

UK Energy Storage Conference

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The future of
energy systems,
buildings
and industries

Megatrends that are changing our world



By 2050, nearly **70%** of the world population will live in cities; today it's **54%**.

Source: United Nations, World Urbanization Prospects. The 2014 Revision, New York, veröffentlicht 2015

At the UN Climate Conference in Paris in 2015, almost all nations of the world agreed to limit anthropogenic global warming to well under **2° centigrade**.

Source: Earth System Research Laboratory, NOAA, 5. Oktober, 2017

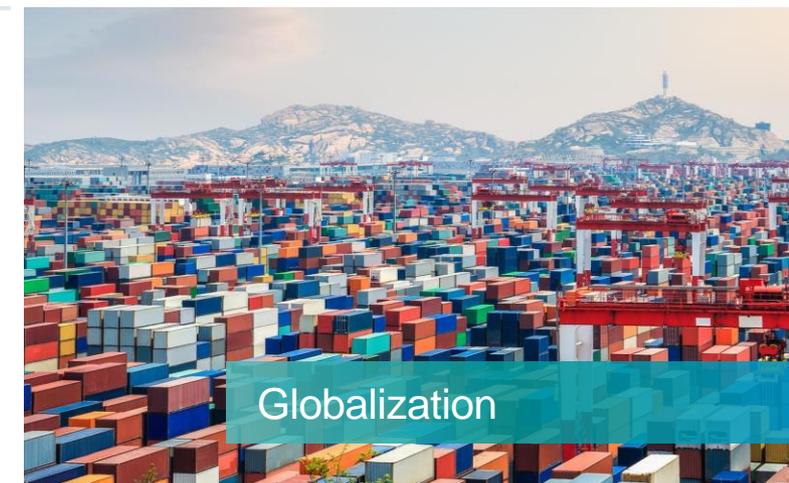


By 2020, the global volume of data will soar to **44 zettabytes**, and **50 billion** devices will be connected.

Source: IDC, The Digital Universe of Opportunities: Rich Data and the Increasing Value of the Internet of Things, April 2014

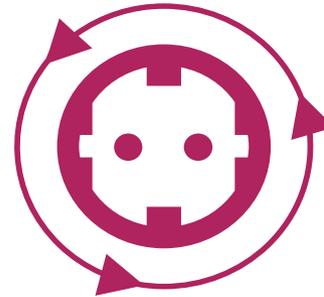
In the time span of **20 years**, global export volume has more than quadrupled.

Source: Statista, 2017



Today's main challenges of the energy system

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Economic Efficiency

“Over the past century, affordable energy has been a significant component of global economic growth and development.”

World Economic Forum

Reliability

“Inefficient, antiquated energy supply stifles productivity.”

United Nations Foundation, »Achieving Universal Energy Access«

Sustainability

“Europe will cut its greenhouse gas emissions by 40% by 2030 and will produce 27% of its energy from renewable sources.”

The Guardian

3D driving tomorrows ,Future Grid'

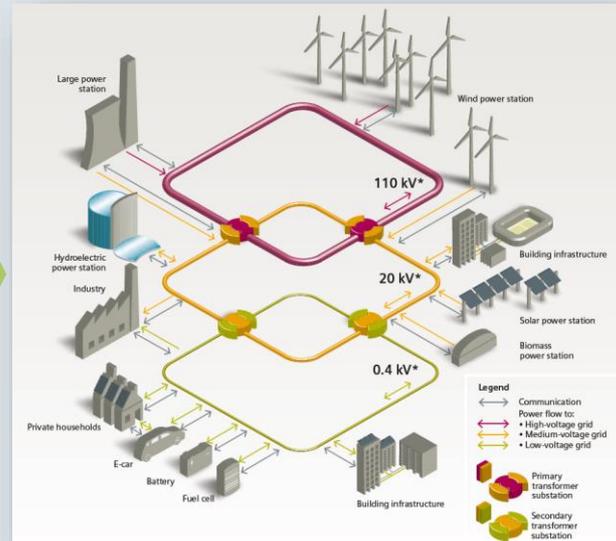
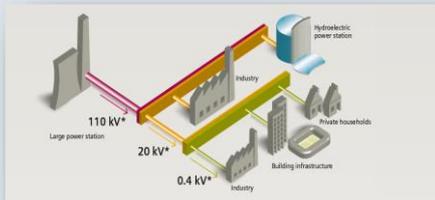
Decarbonation



Decentralization



Digitalization



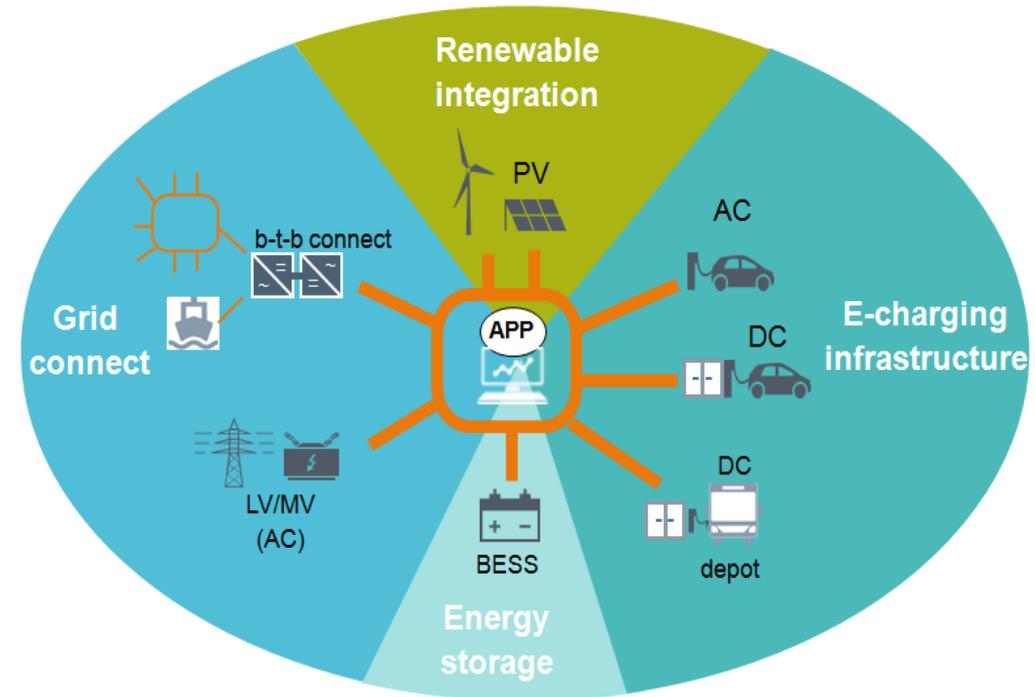
- Changing MW/LV grid structures
- Power Electronics in generation, storage and consumption
- New business models drive / impact on hardware
- Extended domain know how required

Market deregulation

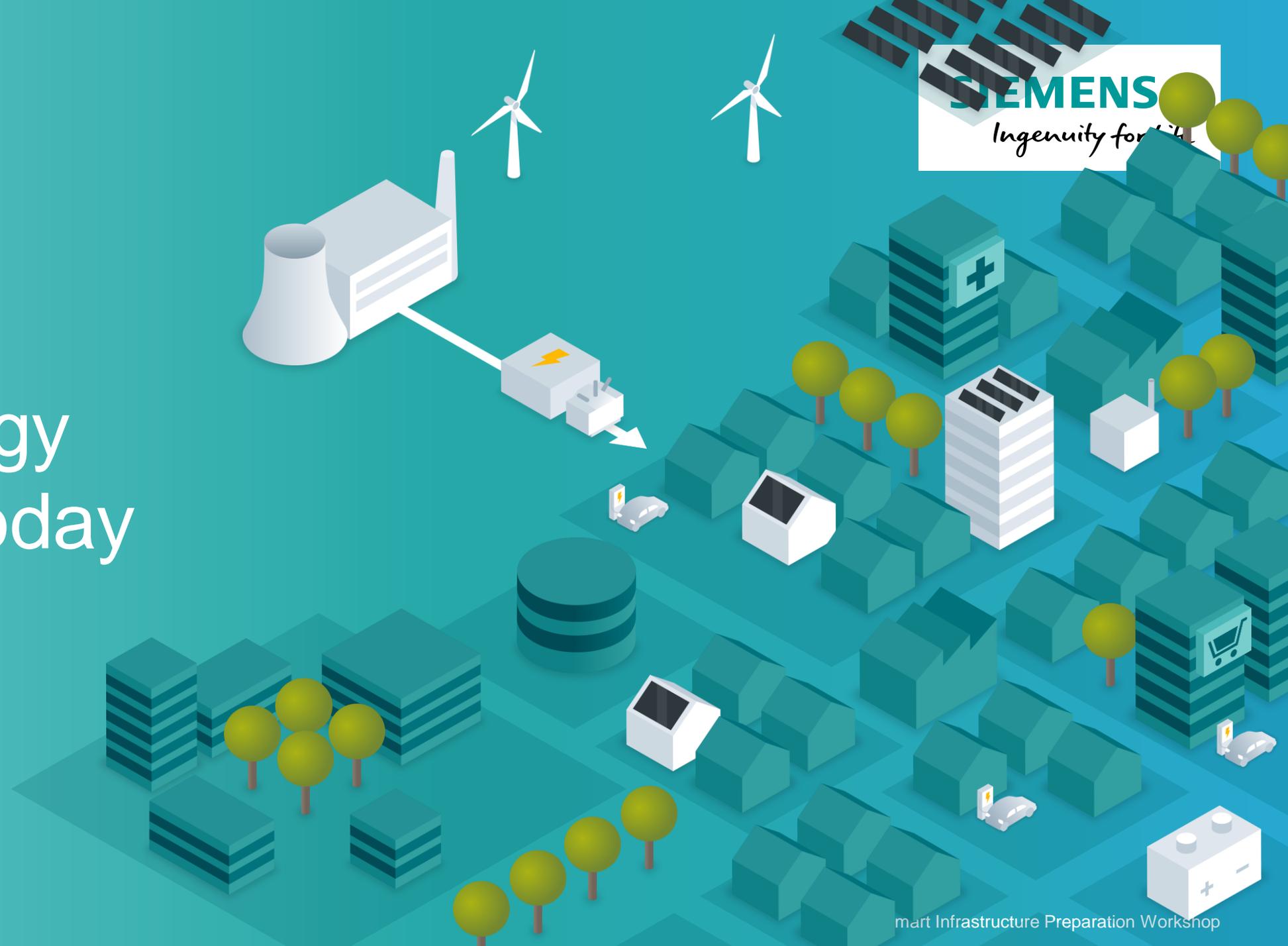
Rise of intermittent renewable generation

Prosumer expansion

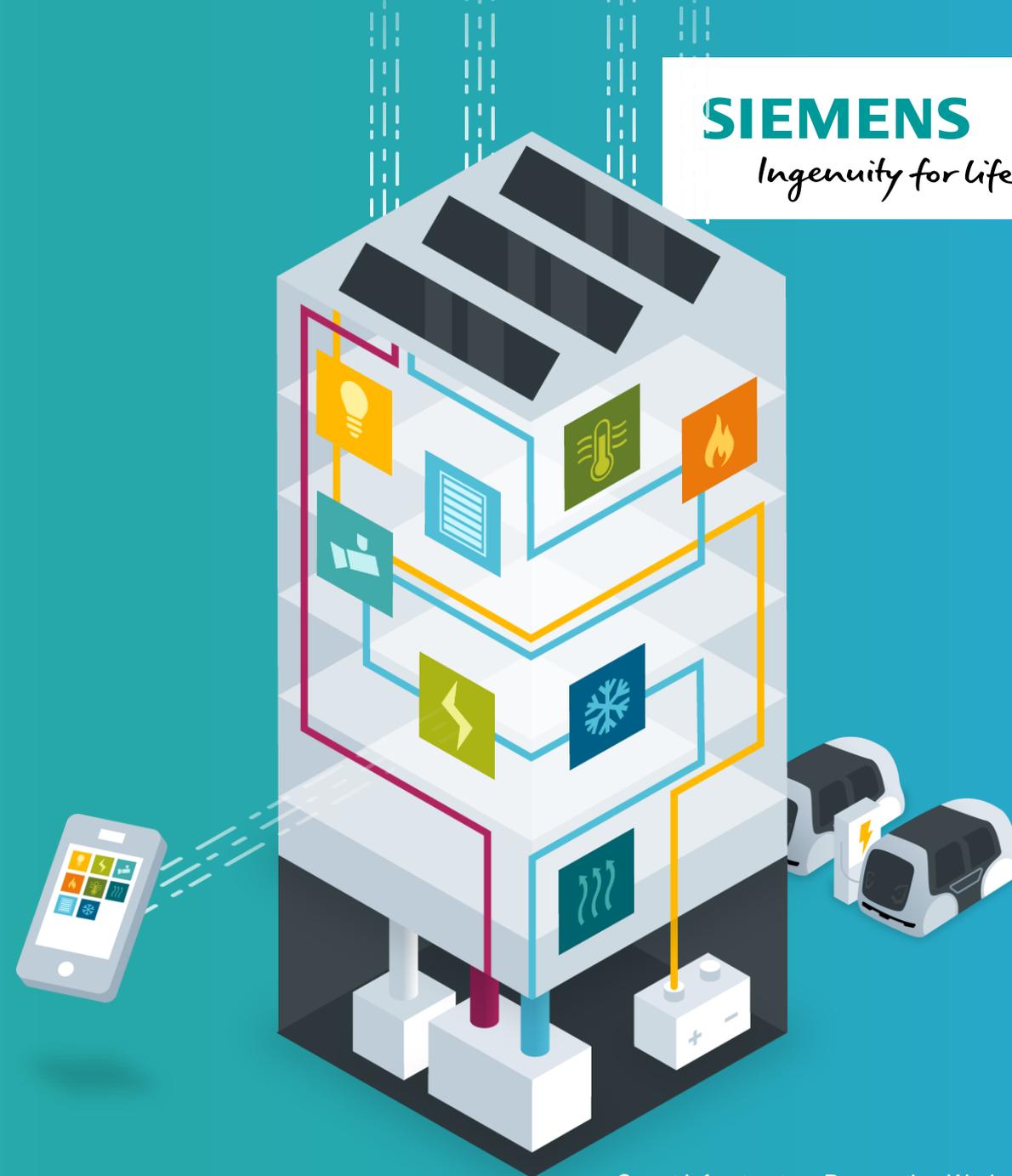
Falling costs & increasing acceptance of battery storage technologies



The energy system today



Buildings today



Electrification market

Trends: decarbonization
and decentralization

2x

electricity
consumption
by 2050

>50%

renewable
annual energy
by 2035

Building market

Trends: urbanization and sustainability

70%

of global population will live in cities by 2050

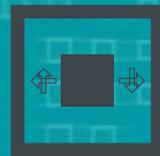
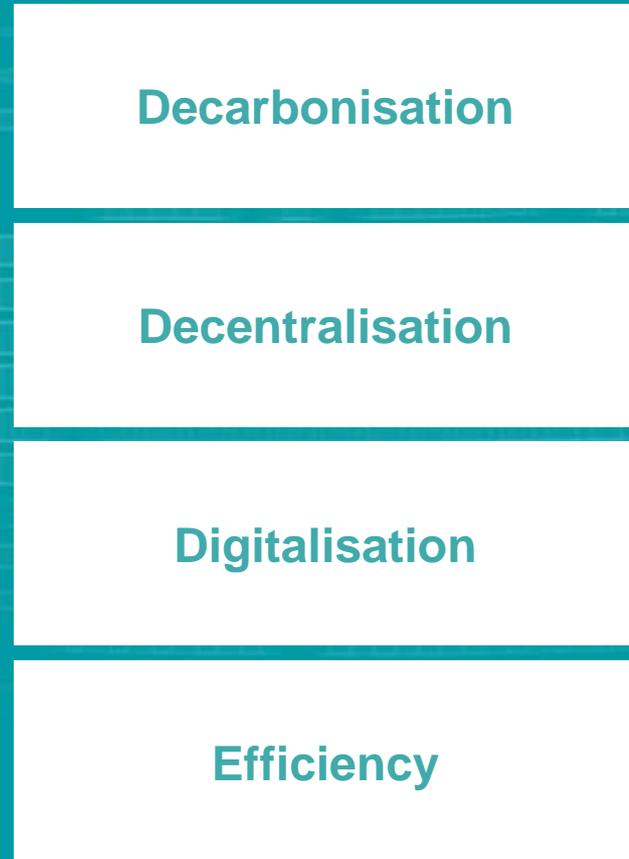
36%

of energy consumed by buildings

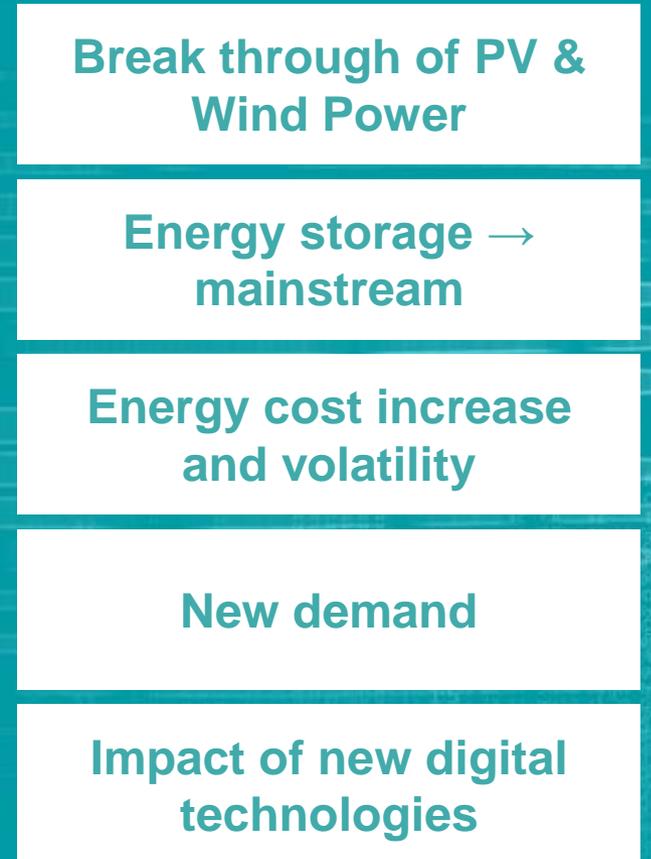
Delivering tomorrows smart infrastructure

How is the market changing? Major energy trends and challenges shaping the future energy landscape

Trends



Opportunities



Storage applications

Residential

Small Commercial

Utility and C&I

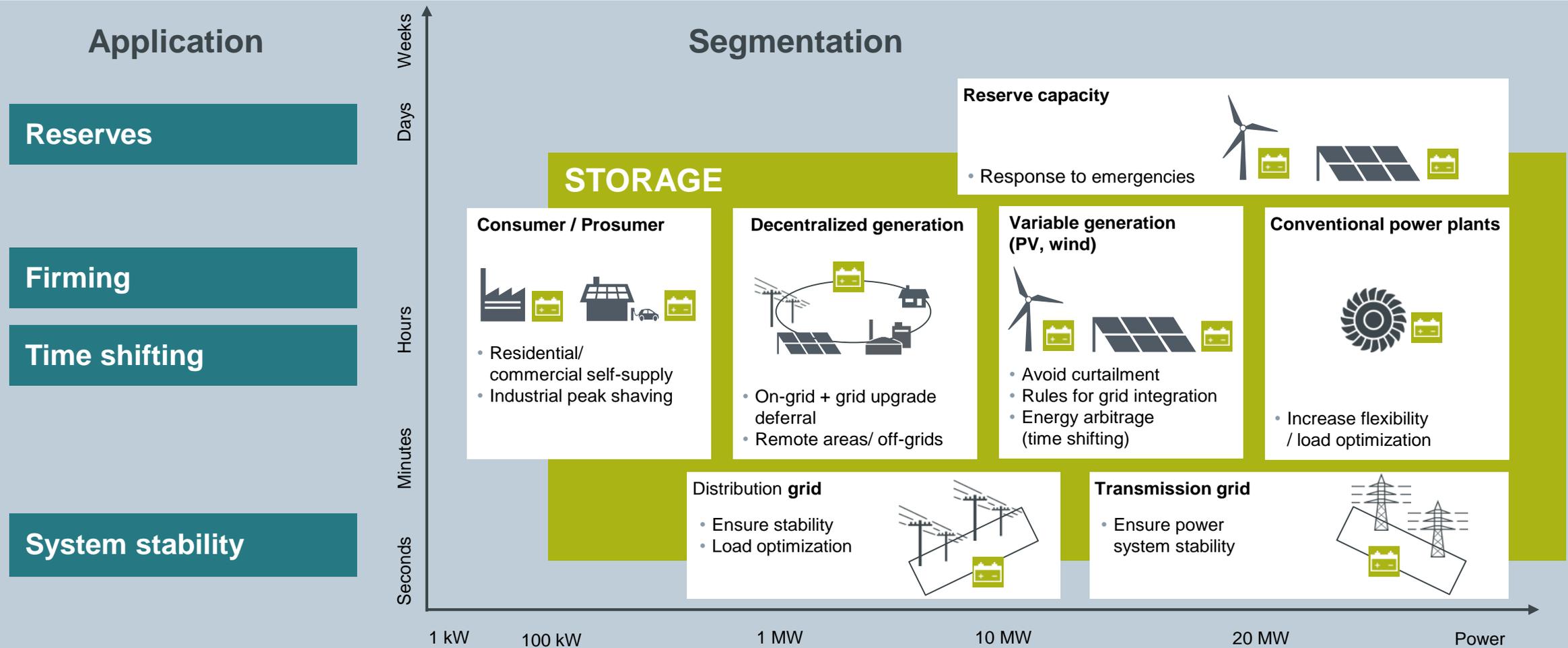
<100kWh

100kWh to 500kWh

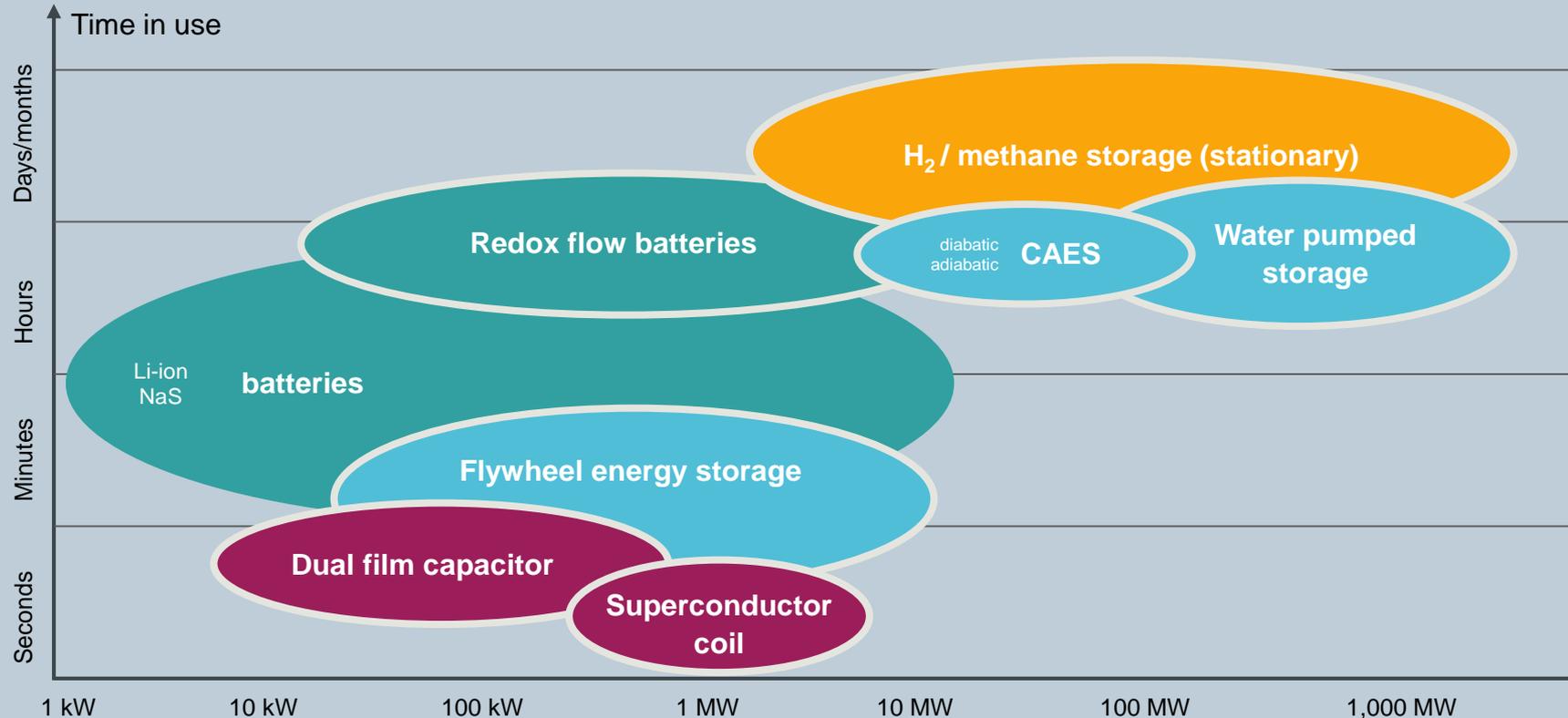
>500kWh



The solution: energy storage for very different purposes



Energy storage technologies and application areas



- Know-how in different battery technologies and chemistries
- Designed for the use of various battery suppliers
- Technical data depending on supplier
- Maximum savings through optimized plant operation

Technology



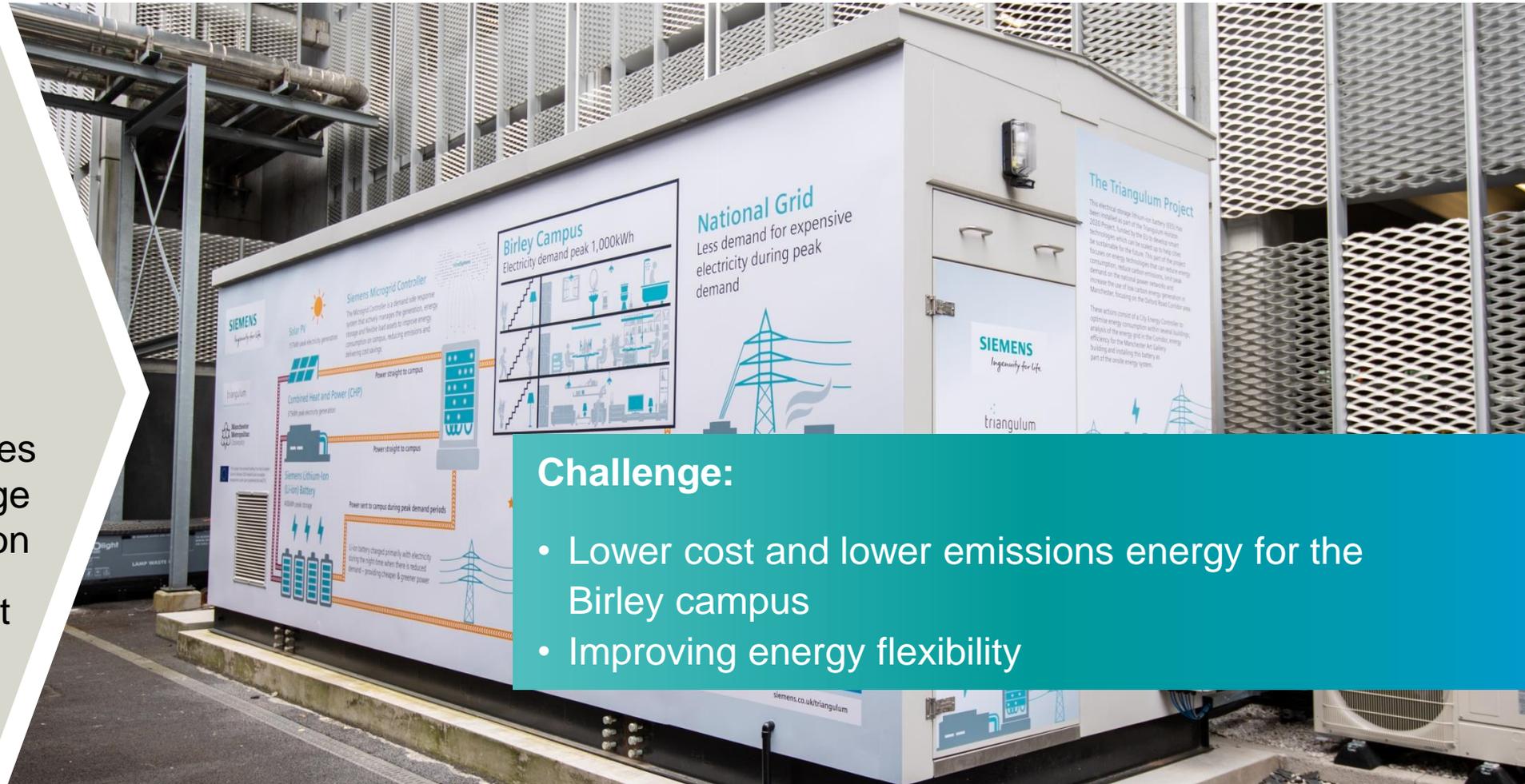
Source: Study by DNK/WEC "Energie für Deutschland 2011", Bloomberg – Energy Storage technologies Q2 2011
CAES – Compressed Air Energy Storage

Scope:

- Li-ion battery storage
- CHP plant
- Solar PV
- Micro-grid control
- Demand side response

Customer benefit:

- ✓ Microgrid actively manages energy generation, storage and improves consumption
- ✓ Battery charged overnight
- ✓ Sustainability integrated into curriculum



Challenge:

- Lower cost and lower emissions energy for the Birley campus
- Improving energy flexibility

Goodwood Festival of Speed, UK



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Scope:

- Hydrogen storage
- EV charging

Customer benefit:

✓ Clean hydrogen produced offsite via wind energy

✓ Hydrogen storage converts to electricity to power EV chargers

✓ EV chargers powered electric supercars which raced at the festival



Challenge:

- Providing electricity to EV chargers at an off grid festival

Fluence & UKPR, UK

ukpowerreserve

FLUENCE
A Siemens and AES Company

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Scope:

- 120MW battery storage partnership between UKPR and Fluence

Customer benefit:

- ✓ Ultra fast response battery storage to balance UK grid
- Delivered by end of summer 2019 – required to be online winter 2020
- ✓ Storage build out happening alongside 160MW rapid response gas assets



Siemens Green Ammonia energy storage demonstration

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- Constructed at the Rutherford Appleton Laboratory, near Oxford, UK.
- Project 50% supported by Innovate UK.



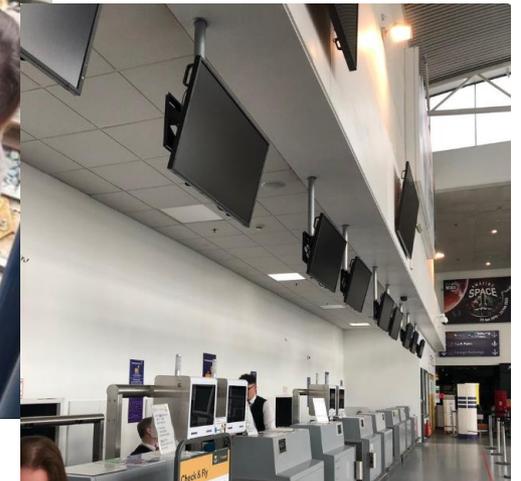
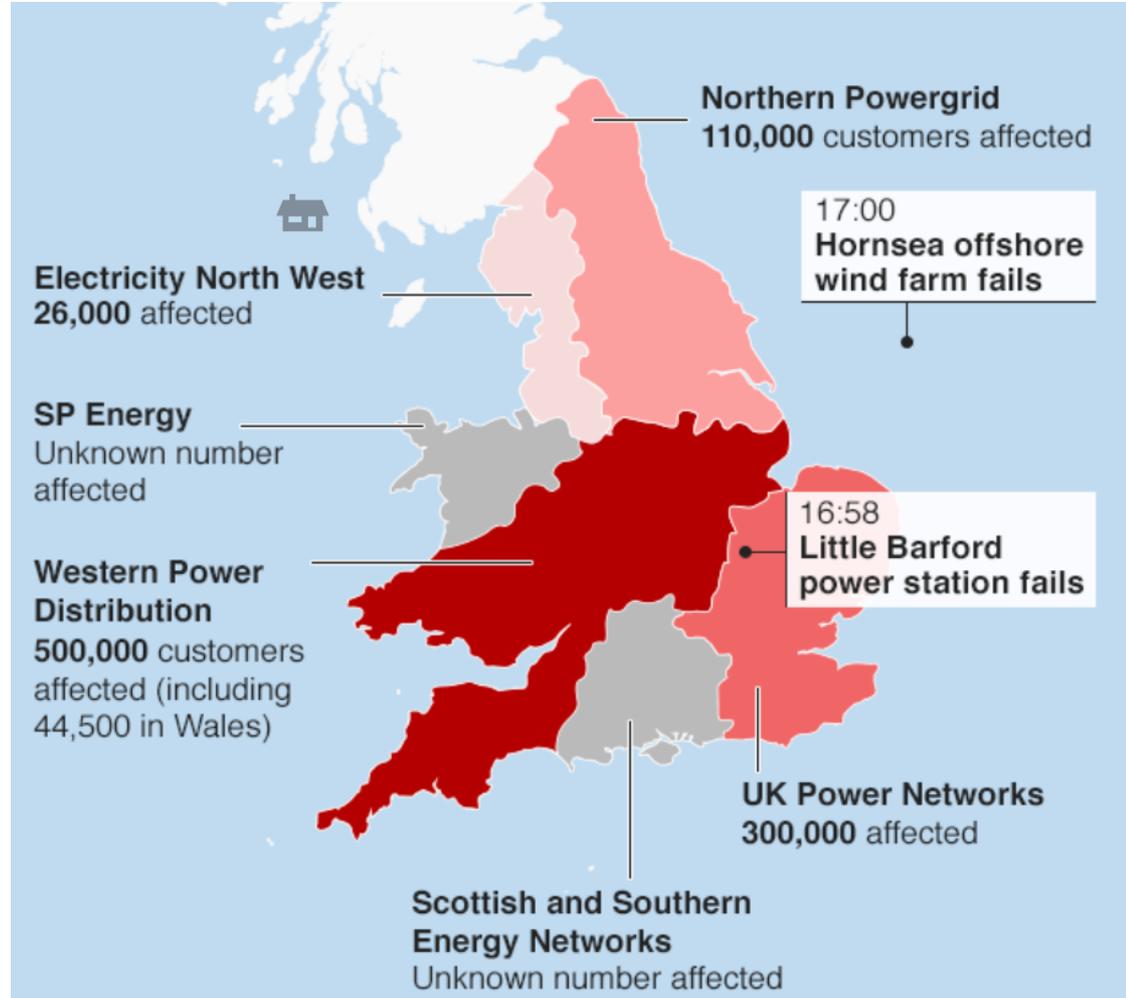
- Objective: to evaluate an all-electric synthesis and energy storage demonstration system based on Green Ammonia.

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the importance of getting it all right!!

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Scale... the next BIG challenge

SECURED INVESTMENT IN
THE REGION OF

**£14.755
BILLION**

IN COMMERCIAL AND
TECHNICALLY VIABLE PROJECTS
THAT DELIVER HEALTHY
RETURNS TO STAKEHOLDERS

TRANSITION OF

47,455 GWH

OF ENERGY FROM POLLUTING,
HIGH-CARBON GENERATION SOURCES
TO CLEAN ENERGY SOURCES



DELIVERED A REDUCTION IN CO2
EMISSIONS ACROSS THE ELECTRICITY,
HEAT AND TRANSPORT SECTORS OF

13,615 KT CO2E



CREATED OR SECURED

75,652

JOBS ACROSS THE TRI-LEP AREA



Summary

- Change – like never before - is the global norm.
- Siemens believes that integrated, smart Networks, Buildings & Industry is the answer
- Storage, in all its forms, is a critical element of our ‘future grid’
- Many of the components of the system are well developed.. more D than R
- The future may well be ‘bottom-up’.. Co-ordination v’s command & control
- Policy & incentives can kick start... But sustain comes from innovation

We are underestimating the scale of the task... and need to raise our ambition



Creating
environments
that care

