POWER RING

Revolutionize energy Management

ikos

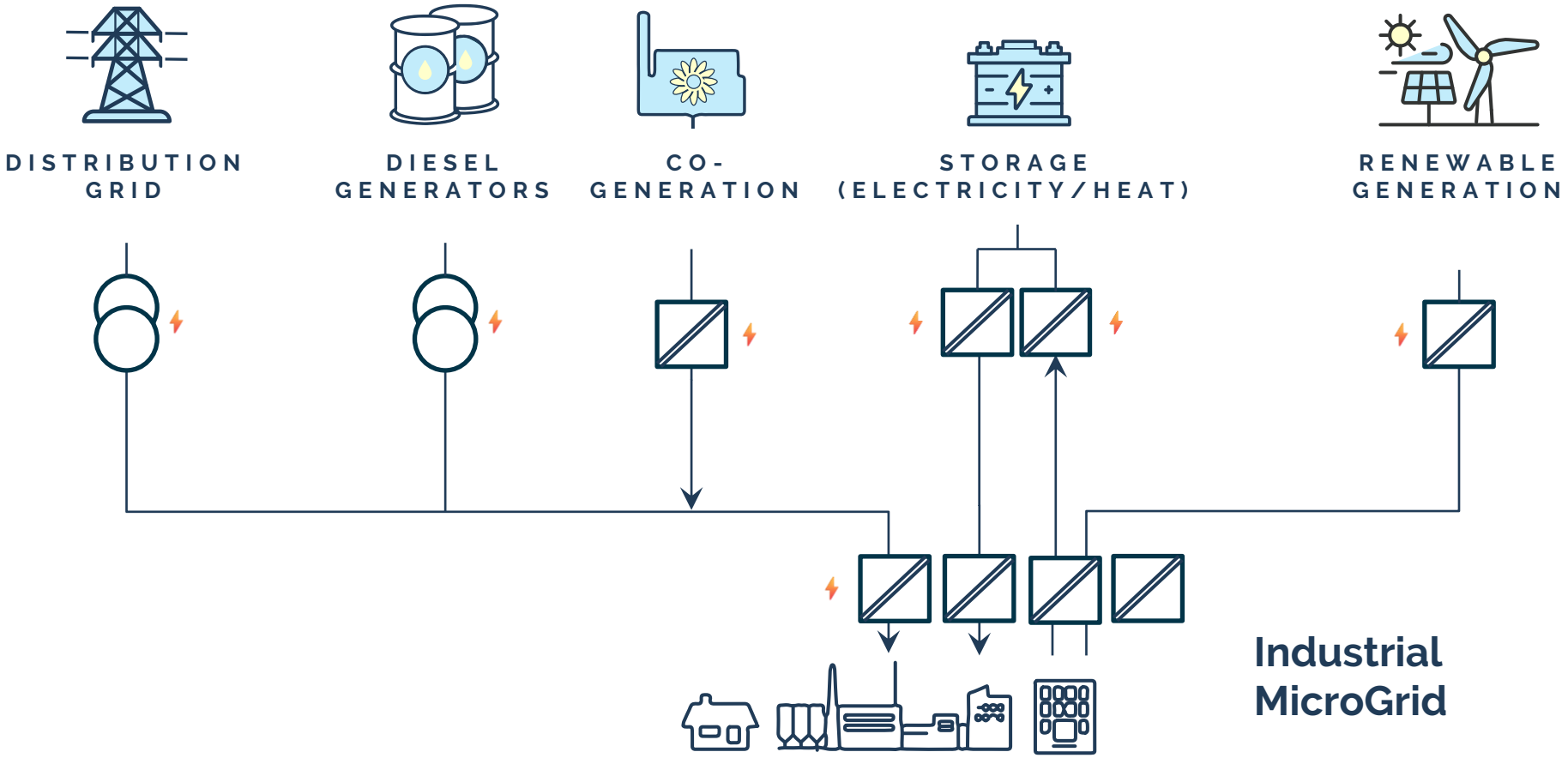
AGENDA

1. Introduction
2. Technology
3. Characteristics
4. Use cases examples
5. Industrial maturity
6. Take-away

TODAY
COMPLEXITY AND INEFFICIENCY

Up to **8+** systems
Up to 10% losses
Optimization impossible
Laborious integration - limited scalability

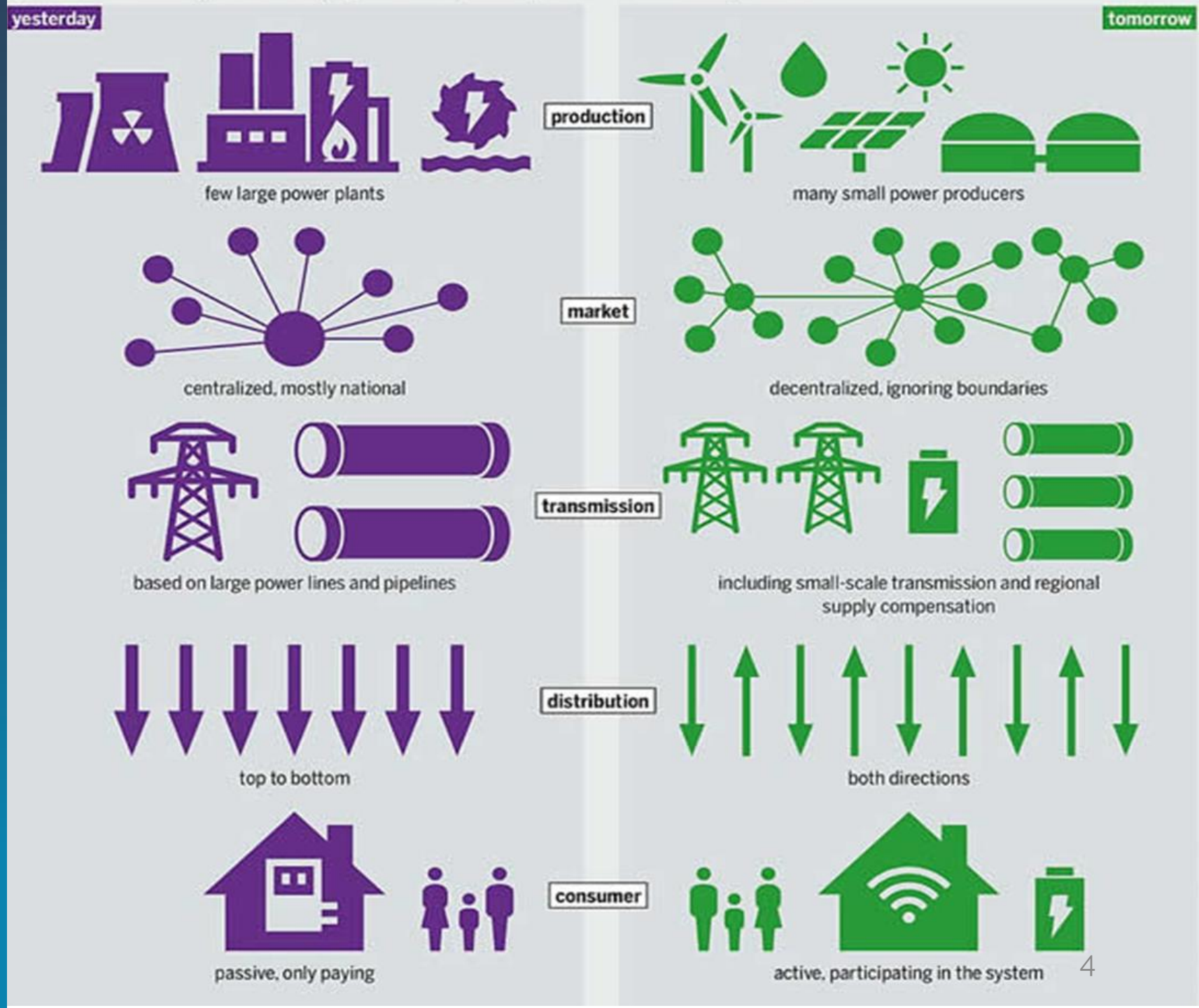
ASSEMBLY CONTROL SYSTEM



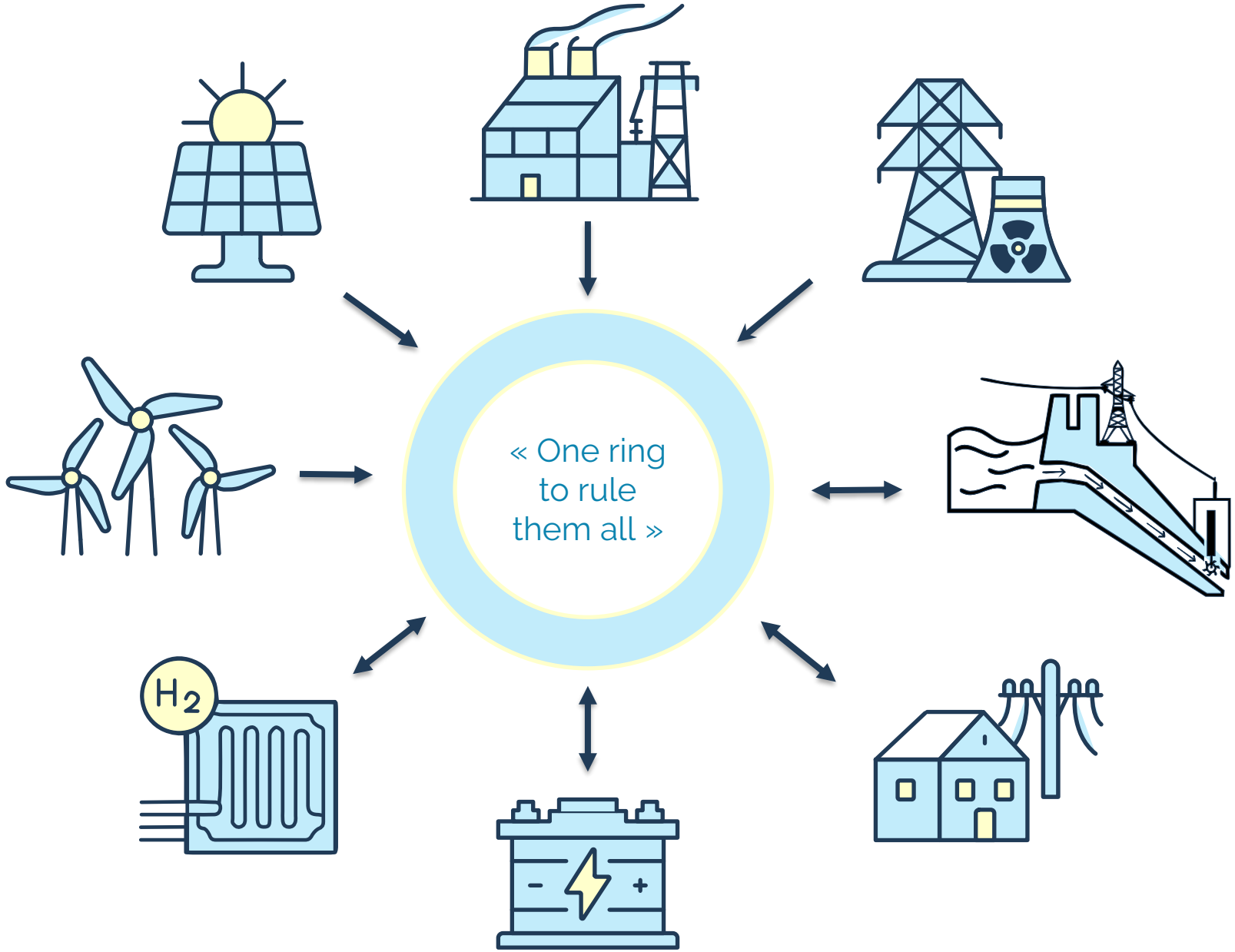
Changes needed

To adapt

- energy production
- energy transport
- energy management



POWER RING
THE UNIVERSAL ADAPTER of ENERGY

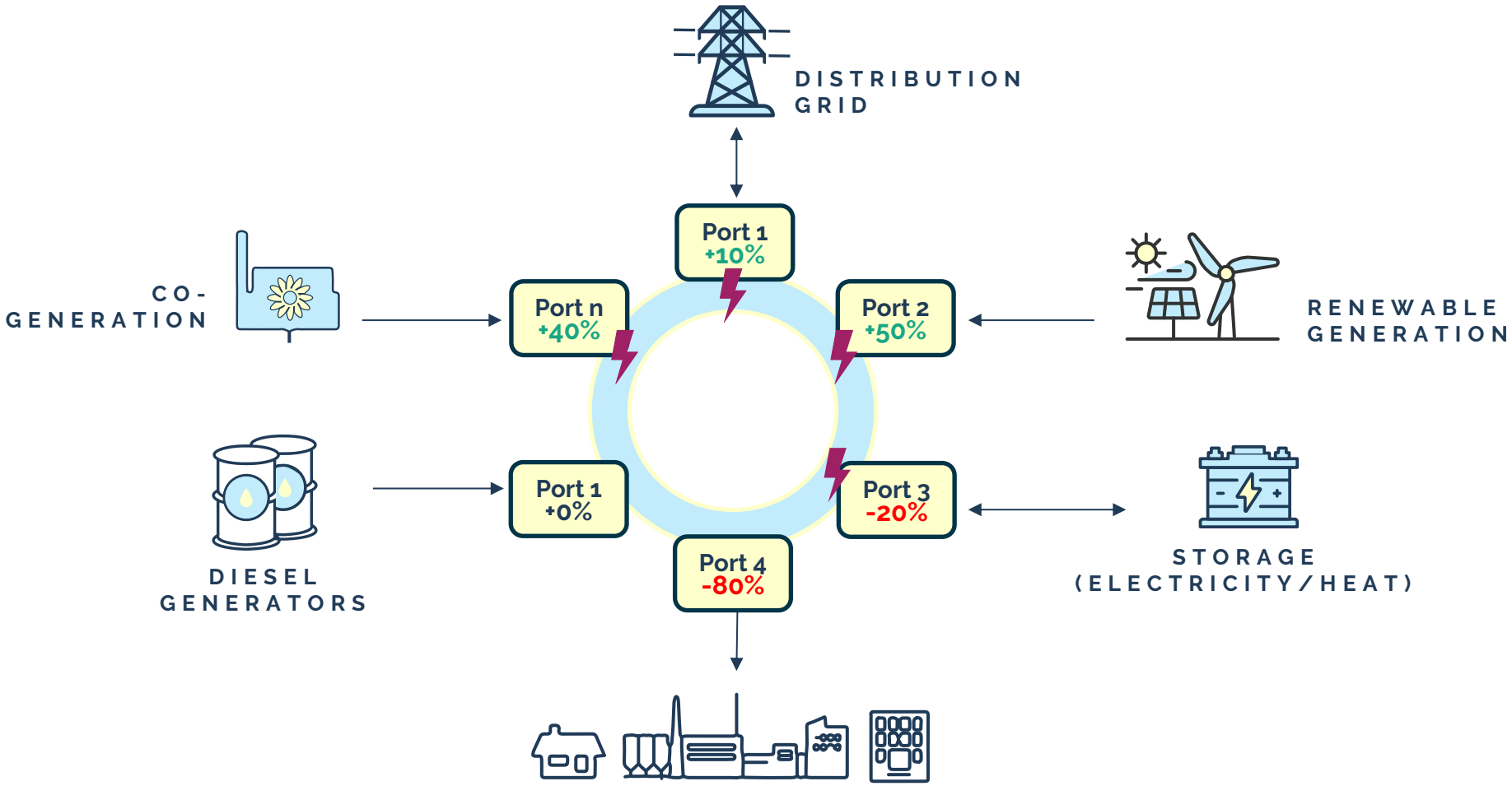


POWER RING

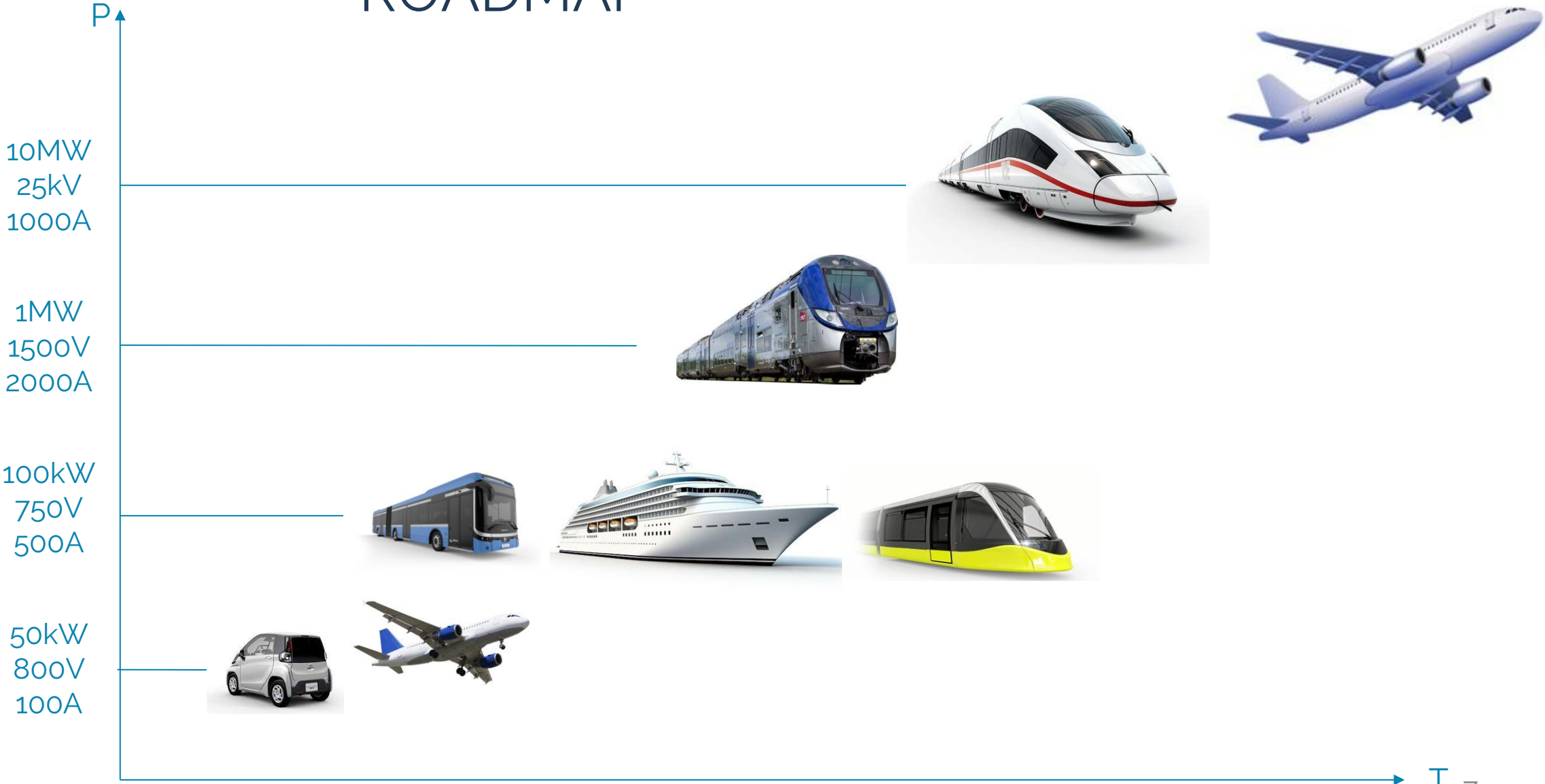
SIMPLICITY AND PERFORMANCE

A universal and modular system
Direct conversion
Intelligent real-time management

Industrial MicroGrid



POWER RING | **Transport**
ROADMAP



POWER RING | **Industrial / Energy**
ROADMAP

P

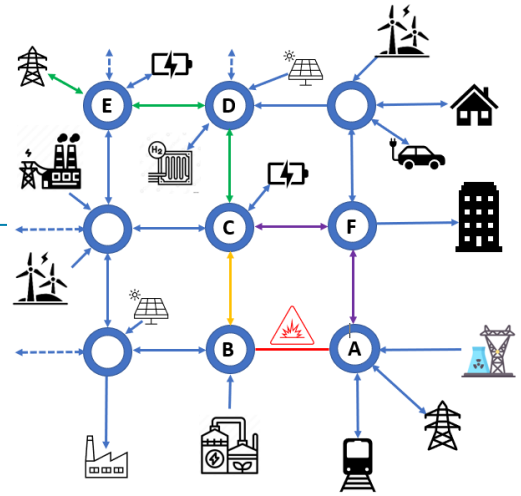
>100MW
220kV

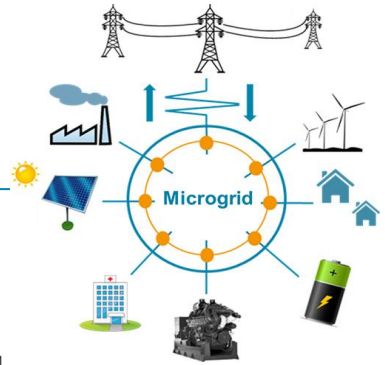
10MW
63kV

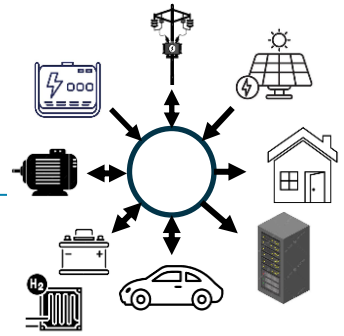
1MW
22kV

50kW
800V

T







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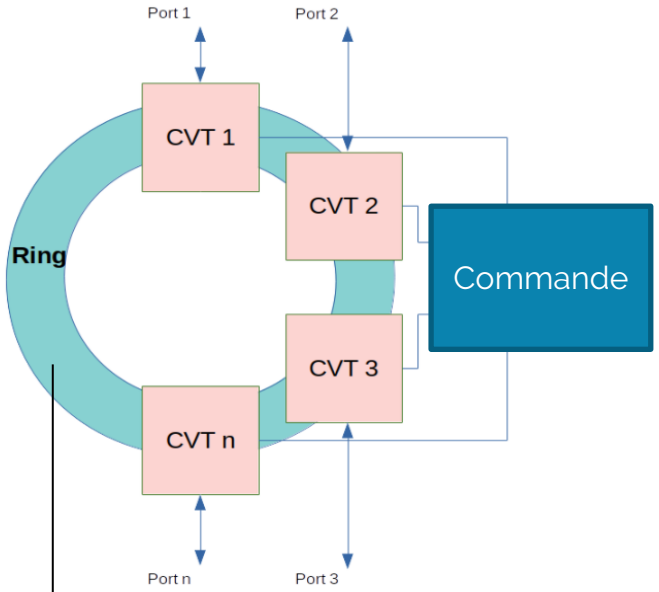
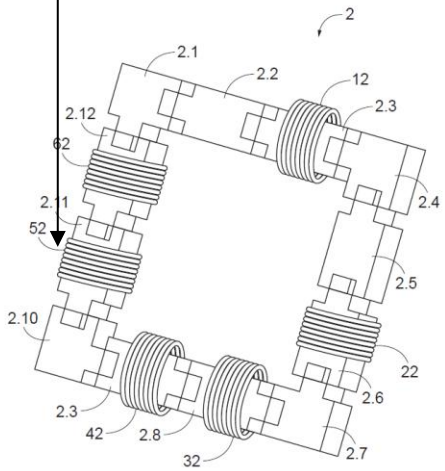
CUTTING EDGE TECHNOLOGIES

4 Technological Innovations

- **Multiports Conversion**
- **Universal and modular ports**
  Scalable design,
  Silicium Carbide technologie,
  new generation already planned for the future
- **Single IA (neuronal network)**
  Command Optimisation
- **High performances multi inputs/outputs Magnetical Coupler**
  Planar, multimodules





Patent filed 2021

Central point: the control command

4 Level of Management

L4-Energy Management System
- Rules for mains transferts

L3-Power Ring Management
- Power balancing (Slow regulation)

L2-Application Management
- Application (Motor/PV/Battery…)

L1-Port Management
- Fast Regulation
- Protection
- Monitoring

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Characteristics

General Features

- Scalable and modular
- High Efficiency (>98%)
- Insulated ports
- Multidirectional
- Ports AC + DC
- Individual ports control
- Real time dynamic reconfiguration
- Remote operation (SCADA)

Network Caracteristics

- Grid forming
- Grid Protection
- Grid monitoring
- Sub and virtual networks capability
- Local Agregation
- Energy storage management
- Network support
  - Frequency correction
  - Phases balancing
  - Reactive energy supression
  - Phase synchronisation
  - Frequency correction

Benefits

- Simple Hardware infrastructure
- Multi ways energy flow
- Simplify networks interconnection
- Self healing
- Add digitalization
- Flexibility
- Easy evolution
- Easy maintenance
- Cut down energy cost
- Energy storage management
- Small size, light weight
- Decarbonation

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Use Case

Low Power

- Domestic use
- Custom application

- UPS
- Boosted supply
- EV charger
- Individual Solar
- Individual storage
- Local generator
- Custom power
- Final application (motor,,,)

Industrial Level

- Grid forming
- Power optimization
- Energy storage
- PV production
- Local Agregation
- UPS

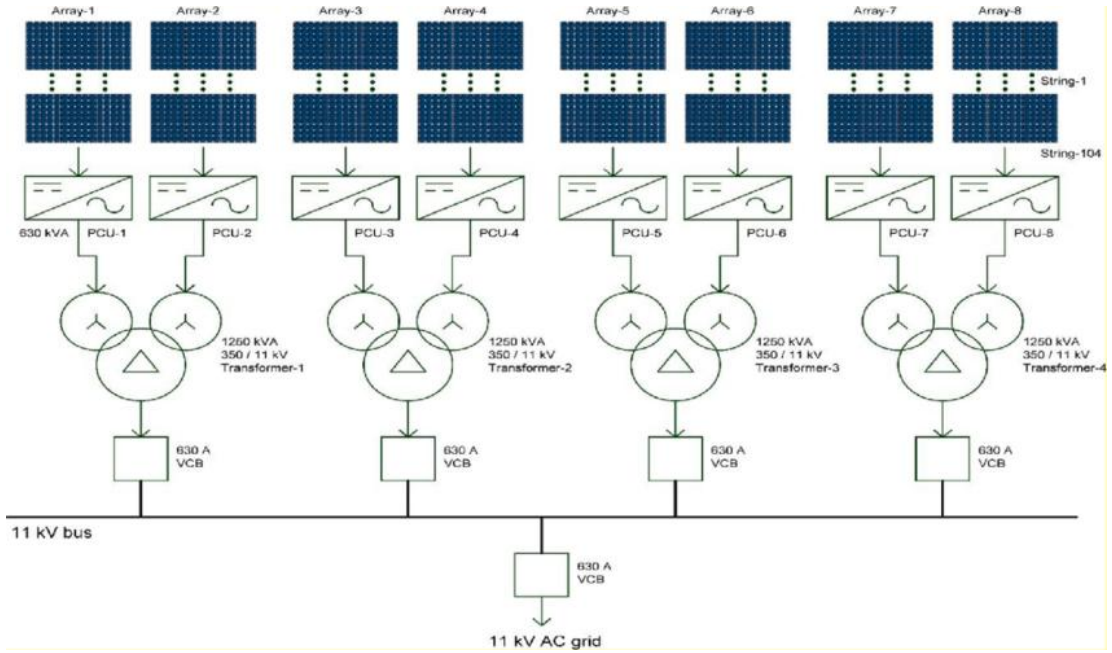
Mid Power

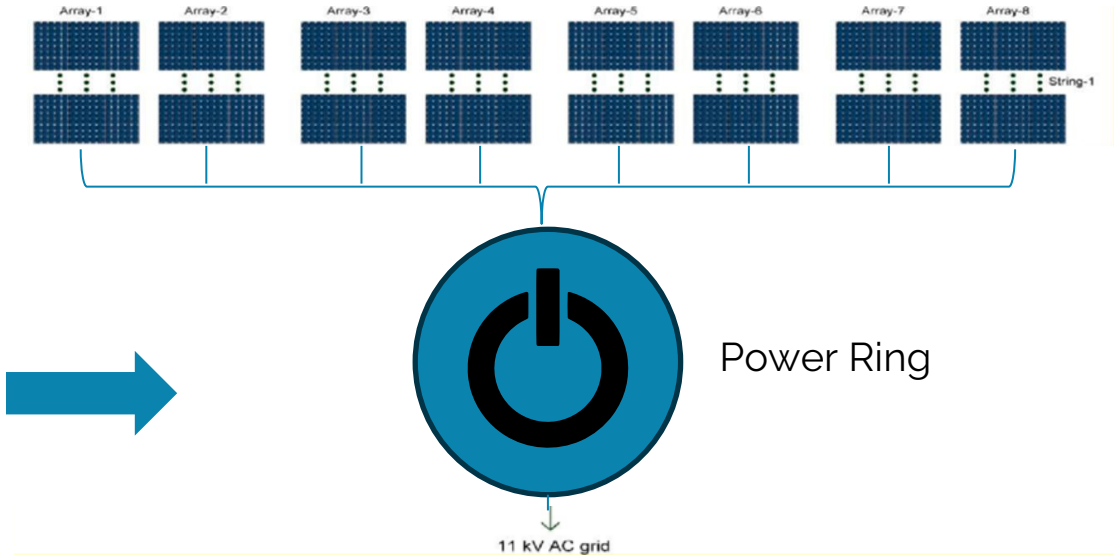
- Energy distribution
- Power net connexion
- Transport
  - Railway
  - Sea
  - Planes
- City structure

High Power

- Energy transport
- HVDC conversion
- DC ⇔ AC Conversion
- Voltage Conversion (HT⇔BT)
- Sub net connection

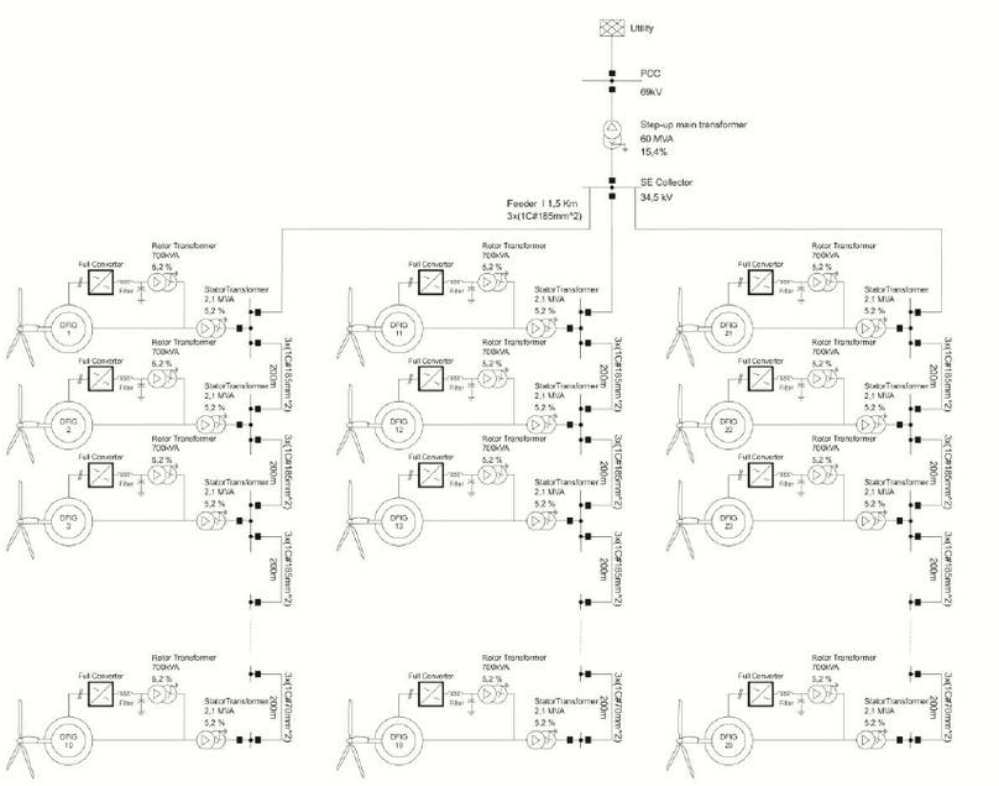
Photovoltaic integration
Simplifying and reducing cables

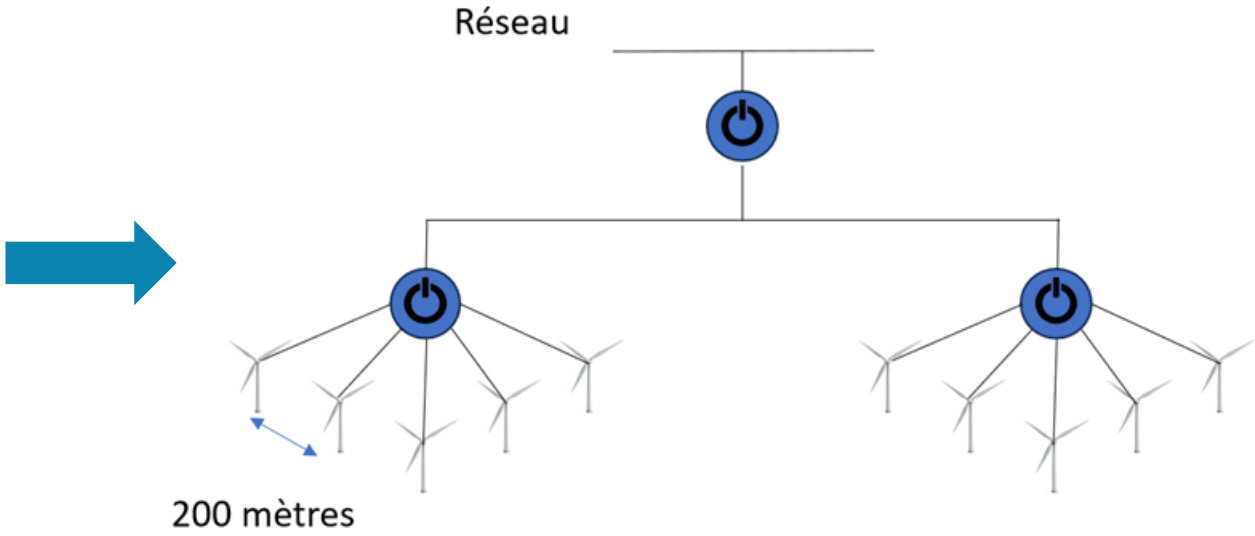




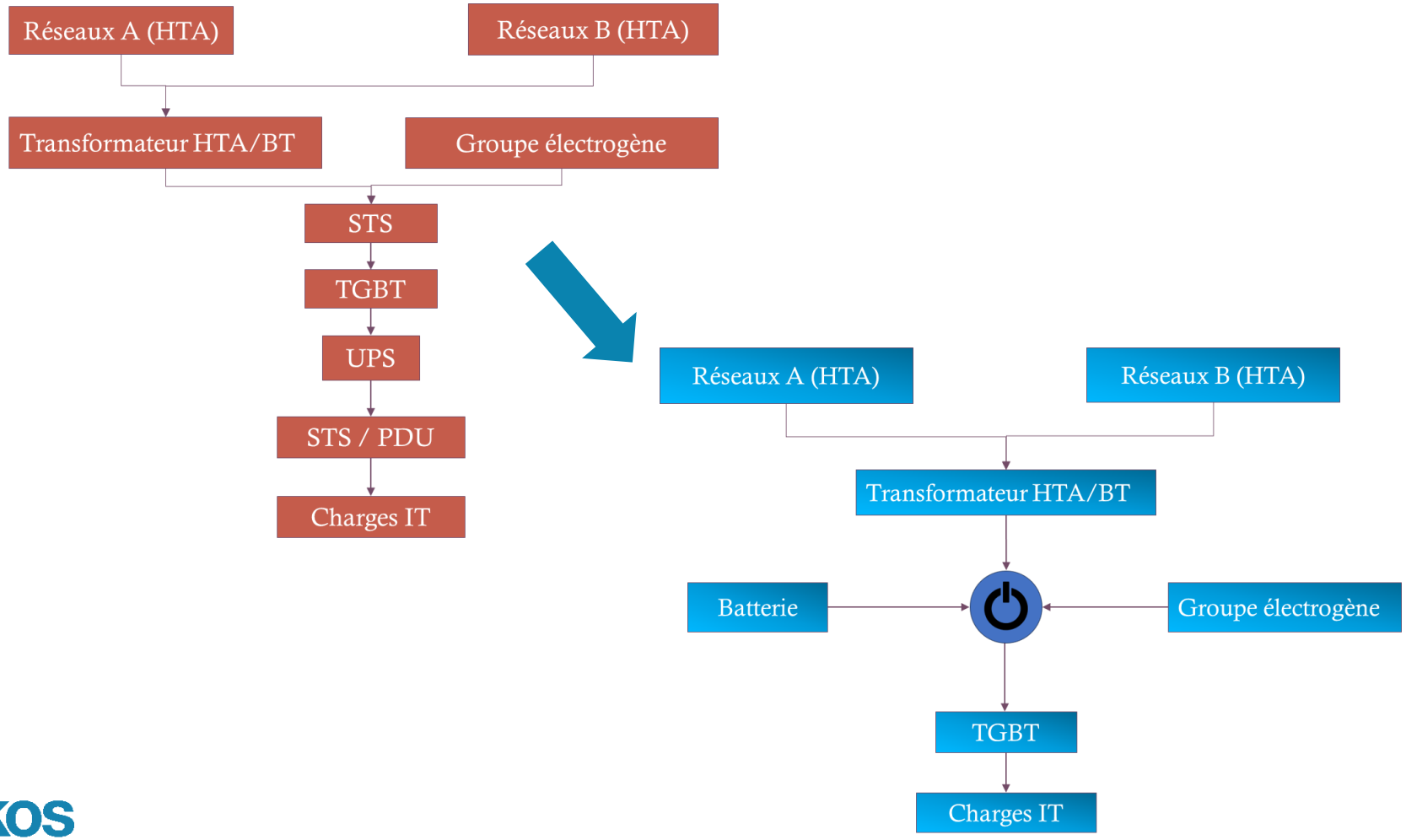
- Reduction of the length of large section cables
- Direct conversion – > reduction of conversion stages,
- Simplifying the physical architecture
- Better availability of the farm in case of a string failure
- Network synchronization and direct injection

Wind energy integration
Simplifying and reducing cables





Datacenters
Reduced number of failure points



Without Power Ring	With Power Ring
Bascule	Dynamic sharing
UPS AC	Shared DC battery
STS required	STS removed
Heavy Architecture	Simplified architecture

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PLURIDISCIPLINARY TEAMS

Excellence and Diversity for Innovation

Main Team

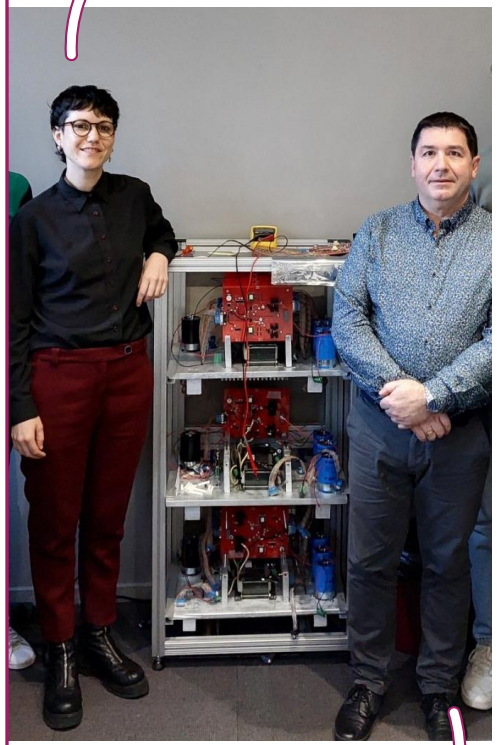
Vincent SARRAZIN sponsor
Patrice GOMEZ Technical coordinator
Jeanne-Marie DALBAVIE project manager
Floran CASSIN PhD ENS/Centrale Supélec
Ismael CHIRINO AGUINAGA
PhD UTC

~50 engineer IKOS
Many contributors worldwide

Research support

2 PhD
4 Scientifics publications
Patent EP4292194A1

Jeanne-Marie Dalbavie
Innovation engineer,
X-Mines, 10 years d'exp



Patrice Gomez
Electronics and power electronics Expert
30 year exp

Vincent Sarrazin
Deputy CEO IKOS
20 years d'exp

Floran Cassin
3 years d'exp

Ismael Chirino Aguinaga
3 years d'exp

TRL4 VALIDATED LABORATORY PROTOTYPE

Prototype Capability

800V, 100A, 4 kW
4 ports

Results

For 130V 1200W
1 source, 2 sources
Static and dynamic operation ✓

- >95% (2% loss due to testing configuration)
- Mass density: 2 kW/kg
- Volume density: 815 < <1540 kW/m3

Elements to be consolidated vs. existing

- **Cost:** design-to-cost from conception (modularity, standardization), LCC study to be carried out
- **Efficiency:** mature product>98%
- **Availability**: study to be done, objective of 30 years, safety and EMC studies on the boards done upstream
- **Harmonics**: reduced filtering for High Frequency

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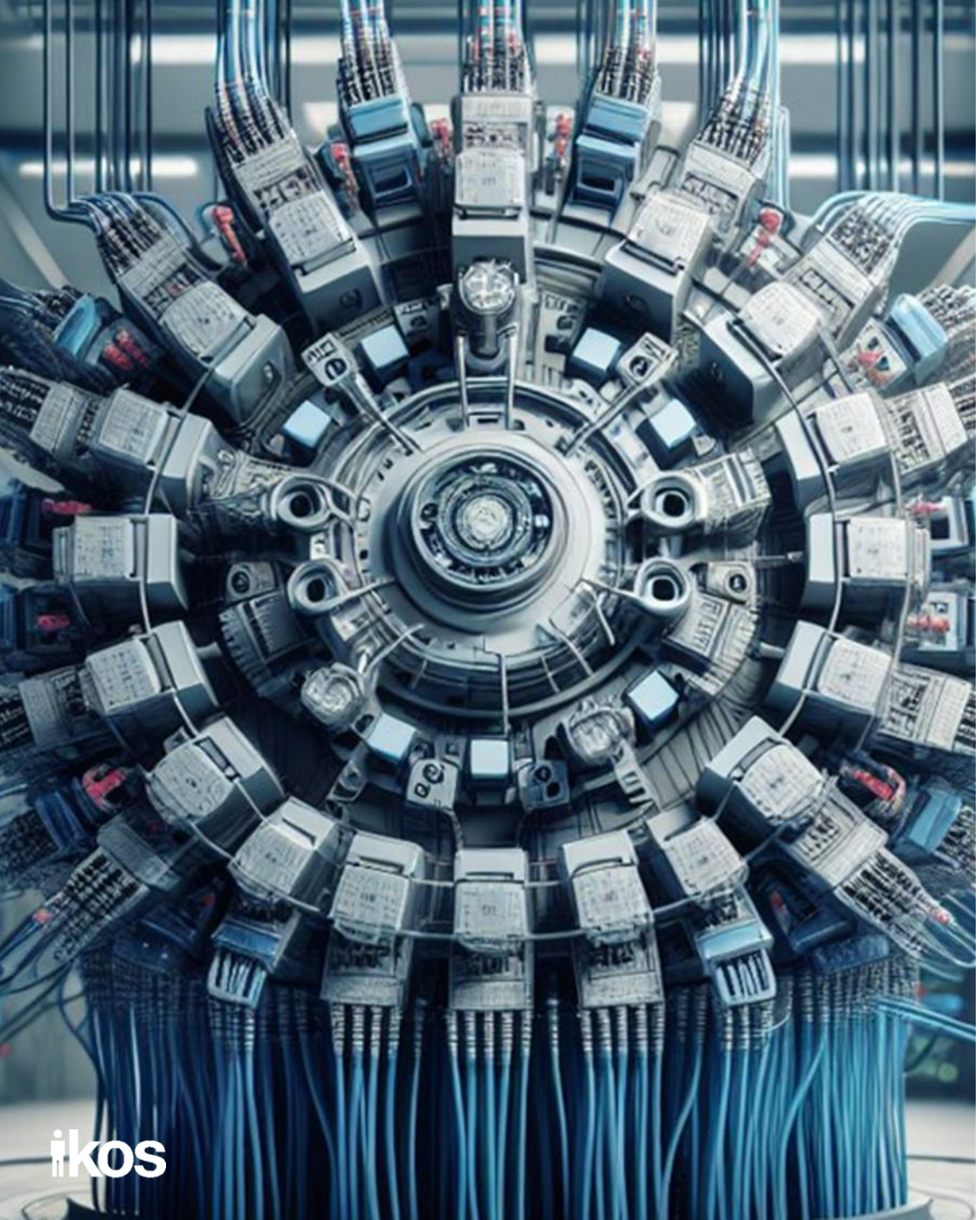

TRL5 on-going

Advance in the field of MAB (Multiple Active Bridge)

- 🔌 Universal Input/output ready for evolution
- ⚡ Smart energy management
- 💰 Reduce deployment and use costs
- 🛡️ Embedded protection

👏 Winner of the 2025 Great National Engineering Award of France 👏

https://www.youtube.com/watch?v=70L4OLuKqkE