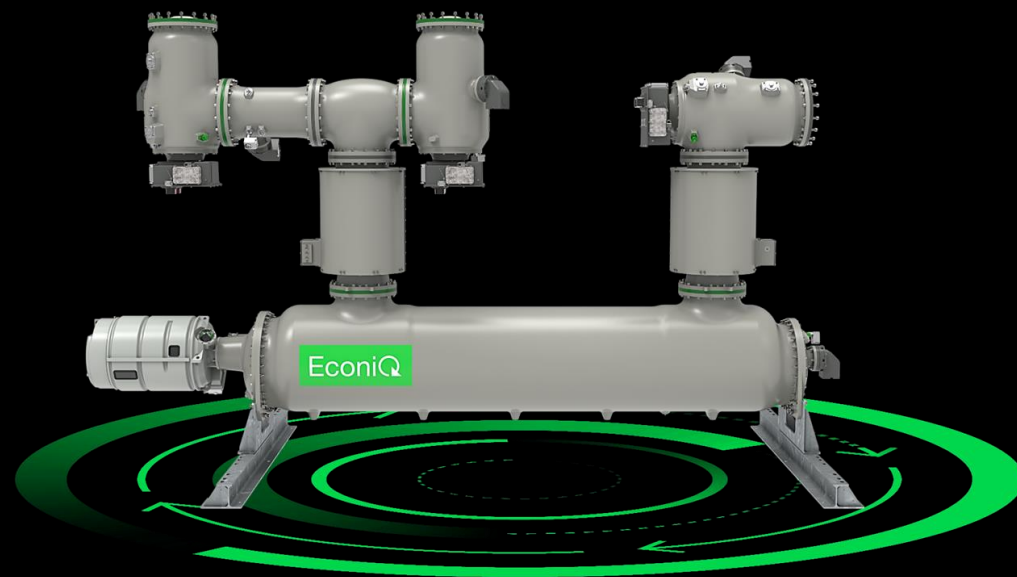
Reducing space uptake by

>90%

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It's time for the next (r)evolution

High-voltage SF₆-free GIS Switchgear, with the same dimensions!



TenneT

Delivering the world's first
SF₆-free 420 kV GIS
Switchgear

In 2030 we expect to deliver

60%

of our High Voltage
Switchgear SF₆-free

**Hitachi Energy is leading
the technology**

Technology is ready for the future – no reason to wait

What is missing can be developed while scaling the infrastructure

Hitachi is unique in technology scope



Hitachi has the largest global installed base



Hitachi is leading
the Energy Transition toward the "Age of Electricity"



Grid
Automation



Grid
Integration



High Voltage
Products



Service



Transformers



Nuclear

HITACHI