



HITACHI
Inspire the Next

Transformers

Advancing a sustainable energy future for all

The journey continues with the world's largest installed base

130 years of groundbreaking solutions



Windstar transformer

For large offshore wind turbine



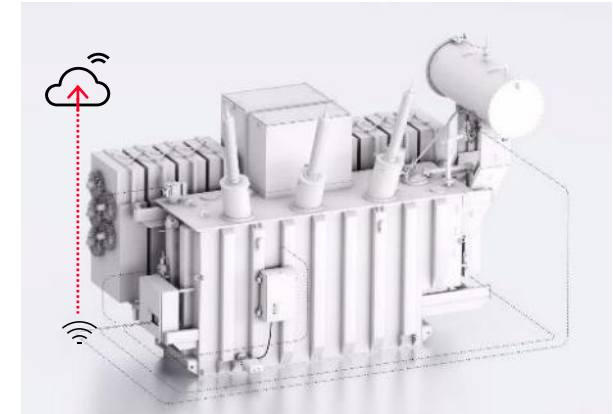
Subsea transformer

For depths up to 3,000 meters



HVDC transformer

World's most powerful
1,100 kilovolt (kV) transformer



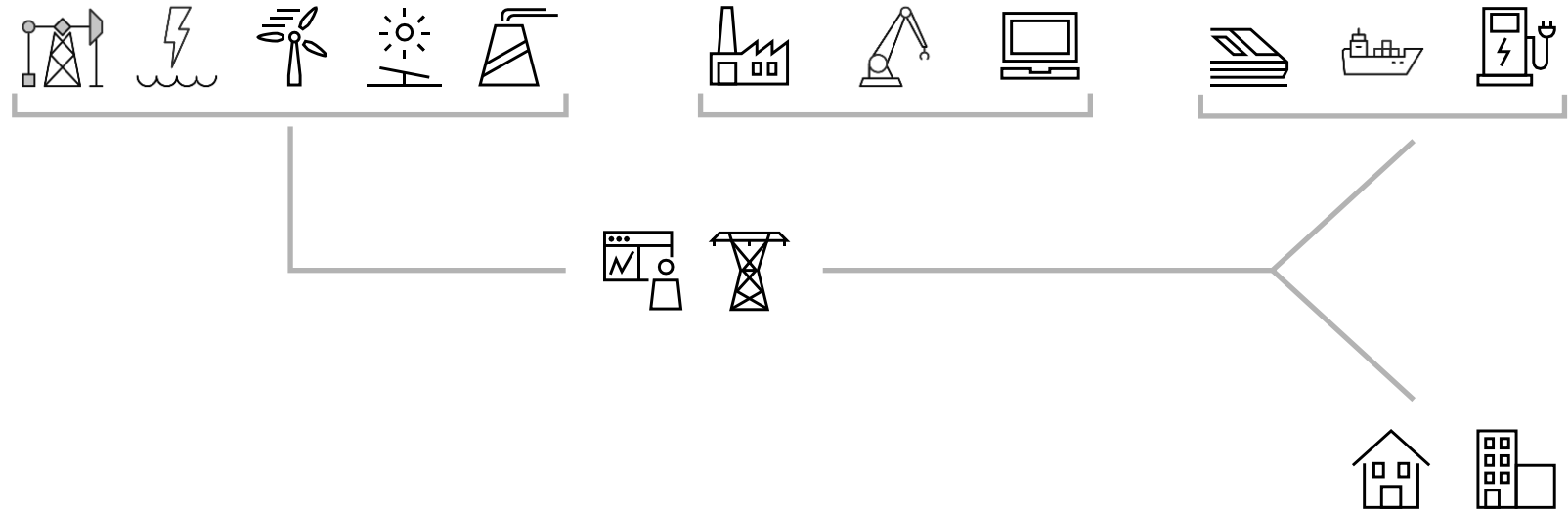
Smart transformers

Enabling your digital future

Today the journey of pioneering innovation continues

Today wherever you are a transformer is powering you

- Transformers are fundamental to electrical networks, they enable efficient and safe power transmission and consumption
- With increasing complexity in the grid, transformers are also increasingly used for improving power quality and network management



Power generation



Transmission and distribution



**Metals & Mining,
Oil & Gas**



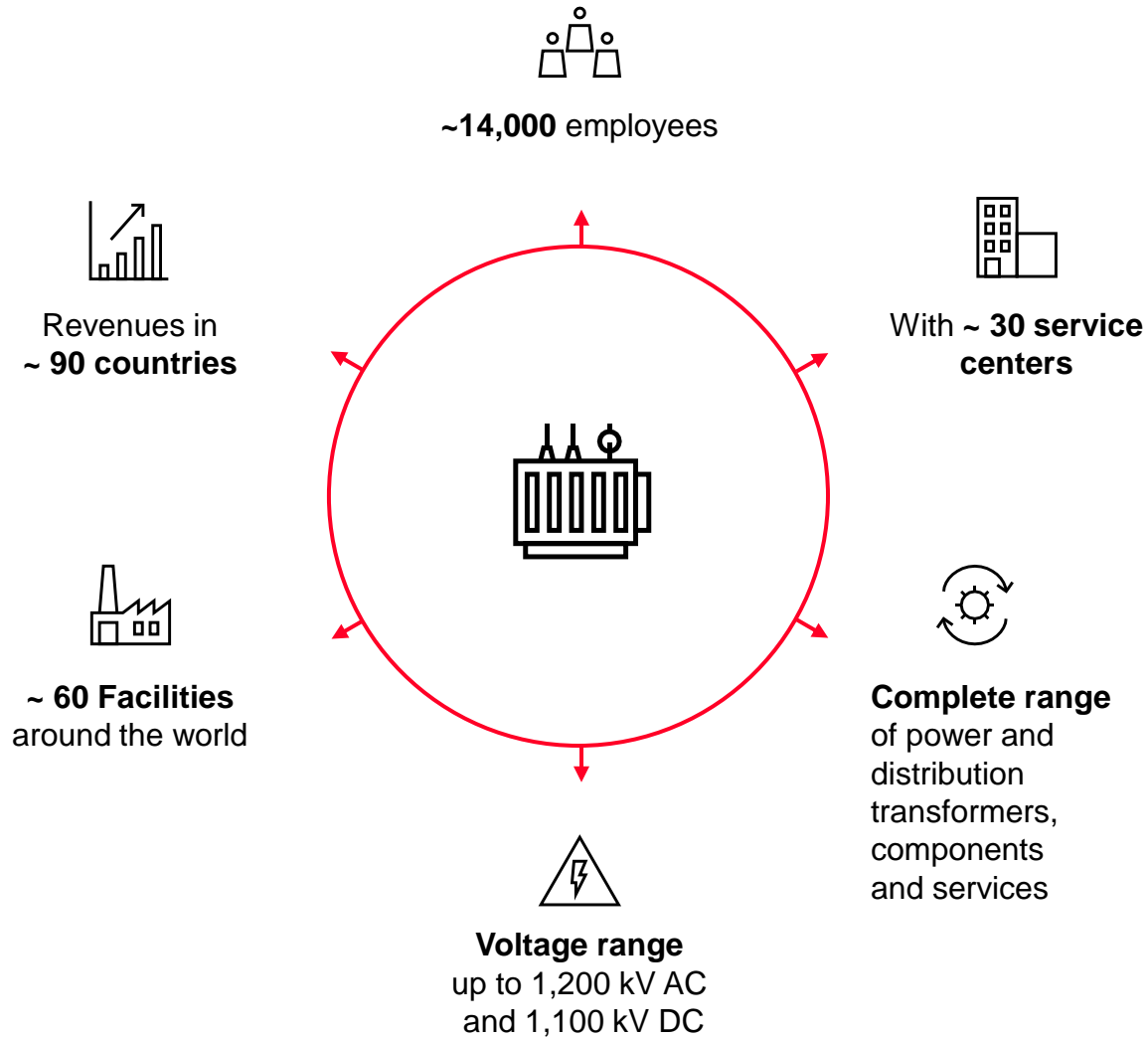
Industry



Mobility



Commercial and Infrastructure

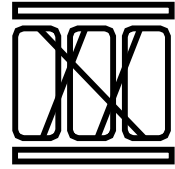


About Transformers Business - World's largest installed base



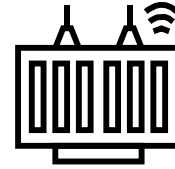
>2,000,000

Distribution transformers



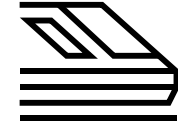
>325,000

Dry transformers



>75,000

Power transformers



>30,000

Traction transformers

>4,000

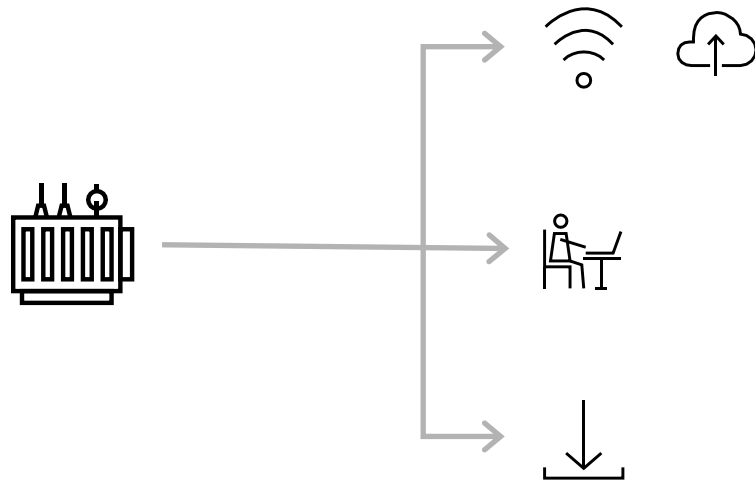
Reactors

>700

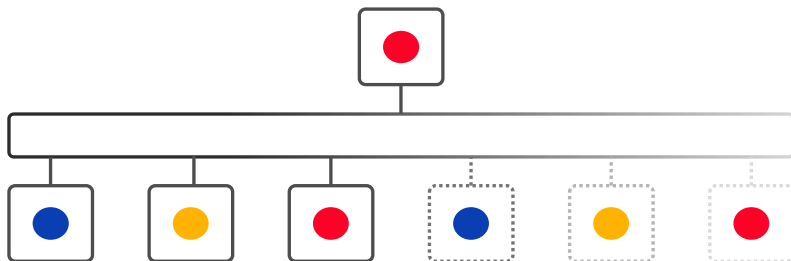
HVDC transformers

Digitalization of transformers: TXpert Ecosystem

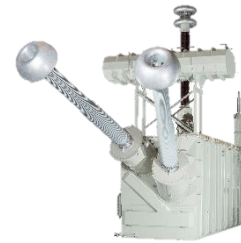
Online and standalone intelligence



Open and scalable



Power Transformers



HVDC Converter Transformers



Dry Transformers



Distribution Transformers



Traction Transformers



Industry & special applications Transformers



Insulation, components & digital sensors



Transformer Service

Power Transformers – Production Units



Distribution Transformers – Production Units





New forces are driving the change in today and future transformer design

01 Renewables

- Integrating more green energy into the grid
- Superior engineering and design for grid complexity



Ex: Voltage regulators
Ex: Booster transformers
Ex: 66 kV specialty transformer

02 Energy efficiency

- Maximizing financial savings
- Reducing CO2 emissions



Ex: Low-loss transformers
Ex: TCO calculator

03 Safety and Environment

- Insulating fluids and materials
- Oil to dry conversion of transformers and components



Ex: Natural Ester oil
Ex: Dry-type transformers, reactors and bushings

04 Service and Intelligence

- Condition-based maintenance
- On-line monitoring
- Multiple intelligent electronic devices



Ex: CoreSense family
Ex: CoreTec™
Ex: TXpert™

05 Security and Resilience

- Onsite vulnerability assessment, hardening, monitoring, rapid repair, rapid replacement



Ex: AssetShield™ ballistic protection system
Ex: Dry bushing (O Plus Dry)
Ex: TXtreme™

06 New boundaries

- UHV AC-DC transformers
- Submersible solutions
- Low noise



Ex: 1,100 kV converter transformer
Ex: Effilight® traction transformer
Ex: Dry transformers up to 72.5 kV



01

Datacenters

- Reliable partner for global Datacenter customers
- Ensuring world class the stability and reliability



02

Renewables

- Integrating more green energy into the grid
- Superior engineering and design for grid complexity



03

Utilities

- Partner of choice for utilities with a long-history
- Product and Service offering to serve the most complex customer requirements



04

Industries

- Long-term collaboration e.g. O&G, Pulp and Paper globally
- Global network to provide offering worldwide



05

Transportation

- Worlds largest traction transformers manufacturer
- Wide transformers offering for Marine industry

COMPONENTS

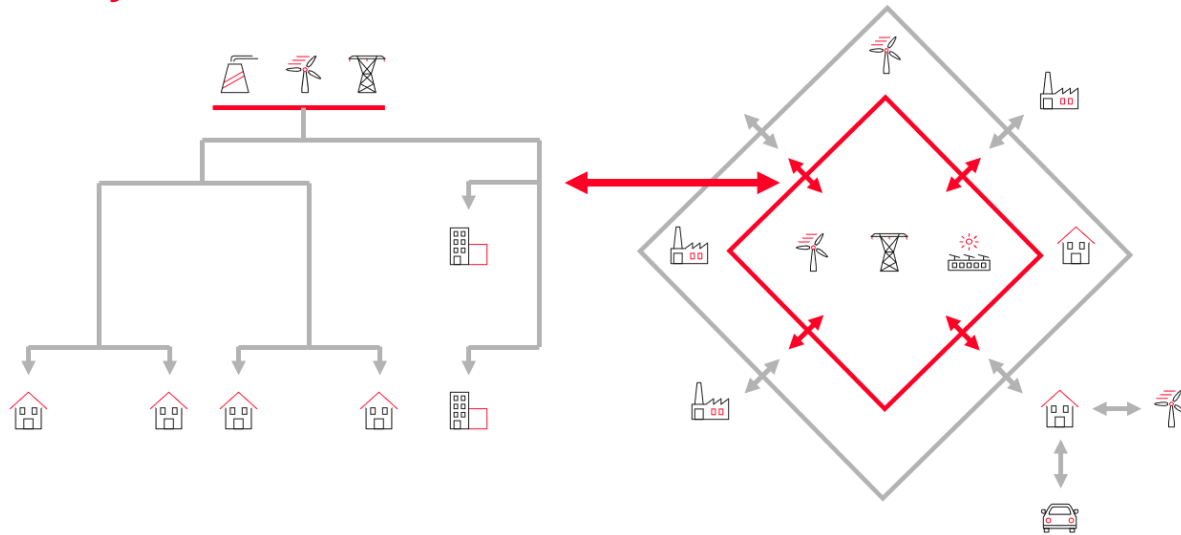
Various



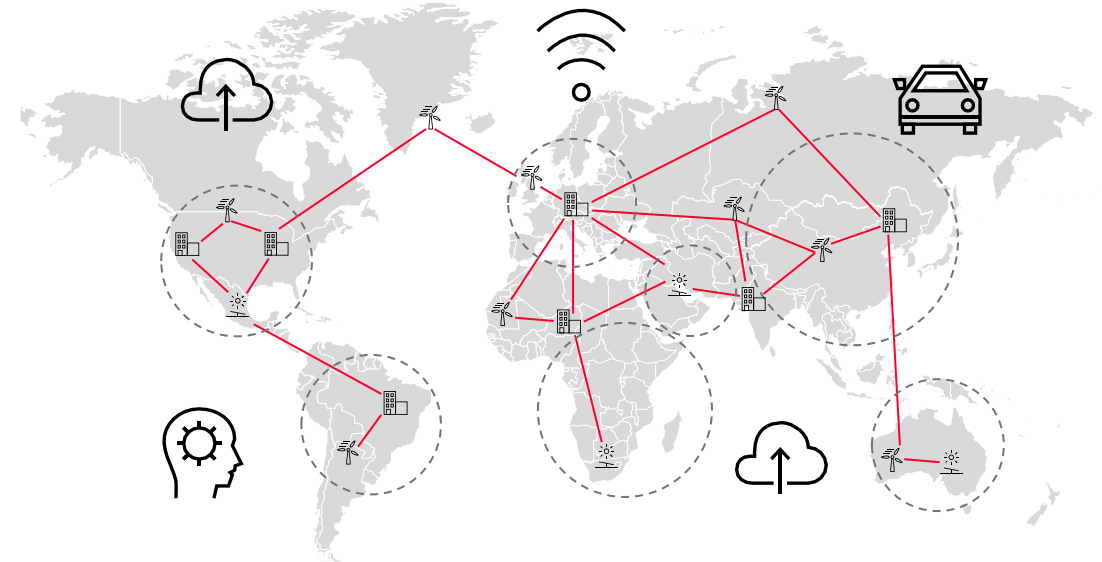
TXpert™ Ecosystem

Unlocking the power of the digital grid

Today



Tomorrow



Increasing complexity of the grid will impact transformers in new ways, for example:

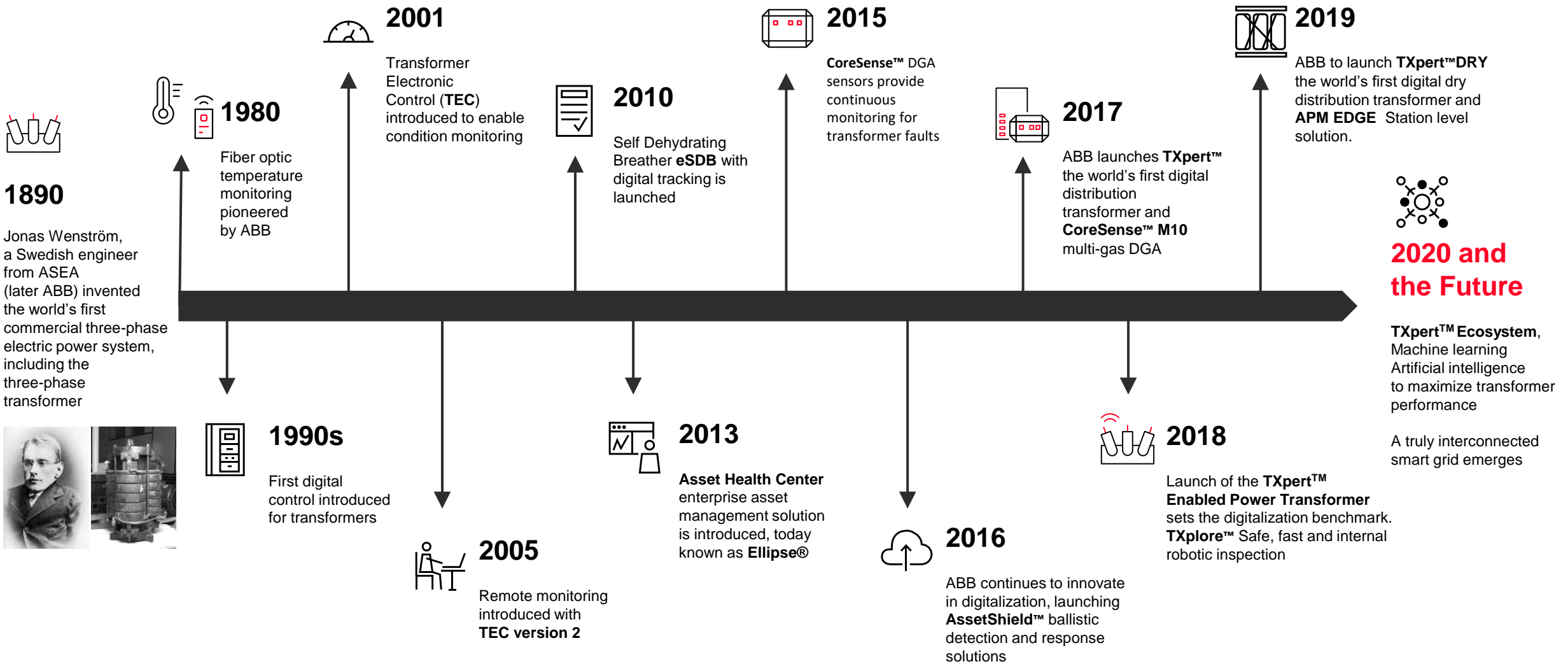
Integration of renewables leads to reverse and dynamic power flows

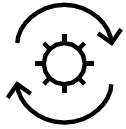
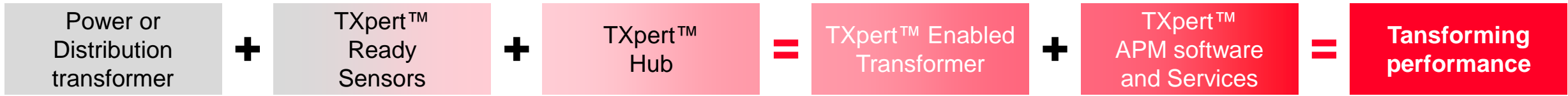
Increasingly overloaded based on generation mix

Dynamic load profiles and increasing risk of outages

Amplified need for data-driven decisions to meet new challenges

Our rich history of leadership in transformers and digitalization





Transforming performance

- Reduced costs and risks
- Optimized operations
- Extended life-cycle expectancy
- Enhanced environmental performance



Unlocking the potential of digital grid

- Full ecosystem
- Digital distribution & substations
- Asset performance Management
- Virtual site management



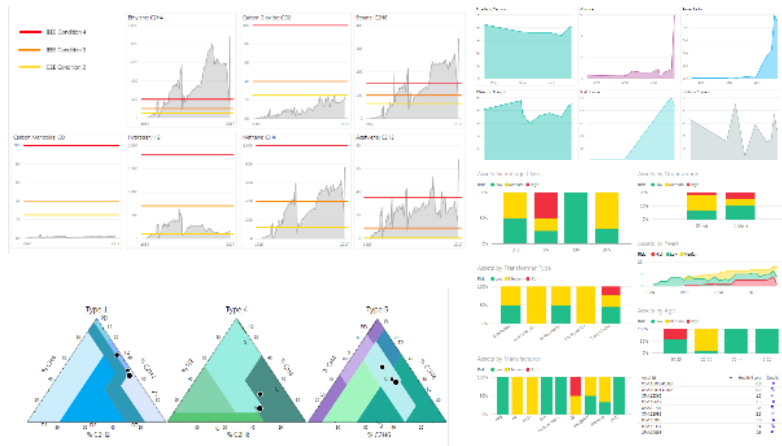
The future is open

- Modular
- Scalable
- Future-proof
- Manufacturer agnostic

Take simple steps to digitalize your transformers for significant leaps in performance based on the knowledge and intelligence derived from thousands of transformers

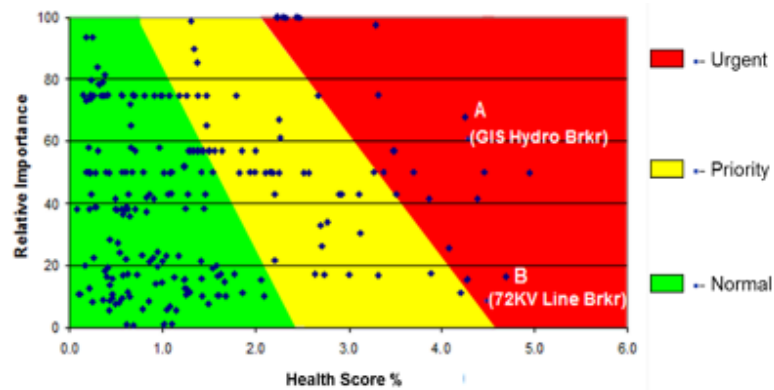
Online Monitoring

Levels and trends



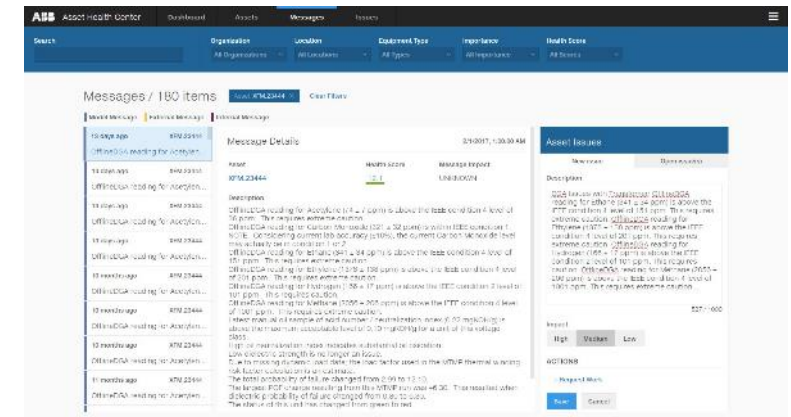
Check different parameters, levels and trends while comparing them to international standards like IEEE or IEC.

Probability of Failure (PoF)



Classify each transformer by its PoF to prioritize maintenance work.

Expert system



Give maintenance recommendations based on design parameters, historical trends and on-line data.

Extend asset lifetime thanks to online monitoring and condition-based maintenance

Transformers for a sustainable world

We enable access to electricity with a focus on sustainability

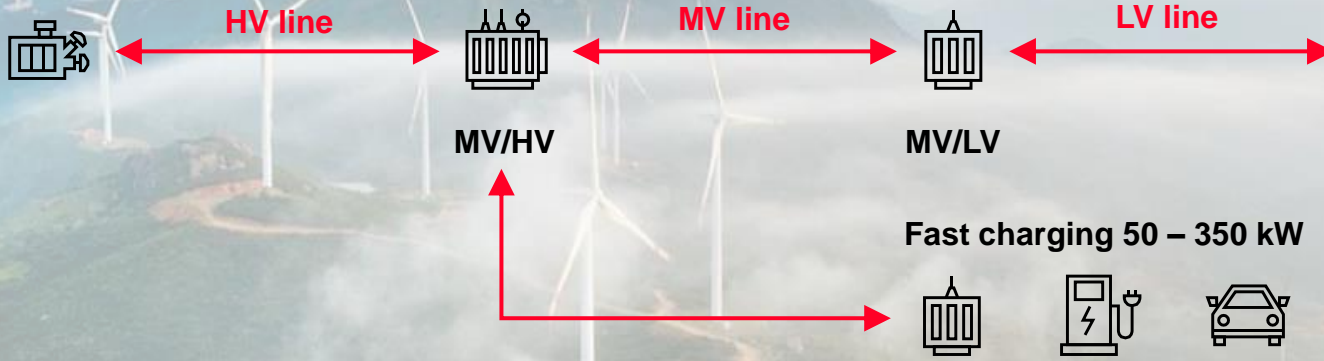
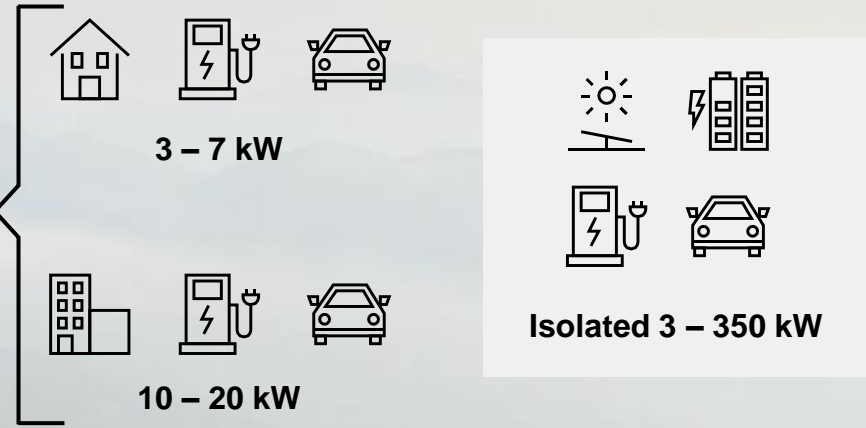
Centralized generation



Distributed generation



End consumers



We are committed to contributing to the United Nations Sustainable Development Goals



Sustainable infrastructure



People and ecosystems safety



Decarbonization



Responsible resource utilization

The total cost of ownership tool

Transformer energy efficiency
Total Cost of Ownership calculator

Settings

Currency: EUR
Use of Watts or Kilowatts in inputs: Watts Kilowatts
Standard: IEC/EN IEEE

Loss capitalization factors (A and B)

Transformer A & B factors known: Yes No

Initial electricity price (1st year): 0 EUR/kWh
Annual increase of energy price: 1 %
Interest rate (for the investment): 4 %

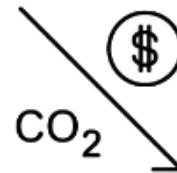
Operating hours per year: 8760 Hours
Service life: 40 Years
Average load during lifetime: 50%

Typical savings for a 40 MVA, 112 kV transformer

Difference between eco-efficient and traditional designs



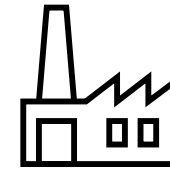
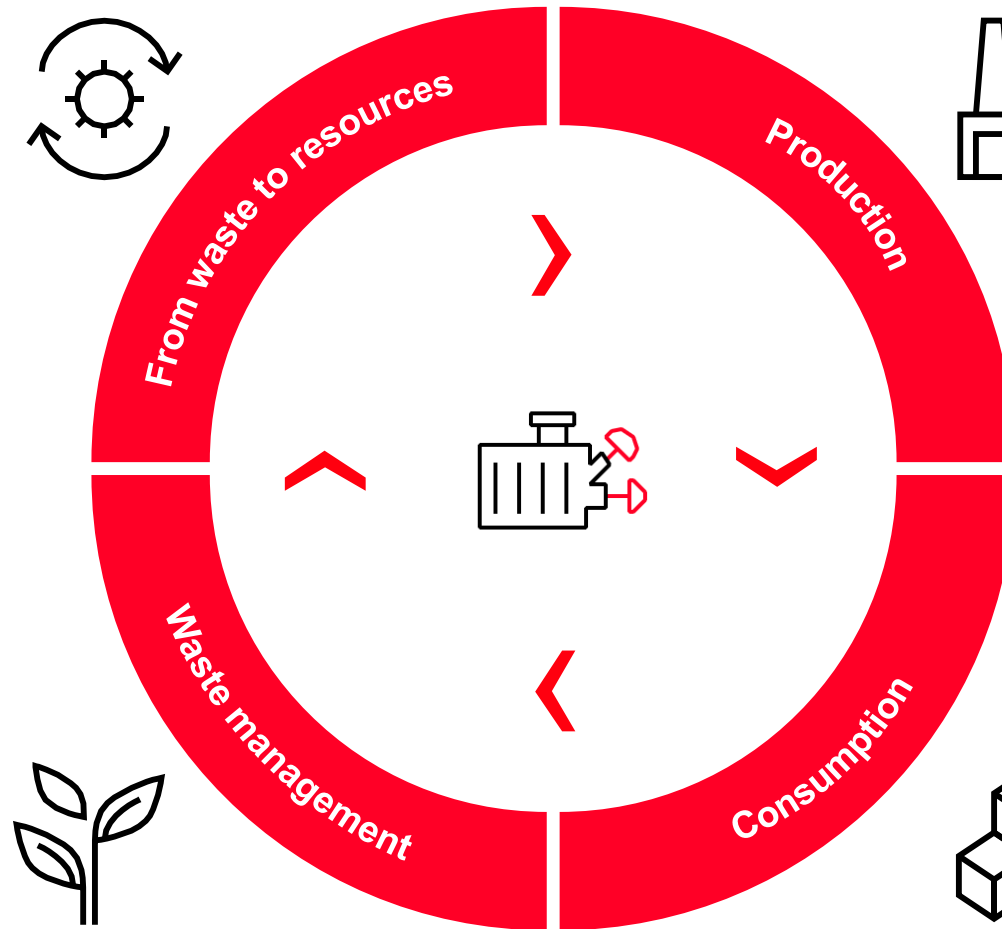
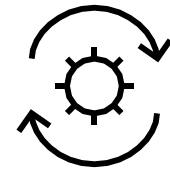
Energy savings/year - 91,542 kWh



CO₂ emission reduction/year - 38 tonnes

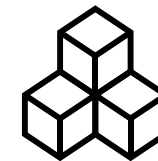
As an example, the European Union alone has an estimated 4.5 million distribution transformers which could avoid 38 TWh of electrical losses and 30 million tonnes of CO₂ emissions every year via energy efficient transformers.

Copper
Aluminum
Steel
Oil (new development)



Responsible sourcing
Designs built with TCO
(total cost of ownership)

Transformers can be
~99% recyclable and reusable



Prolonged lifetime with condition
monitoring, life-assessment and
preventive maintenance services

EconIQ™ transformers: co-creating sustainable solutions

Your partner in the **sustainability** journey across the transformer life cycle

With **transparency** on environmental impacts using science-based methodologies

Solutions for decarbonization, enhanced safety, protecting ecosystems and responsible resource use



 Proud to be active partner with initiatives worldwide for driving **higher energy efficiency** standards in transformers e.g.



(European Committee for Electrotechnical Standardization)
Currently holding the **Secretariat** for Transformers Committee CLC TC 14



Providing technical **expertise** to United4Efficiency Program (Under leadership of UNEP)




International Electrotechnical Commission
Currently holding **Chair** of Transformers Committee IEC TC 14



Partnering worldwide with other key Standardization Committees: IEEE, cigre and country organizations





Transformers and services —
partnering with our customers
for the grid of the future

Powerful transformers for bulk power transmission

About 800 million people worldwide do not have access to electricity.

The 3293 kilometers long Changji-Guquan link in China is capable of transmitting 12,000 megawatts, that is enough power for about 12 million people in China with about 40% lower losses⁽¹⁾.

Hitachi Energy 800-ton 1100 kV UHVDC transformers facilitate power flow across this link from the sending station.



HVDC Light® transmission system, Norway-Germany

1,400 MW, ± 525 kV, 623 kilometers.

TenneT in Germany and Statnett
in Norway.

Called “The green-link” it will enable
trade in hydro power from Norway and
solar and wind power from Germany.

HVDC Converter and AC transformers
from Hitachi Energy in both countries.

Compact design for challenging
transportation.



Mainstream Renewable Power - Andes Renovables

Supporting Chile's aim to get 70% of its electricity from renewables by 2050.

12 wind and solar projects, 1500 MW capacity – electricity for 1.3 million people based on per capita usage in Chile

TXpert™ Enabled Power Transformers for grid integration:

- Designed to never go offline unexpectedly
- Enable preventive maintenance
- Remote management in far-flung locations

Ckani 109 MW
Tchamma 157 MW



Cerro Tigre 185 MW
Pampa Tigre 100 MW
Lianos del Viento 160 MW



Rio Escondido 145 MW
Valle Escondido 105 MW



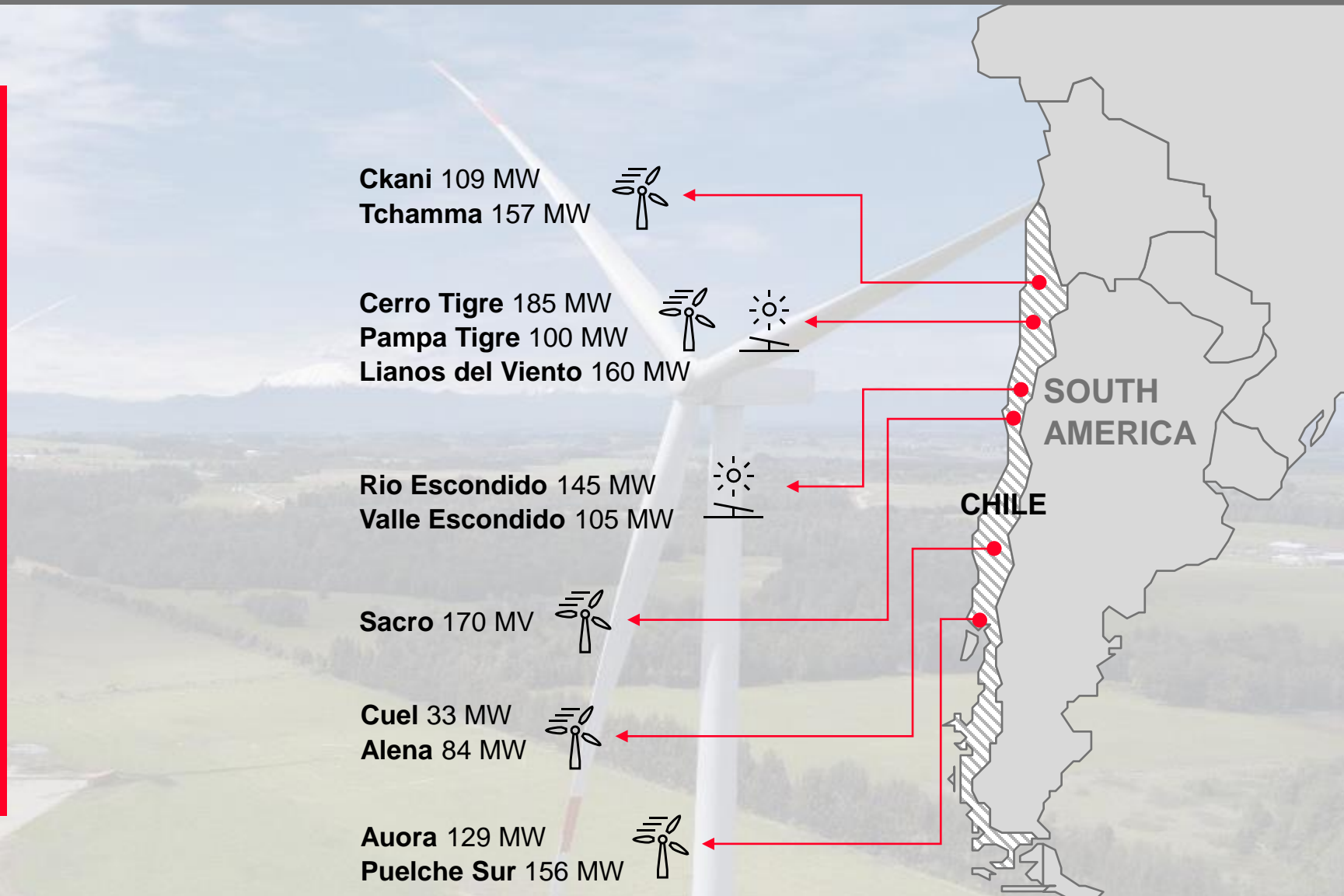
Sacro 170 MW



Cuel 33 MW
Alena 84 MW



Auora 129 MW
Puelche Sur 156 MW



InterContinental Robertson Quay Hotel, Singapore

- Minimize out-age risk
- Maximize return on investment
- Optimize operations with condition-based maintenance
- Enhanced safety of personnel and environment

40%

Reduction in the failure rate

50%

Increase in the lifespan of the transformer

100%

Increase in book value of the transformer
at the end of 20 years



TXpert™ Enabled dry transformer

It is projected that by 2050 more than two-thirds of the world population will live in urban areas.

75 dry transformers from Hitachi Energy are installed in the Burj Kalifa, Dubai, eliminating risks of oil spills and safety hazards.



Enhancing safety with TXpand

A rupture resistant transformer solution:

- Capable of absorbing the expansion caused by gases generated during a 20 megajoule arc
- Minimizing oil spillage and predictably channeling what little oil escapes for easy containment
- Risk of unplanned and long outages are reduced
- The TXpand transformer technology has been co-created with our partner Hydro Quebec, Canada



Eliminating hazards of oil-spills

Dry-type transformers

- 100% oil-free to minimize environmental contamination and fire hazard

Ester insulation fluid

- Biodegradable as designated by the Environmental Protection Agency (EPA)
- Reduced fire risk with 355°C fire-point for natural esters as compared to 170°C for mineral oil
- Available in power and distribution transformer up to 420 kV / BIL 1425 kV
- Supplied about 200 power transformers and 12,000 distribution transformers with ester fluids



Reducing incidents with TXplore™

- No, or very little, oil needs to be handled
- Eliminates the risk of a person entering confined space
- Inspection can begin immediately after taking an outage
- Significant reduction in outage time



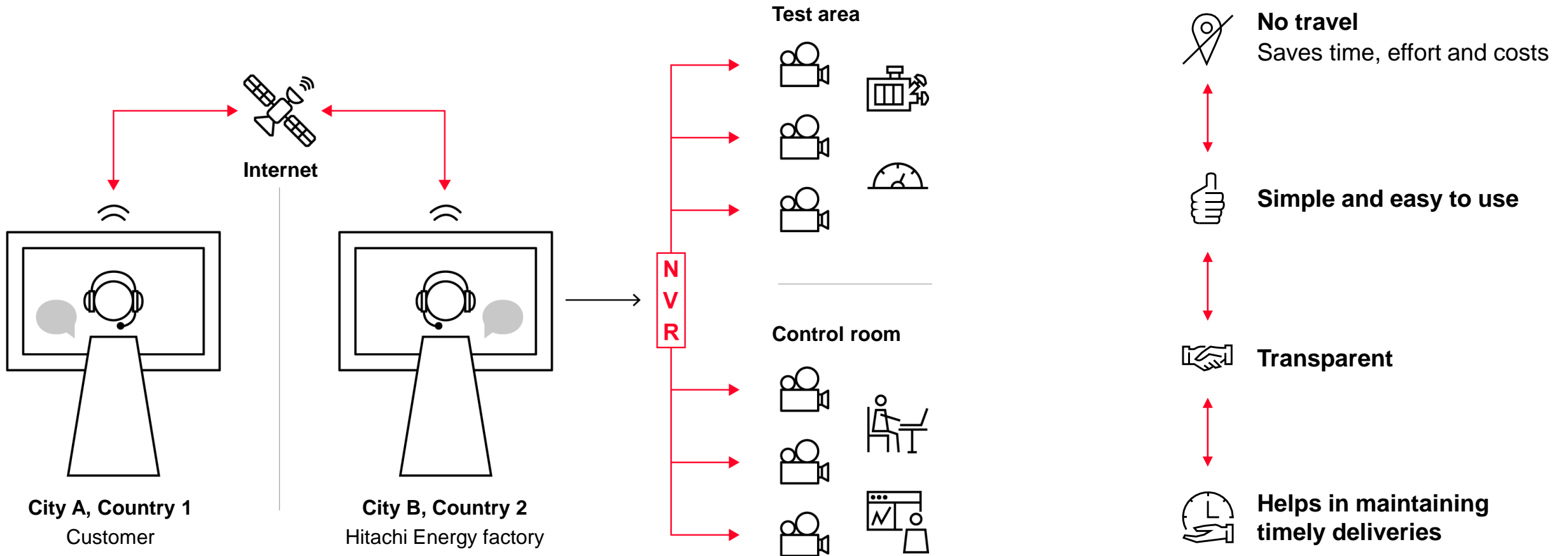
Circularity is present already in the transformers industry; but considering that almost 99 % of the transformer materials could be reused or recycled, a lot more can be done towards circularity.

A recent example is the Stena recycling and Hitachi Energy case in Sweden where old transformers will be disposed reusing or recycling about 99% of the material, comprising 64% material recycling, 35% clean, low emissions efficient incineration for energy and the balance 1% as disposed waste.




The new normal


Virtual Factory Acceptance Test (FAT) - Ensuring full transparency and trust




Utilizing the power of virtual technologies

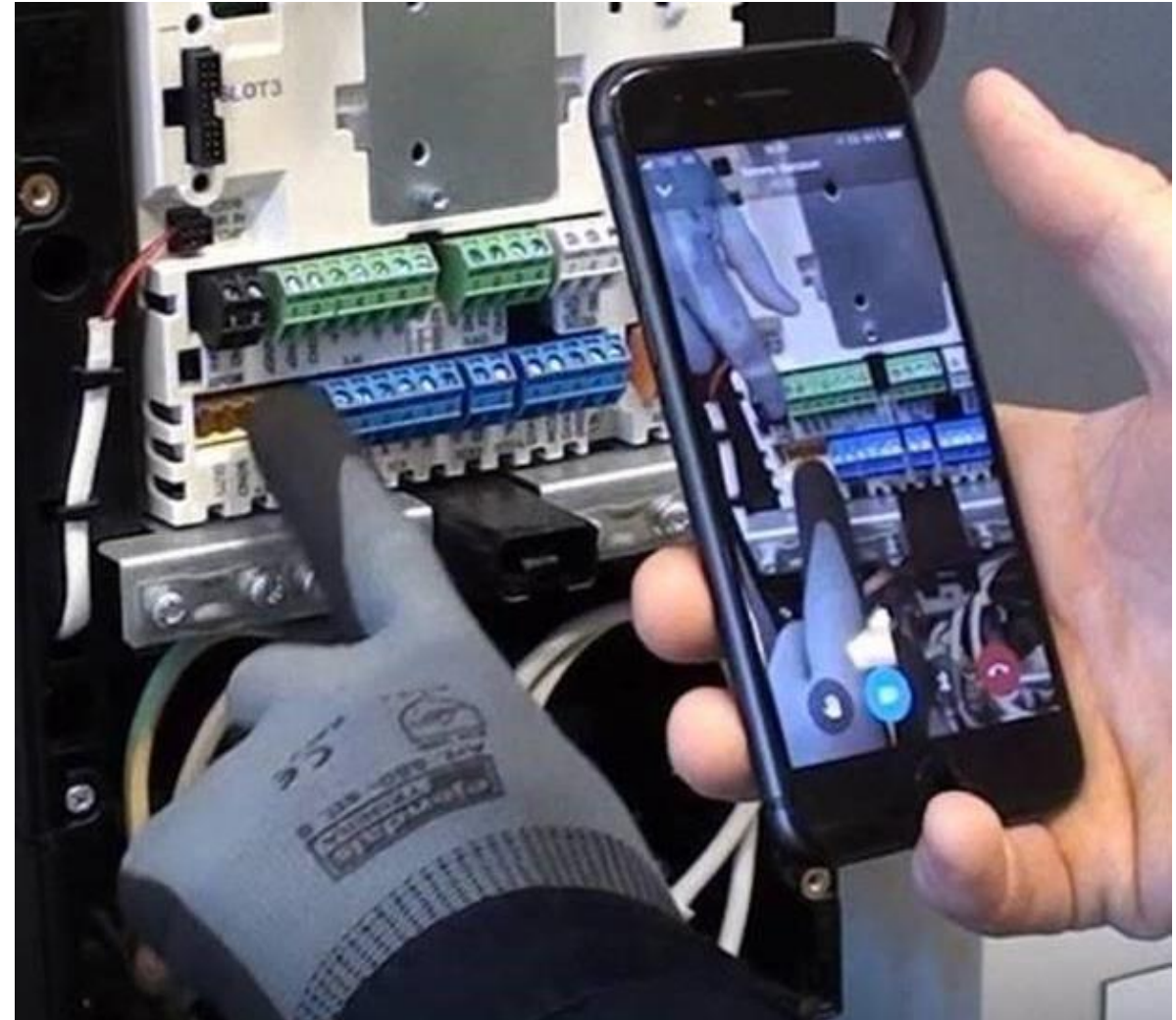
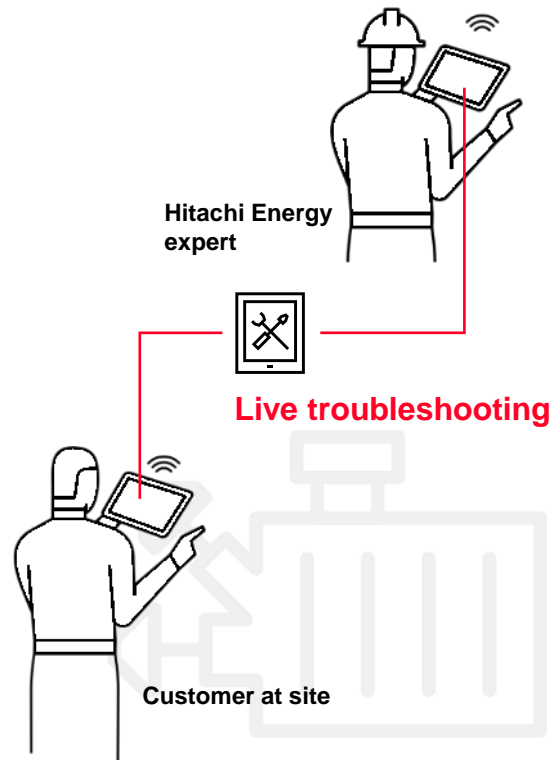
Augmented reality powered visual inspection by experts 24/7

 Global specialists

 Fast service solutions

 No travel

- See with the eyes of our experts who will guide your hands
- Check status of alarms and monitoring devices to detect defaults
- Access transformer virtual installation support





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