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Distributed Energy Systems

Neue Chancen durch dezentrale Energiesysteme

The “old” energy system

The energy system of tomorrow

Three trends are shaping the energy system …

decarbonization, decentralization and digitalization

100%
electricity from renewables by 2030

45-50%
renewable annual energy by 2030

- Austria‘s #mission2030

… leading to Opportunities for industries, cities, infrastructure facilities, communities and campuses

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Trends

Decarbonization

Decentralization

Digitalization

Future Energy

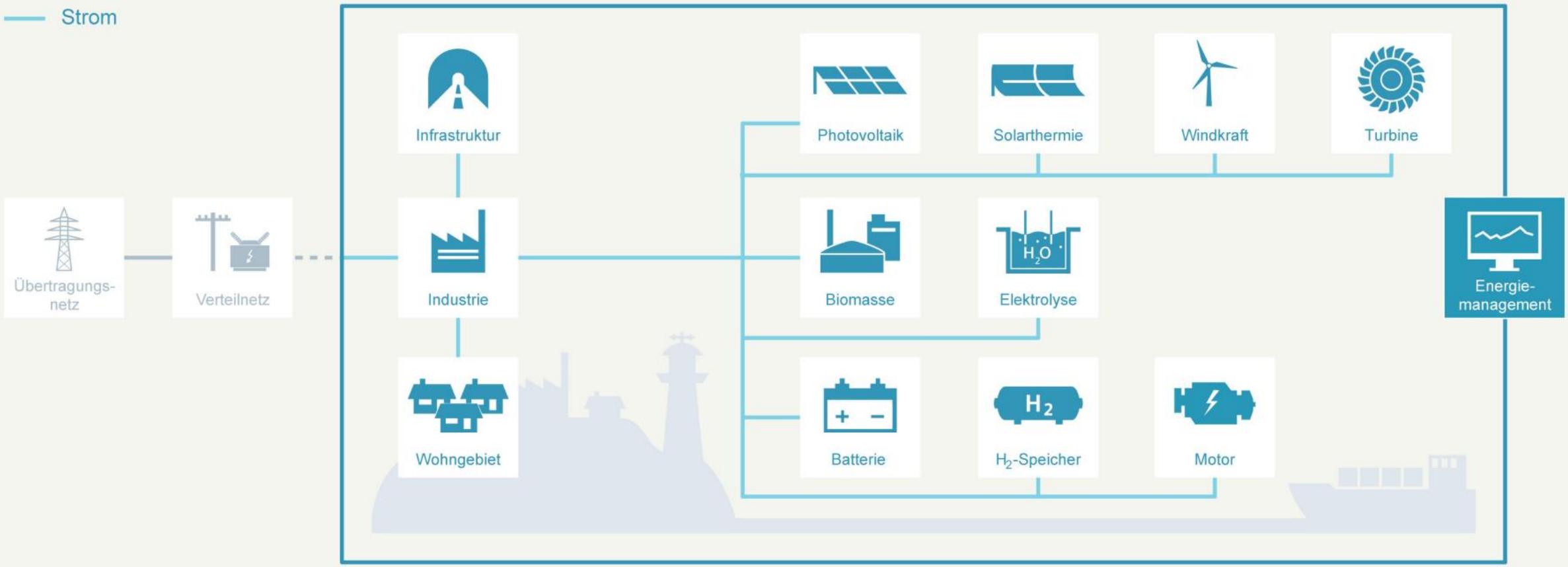
Opportunities

Cost reductions and more economic efficiency

Optimized supply security and maximum reliability

CO2 reduction and improved sustainability

Building blocks of a DES (Decentral Energy System)



Example: Load management at an energy intensive factory

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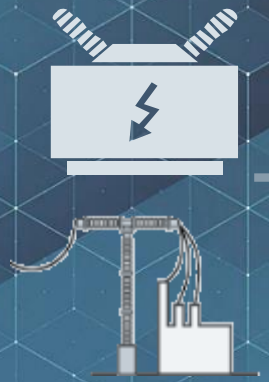
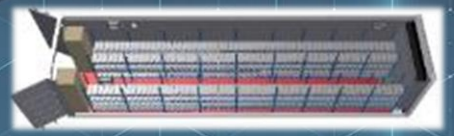
1600 kVA
6 kV – 0’4 kV



1000 kW / 1500 kWh

battery storage



Coverage of the first minutes

1200 kW

CHP

load takeover

1200 kW

CHP

load takeover

1500 kW
load shedding

switching off
dedicated loads

grid access

- 530 events
- 5,5h max duration
- runtime 450h/a

Battery Storage

CHP 1

- 41 events
- 96h max duration
- runtime 809h/a

- 43 events
- 24h max duration
- runtime 207h/a

CHP 2

Peak-Shaving

- 4 events
- 15 min max duration
- runtime 1h/a

Campuses and infrastructure facilities

Algonquin College, Ottawa, Canada

Algonquin is the largest college in Eastern Ontario, with 63,000 students

Scale: 4 MW

Completion: 2017

Challenge

- Paving the way for a zero carbon footprint
- Creating a unique culture of sustainability

Solution

- Sustainable campus-wide energy system backed by a long-term partnership

Scope

- 4 MW CoGen plant and 500kW PV plant
- Energy storage
- Microgrid Management System (MGMS)
- Infrastructure upgrades
- EV charging stations
- Financing

Benefits

- 1,200 tons less CO_2 per year
- Annual operating cost savings $3,200,000
- Annual energy cost reduction of

48%

Remote locations

Isabela Island Hybrid Power Plant, Galapagos Islands, Ecuador

First of its kind local energy system located on the Galapagos Islands

Scale: 1.2 MW

Completion: 2018

Challenge

- Sustainable, reliable energy supply for a UNESCO world heritage site

Solution

- Hybrid Power Plant based on 100% renewables

Scope

- Solar PV plant
- Pure plant oil gensets
- Energy storage
- Control system
- Performance guarantees for renewables
- Remote monitoring

Benefits

- Designed to run completely carbon-neutral
- 30 dB noise reduction
- 99% availability
- Shut down of engines at good solar radiation
- Guaranteed renewable plant performance
- Average monthly reduction of CO_2

85 tons

Campuses and infrastructure facilities

Sello Shopping Center, Espoo, Finland

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Sello is one of the largest shopping malls in Scandinavia

Scale: 2 MW
Completion: 2018

Challenge

- Achieving substantial energy savings, sustainability and long-term improvement of indoor air quality

Solution

- Distributed Energy Resource Performance Monitoring and Siestorage

Scope

- Smart energy management as a service
- 600 kW solar panels
- 1.68 MW battery storage
- LED-lighting system
- Upgrade of automation system

Benefits

- 125,000€ annual heat and electricity cost savings
- 271 t reduction of annual CO_2 emissions
- 470 MWh energy production per year
- Annual profit on the energy market of

480,000 €

Remote locations

Island of Ventotene, Italy

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Ventotene Island is not connected to the Italian national distribution network

Scale: 2 MW
Completion: 2015

Challenge

- Sustainable and stable power supply for a remote island in the Mediterranean Sea

Solution

- Hybrid solution comprising generators, renewable energies and a storage system

Scope

- Use of renewable sources instead of four diesel generators with 480 kW each
- Increasing number of PV plants
- Integration of a SIESTORAGE system
- Microgrid controller

Benefits

- Operating hours of all generators reduced by approx. 55.5 percent
- 91% operating time during which grid stability is guaranteed
- Reduced fuel consumption and CO_2 emissions per year by

15%

Remote locations

Blue Lake Rancheria, California, USA

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Blue Lake Rancheria is a federally recognized tribal community

Scale: 700 kW
Completion: 2017

Challenge

- Increase the reliability of the electrical system as well as reducing carbon footprint

Solution

- First-of-its kind low-carbon based microgrid solution for critical community buildings

Scope

- Siemens Spectrum Power™ Microgrid Management System (MGMS)
- Integration of one existing 500 kW solar photovoltaic system, battery, building automation system and diesel engine gen set
- Consulting engagement

Benefits

- Annual energy cost savings by at least 25%
- 195 metric tons less annual CO_2 emissions
- > 40% renewable energy generation of annual production
- Available on-site power independent from the utility

7 days

Leafs / Blockchain pilot project Heimschuh
Provisioning of storage capacity to prosumers

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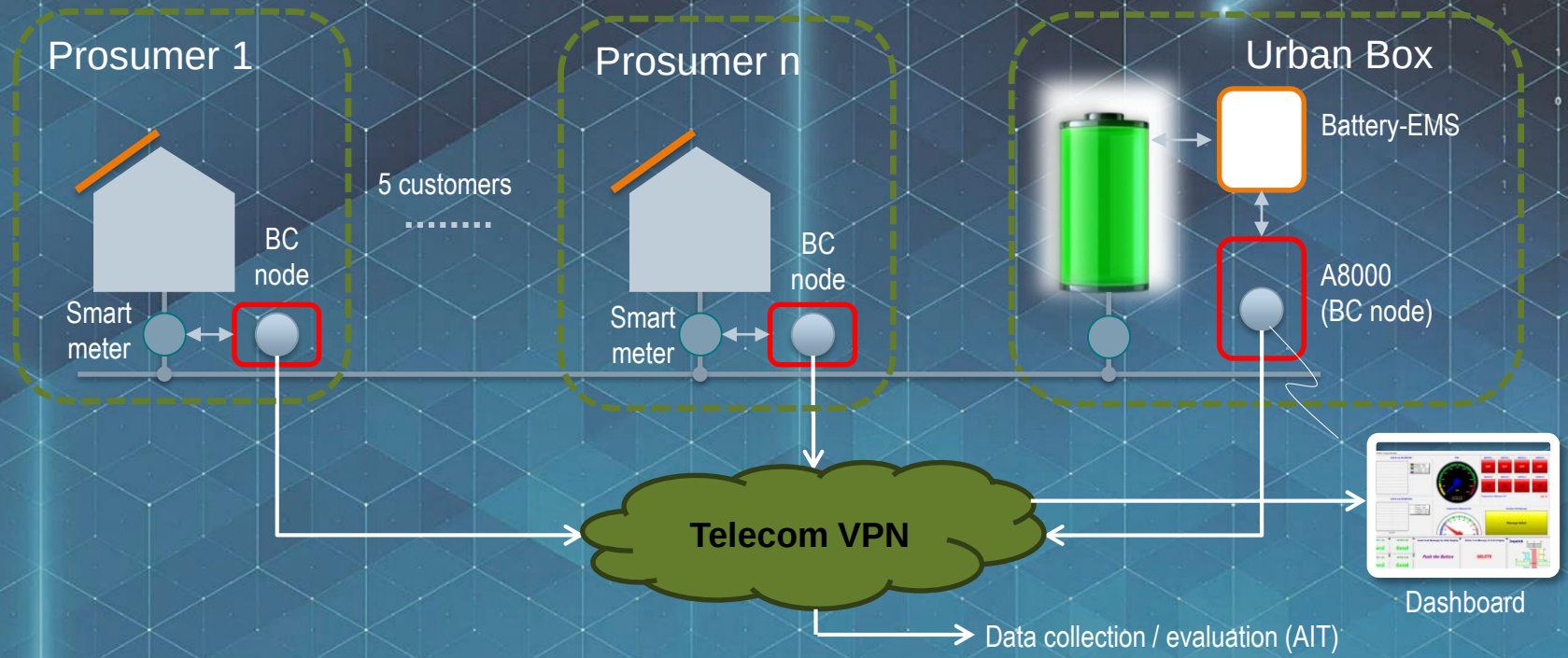

Project Partners: Energienetze Steiermark (DSO), AIT (Austrian Institute of Technology), Siemens

Solution concept: Private Ethereum Parity Blockchain

Prosumer:
- Forecast based request of storage capacity (Day ahead)

A8000:
- Check of all capacity requests against available sorage capacity and max. inverter power
- Assignment of storage capacity

A8000:
- Execution of battery charging supporting voltage management within the LV grid segment
- Delivery of stored energy
- Keeping an account per prosumer

To be extended in the R&D project Blockchain Grid

Logistics Company with long-term Storage for PV with Battery Aystem and/or Power-to-X (e.g. Hydrogen)

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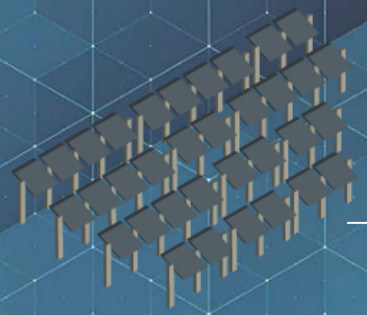
consumpttion: 2-6 MW



generation:

4..8 MWpeak

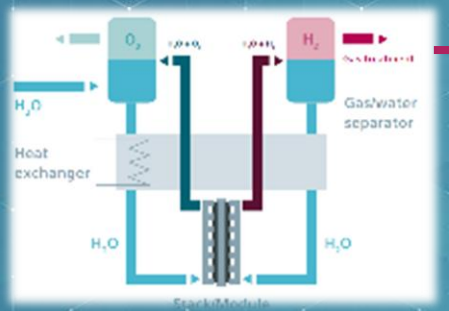
measurement (P)

grid acess:

0.4/10..20 kV

battery system

x MW @ y MWh



electrolysis

x MW

Our Digitalization / Automization Portfolio is the Brain and the Heart of an efficient Distributed Energy System

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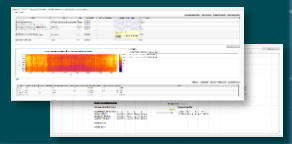
Monetization
Efficiency and optimization
Transparency and awareness
Resiliency and control
Planning

Spectrum Power MGMS

PSS DE

Back Office

Technical feasibility & economic simulation

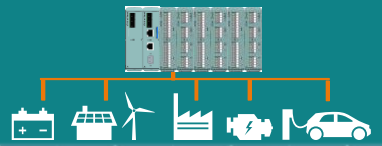


- Optimize Cost
- Optimize reliability of supply
- Optimize Sustainability

Microgrid & Photovoltaic Power Plant Controller

On site

Local Hardware Controller, fail safe and real time



- Network stability
- Generation Control
- Load Management
- Monitoring/ Reporting
- Measuring
- Storage Control
- Peak shaving
- Islanding / Black start

DEOP

Cloud Apps

Digital Services for Microgrid Optimization and Monitoring

- Monitoring/Reporting
- Optimized supply
- Enhance sustainability
- Maximized efficiency
- Archiving
- Price forecasting
- Load forecasting
- Optimization of own requirements

DEMS

Aggregator

Trading optimization and ancillary services

- Virtual Power Plant
- Demand response
- Load forecasting
- Market interaction

Energy market

- Reduce cost
- Security of supply
- Sustain-ability

Siemens Digital Grid provides the whole Digital Value Chain for Distributed Energy Systems

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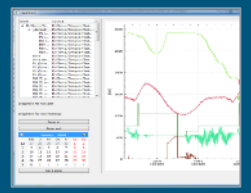
Simulation services

Simulate project, Evaluate DES baseline and DES solution benefit (hardware and software)



Managed services

Customer DES solution, operation recommendations

Optimization

Historical or predictive data: Evaluate best solution configuration (incl. the optimum function setting for the control) and operation minimizing operation cost and verifying grid stability

Consulting

Consulting offering: Energy site improvement recommendation and services based on data

Microgrid controller offering

Simulation data to design optimized control functionalities in a modular way

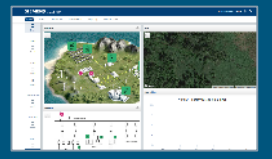
DER Performance Monitoring and Analytics Campus/C&I/IPP Performance monitoring plus data analytics

Connected Field Devices

Reliability, energy efficiency, market interaction and data gathering

Decentralized Energy Monitoring Optimization

DES Data gathering, reporting, benchmarking data analytics (Actual vs. Historical, Simulation baseline, anomalies detected)



Distributed Energy Systems provide Value with comprehensive Lifecycle Services and utilize the full Breadth of Technology

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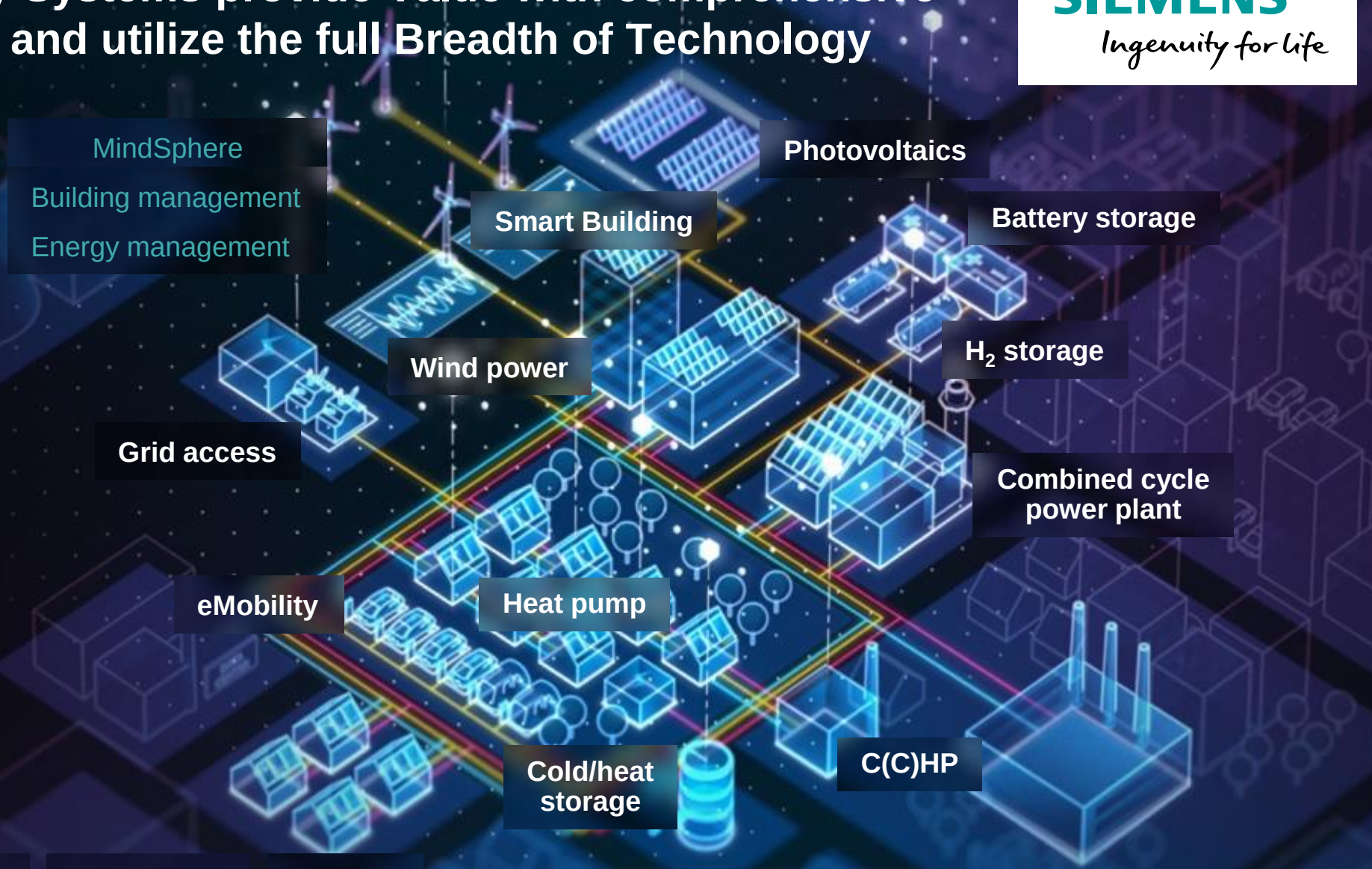
Resilient energy supply

Reduced costs

Improved sustainability



Vielen Dank für Ihre Aufmerksamkeit

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