The energy future of large scale facilities

- Building a sustainable future

Jonas Abrahamsson
CEO E.ON Nordic

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E.ON is one of the largest private energy companies with strong position in the Nordic market

E.ON Group

- Facilities across Europe, Russia, and North America
- Our more than 85,000 employees generated just under €93 billion in sales in 2010
- 26 million European customers in 2010
- Our objective is to make energy cleaner & better wherever we operate

Corporate history of E.ON Sverige

2001 e.on → majority → sydkraft

2005 sydkraft → becomes → e.on Sverige

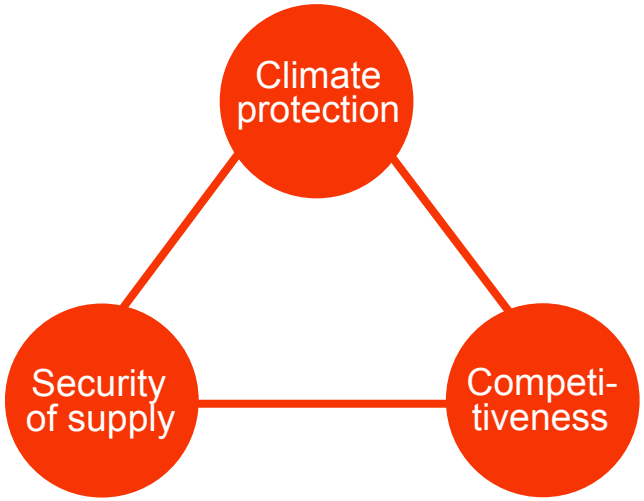
2008 Statkraft deal → becomes 100% E.ON → e.on Sverige

Energy is a central part of daily life in society and a key driver for economic growth

Energy business characteristics

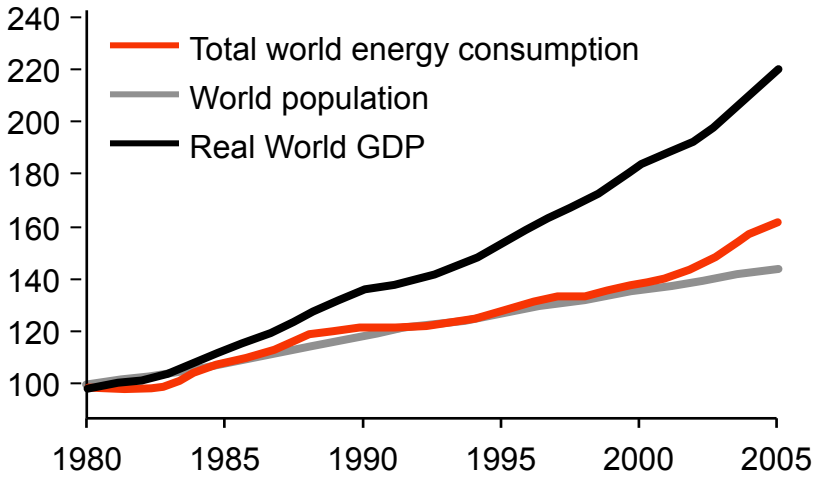
- Global, capital intense industry with long lead times
- Central and essential part of society
- “Everyone has a view”
- Enabler for economic growth
- Political framework – energy policies

The Energy “trilemma”



Dual trends and game changing events have significant effects on the energy industry globally

Global trends in energy markets

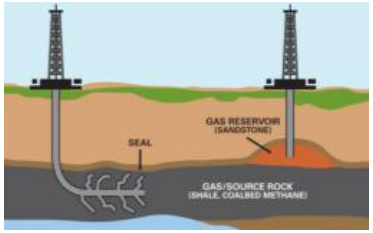


Source: IMF, EIA, US Census Bureau

- Global – strong demand growth
- Non–OECD – energy need driven by economic growth and increasing population with higher living standards
- OECD – stable demand – addressing climate change by energy system transformation

Game changing events

Technology break-through



Fukushima

Financial crisis

Political intervention

Energy system transformation triggered by climate challenge and political ambitions

Drivers and enablers of energy system transformation

Drivers

Climate Challenge

COP17/CMP7 UNITED NATIONS DURBAN, SOUTH AFRICA

Political ambition level

Policy framework & legislation

Customer perspective

Energy system transformation

GREENER ENERGY

LESS ENERGY

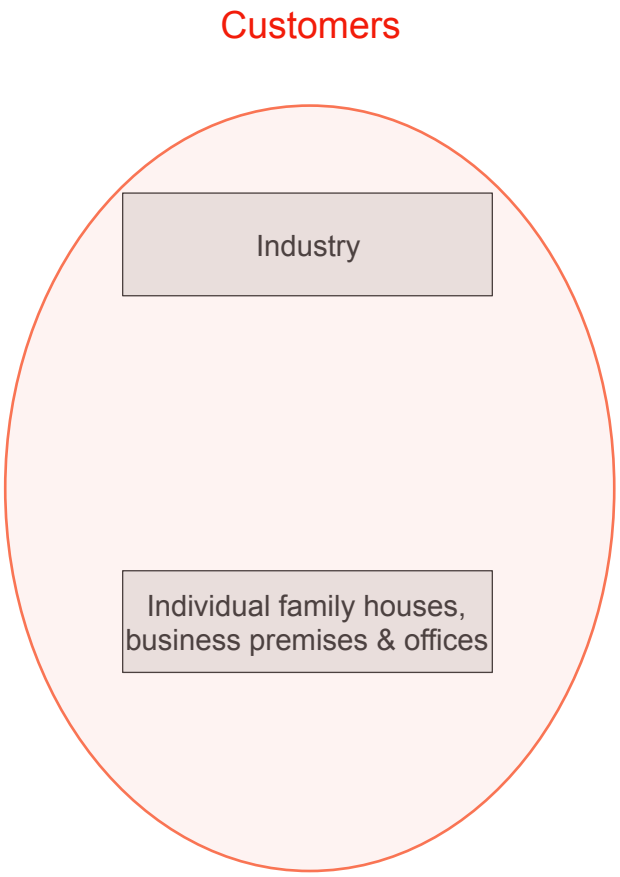
Enablers

Technology & Innovation

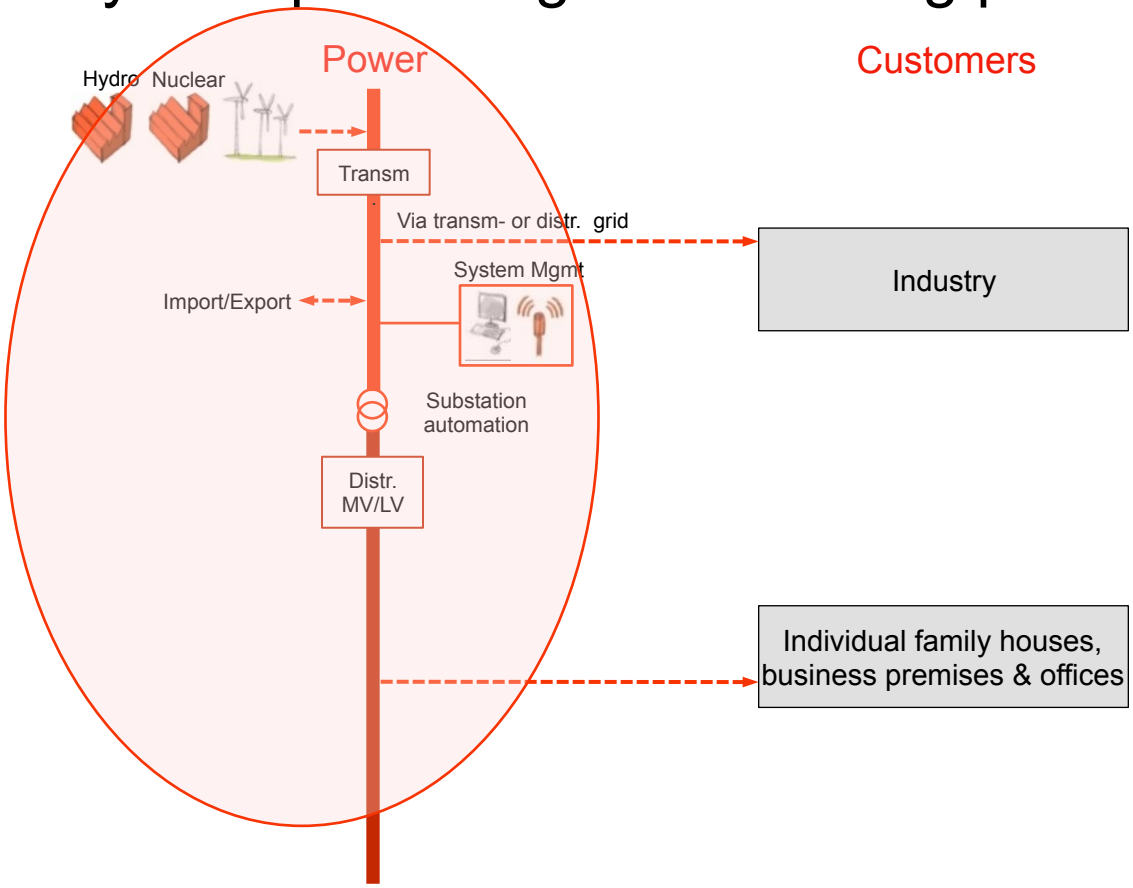
Support regimes

Customer behaviour

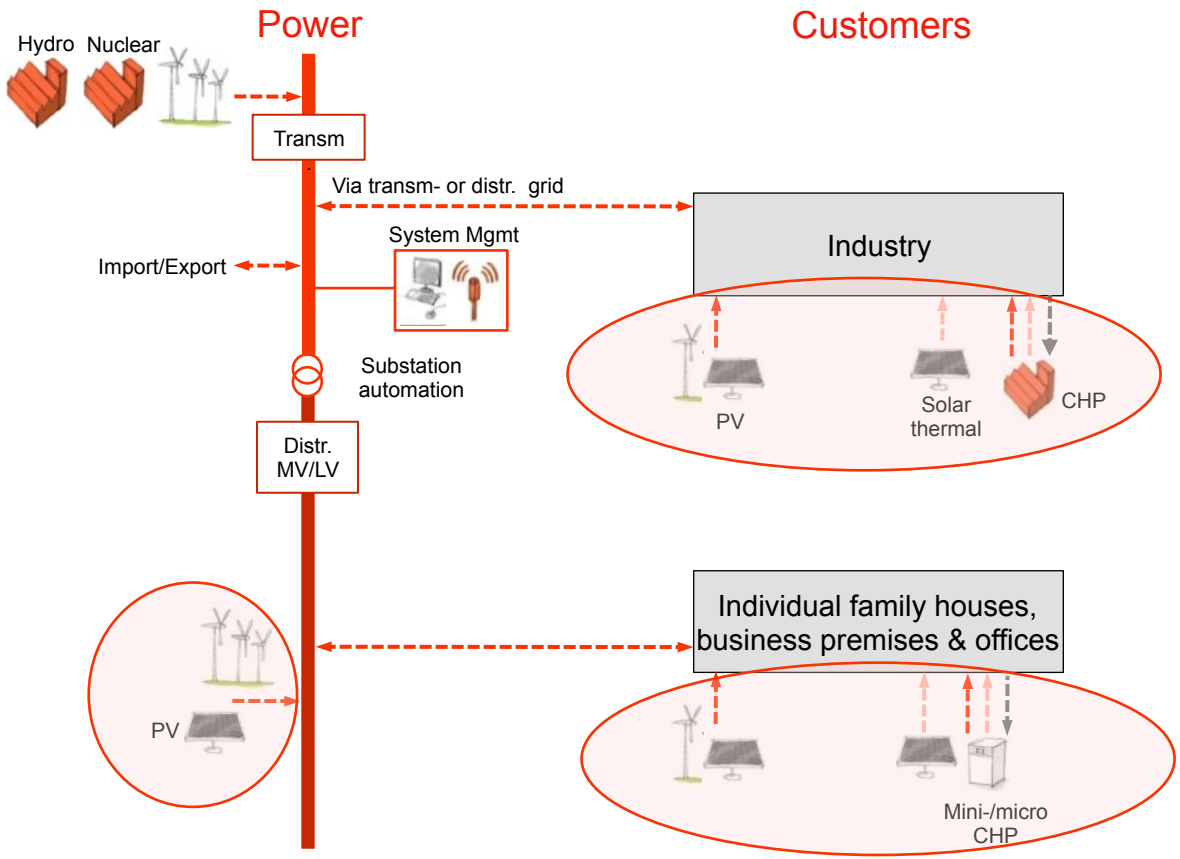
Looking at the energy system of the future the customer with a clear position in the center



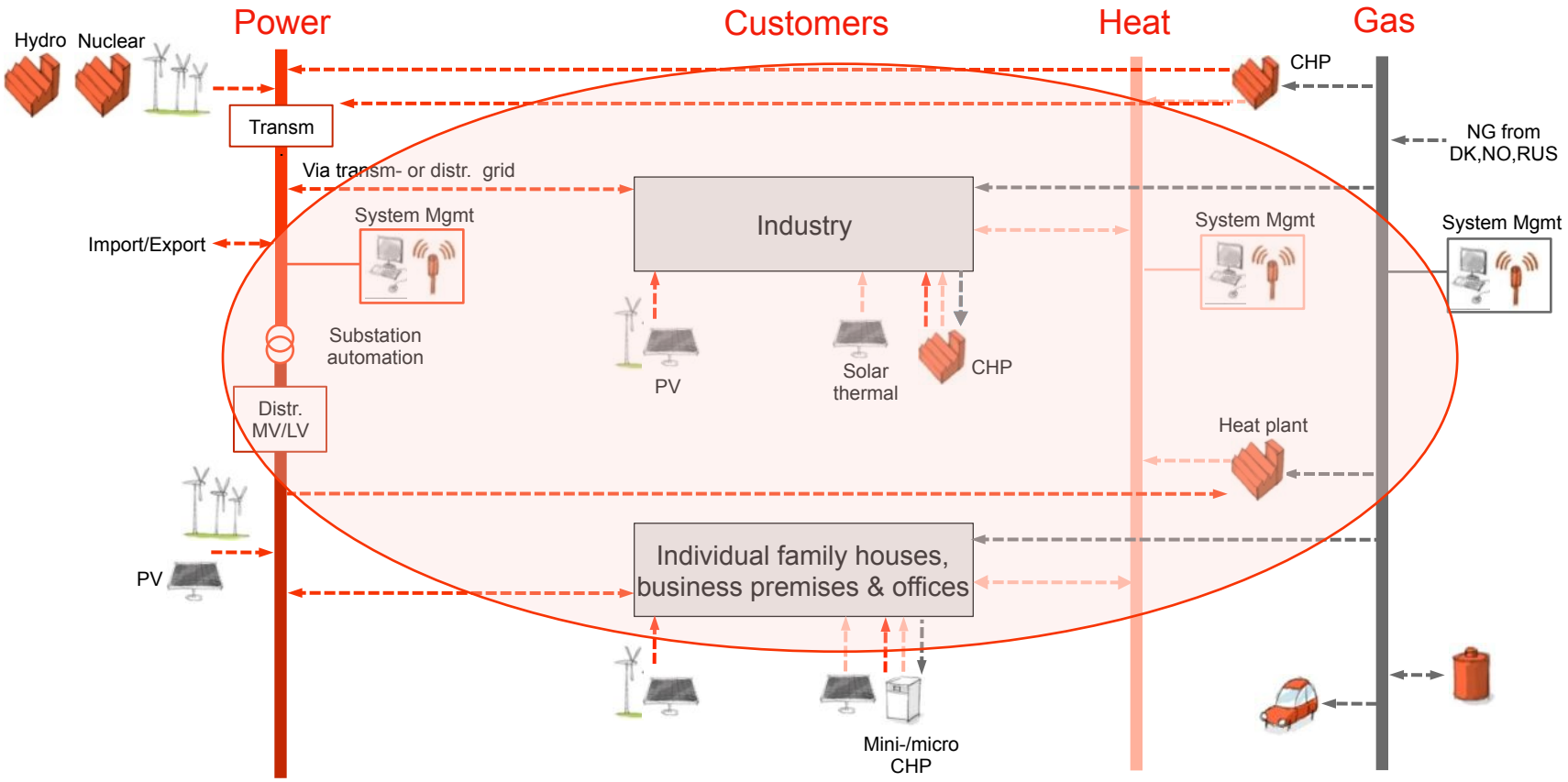
Today customers are served mainly via a large central system producing & distributing power to the end customer



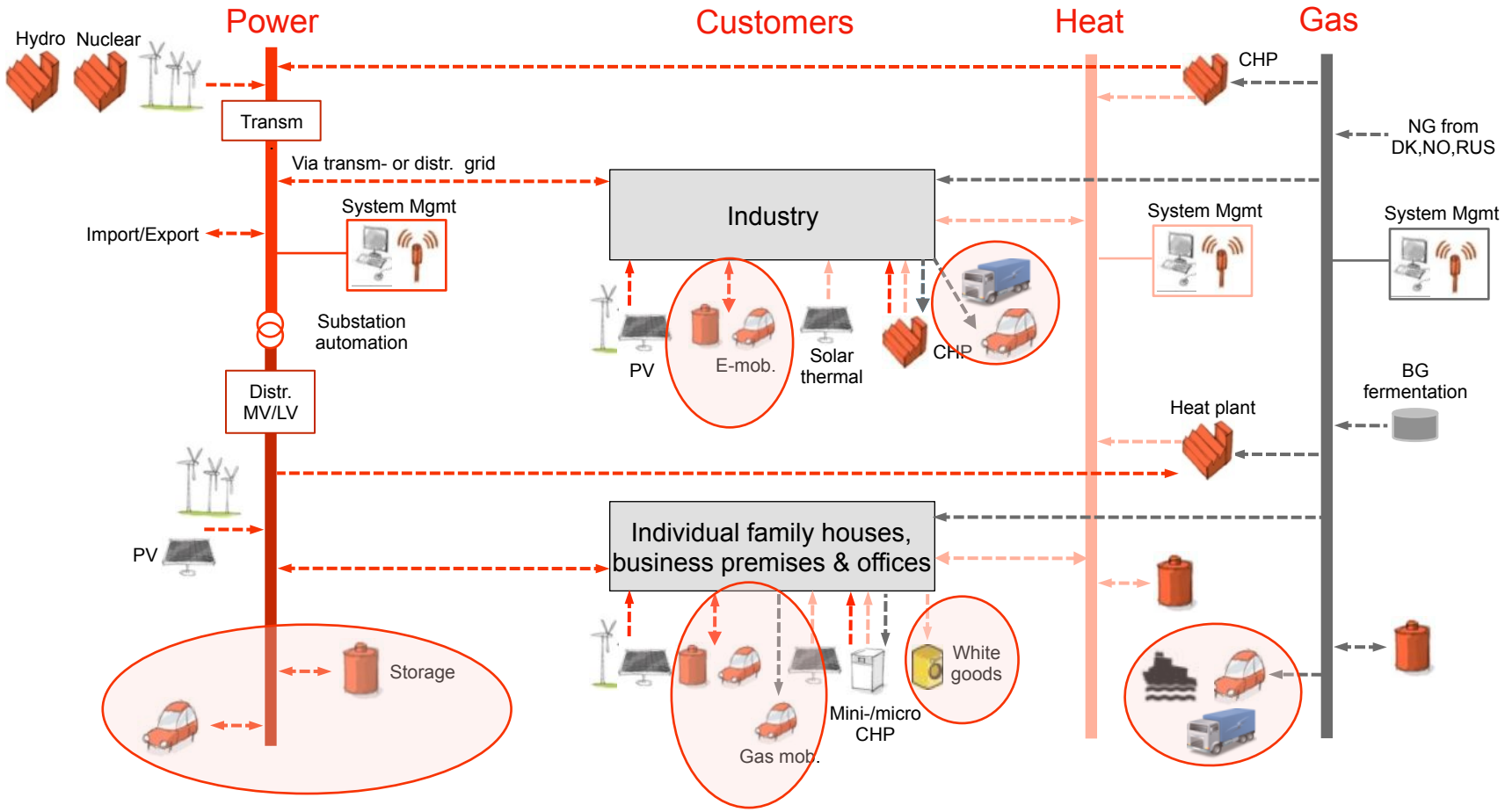
Trend 1 – Central system will be complemented with more decentralized energy production



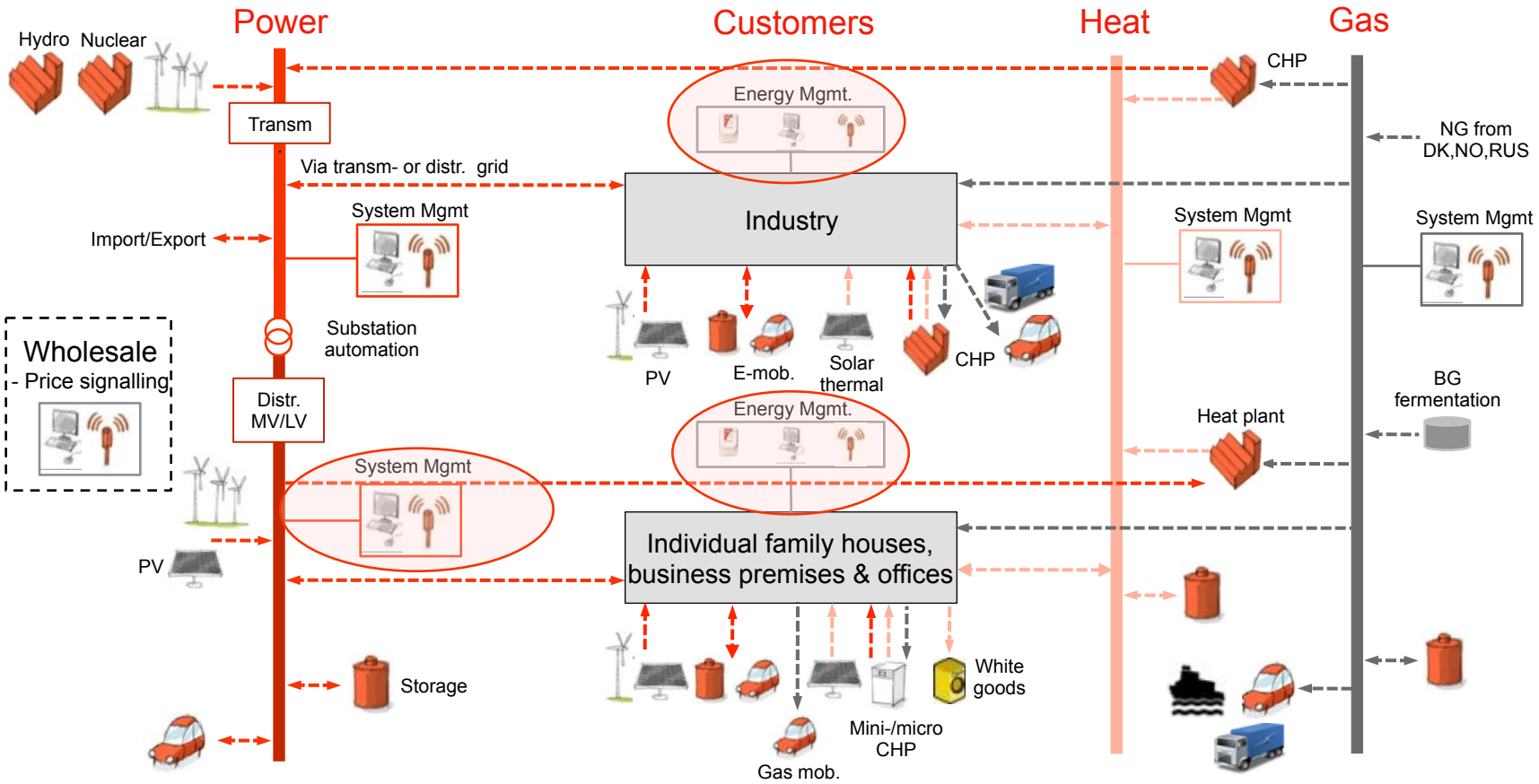
Trend 2 – stronger integration of energy carriers increases the overall efficiency potential that can be tapped



Trend 3 – additional energy application areas such as e-mobility and smart white goods, but also storages

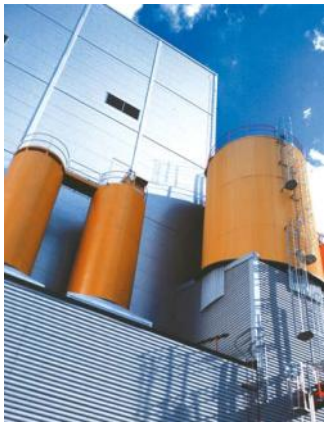


Trend 4 – local supply and demand management needed to incorporate the earlier described efficiency

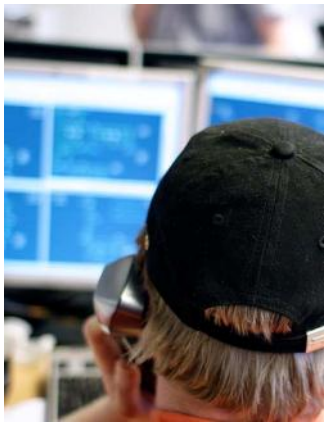


E.ON contributes by concepts and products for smart energy optimization and sustainability

Cleaner production



Smart energy networks



Sustainable solutions

Smart homes

Mobility solutions

→We build the sustainable society

The energy concept

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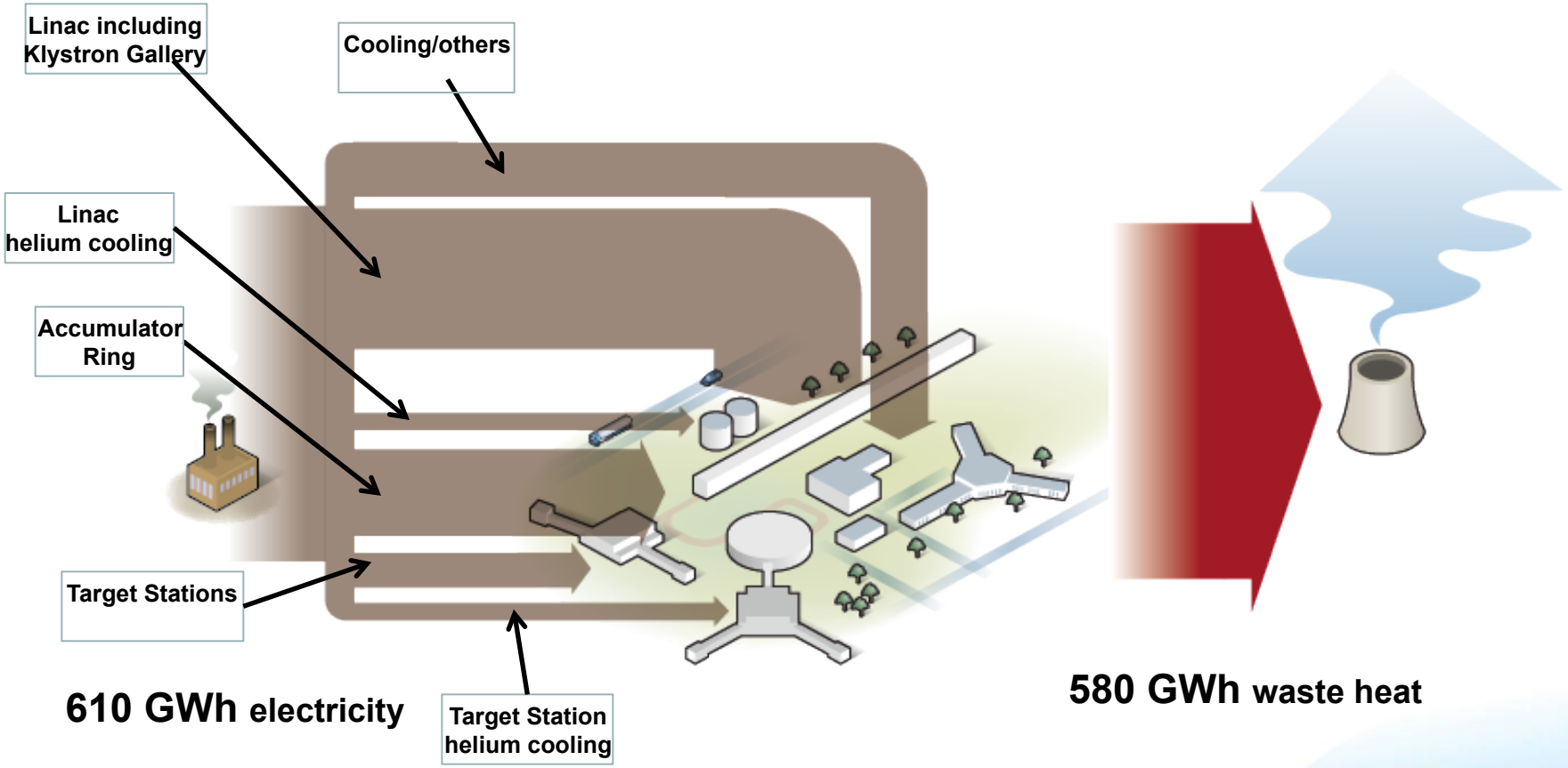
ESS Energy concept 2002
The original design



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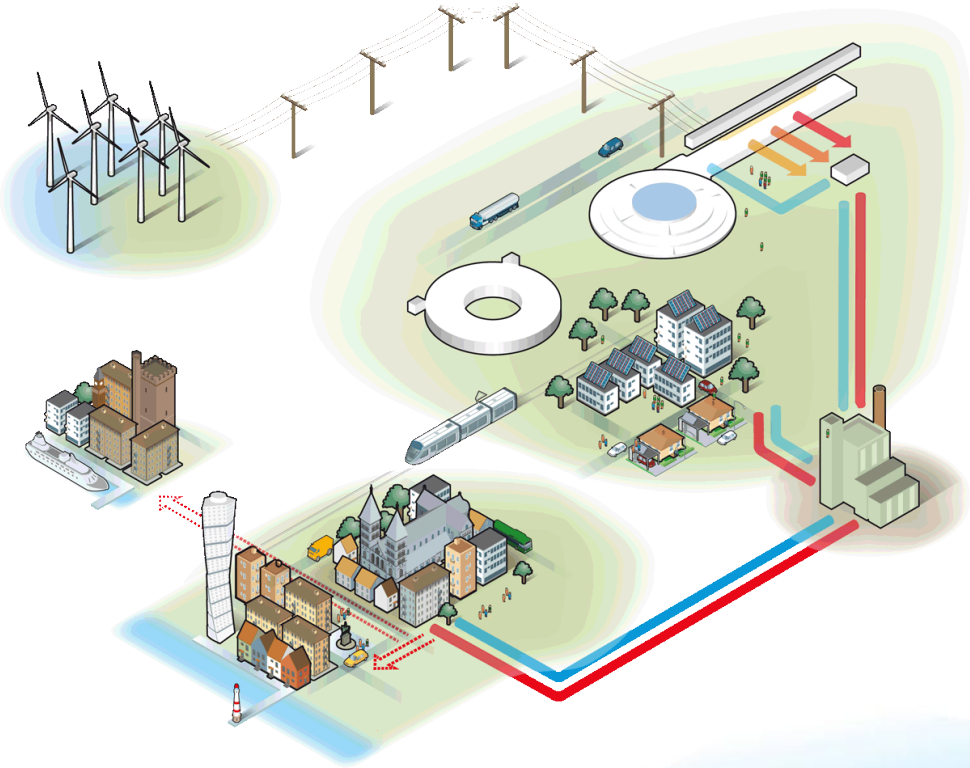
Energy for Sustainable Science

The ESS sustainable energy concept is built on three corner stones: Responsible – Renewable - Recyclable

- **Renewable** – 100 % from renewable energy sources
- **Responsible** – 20 % decrease of the energy consumption (improved energy efficiency with smart cooling systems)
- **Recyclable** - Utilizing the waste heat and make business of it



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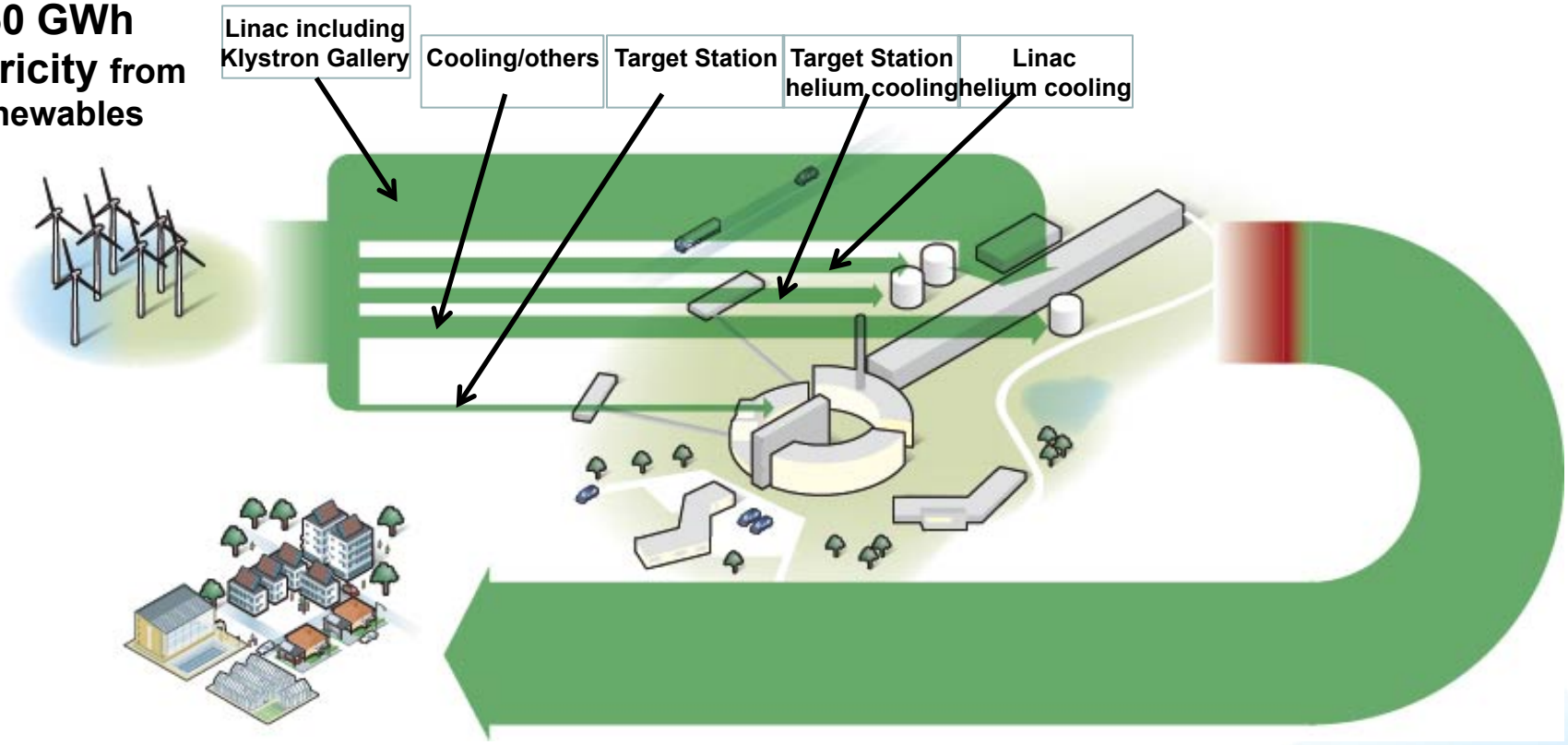
ESS Energy concept 2011
The world's first sustainable research facility

250 GWh electricity from Renewables



174 GWh heat reused

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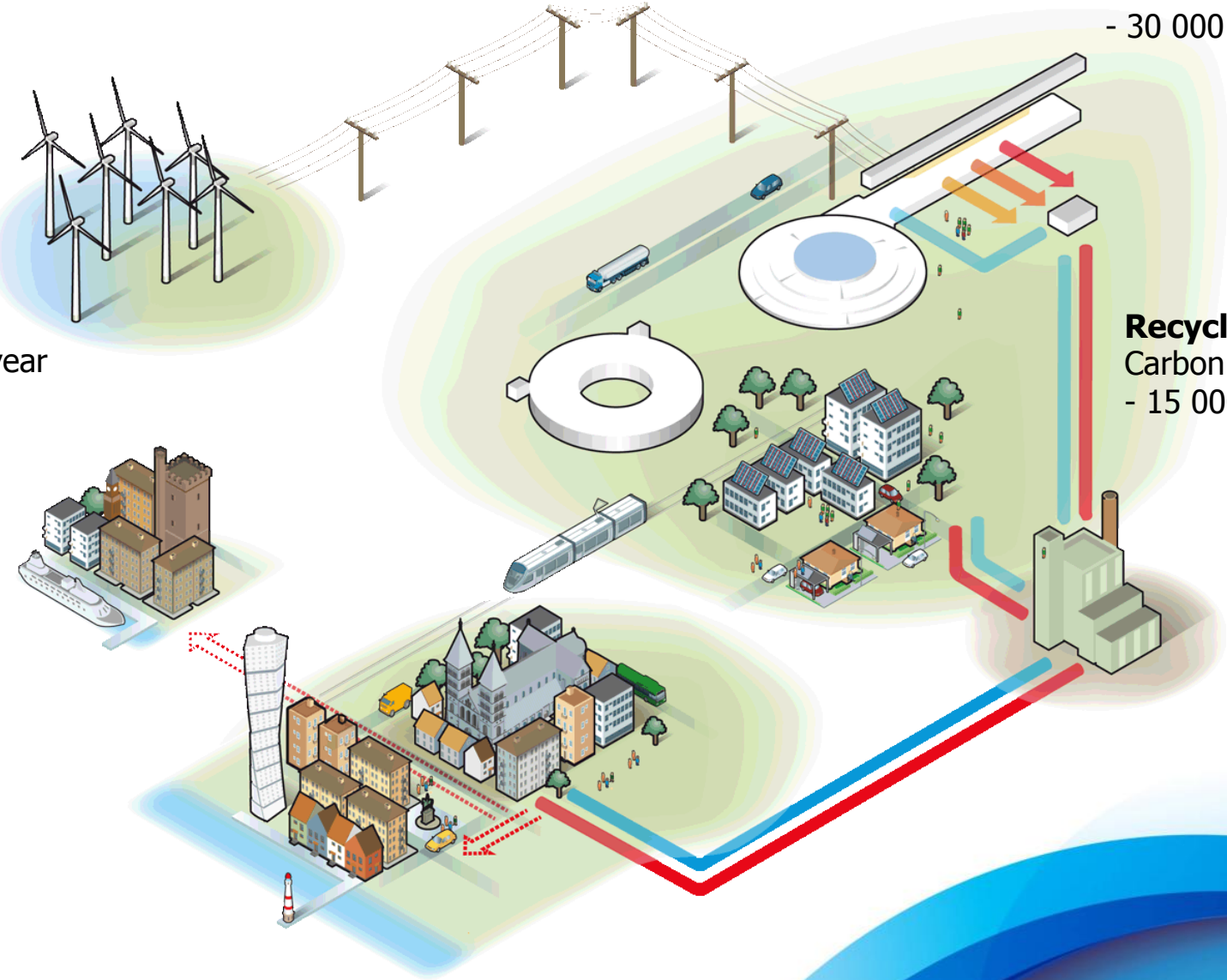
Energy for Sustainable Science

The energy concept will also save carbon dioxide emissions

Responsible
Carbon dioxide :
- 30 000 tons/year

Renewable
Carbon dioxide :
- 120 000 tons/year

Recyclable
Carbon dioxide :
- 15 000 tons/year



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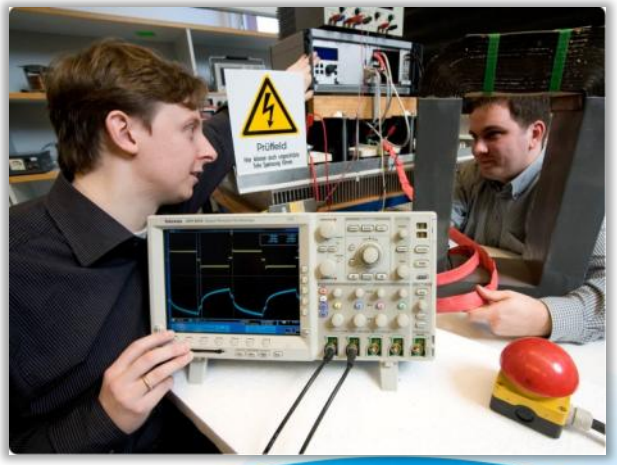
Energy for Sustainable Science

Together with E.ON Energy Research Center (EERC) disturbances to and from the ESS facility will be minimized

- Minimize problem in the electric power interplay between ESS and the grid, and with in ESS
- Simulation model for complex disturbances in real time and potentials for stabilize the control of the power grid already in the design phase
- Energy efficiency to decrease energy consumption



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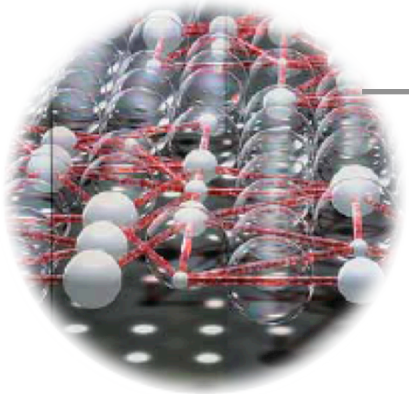
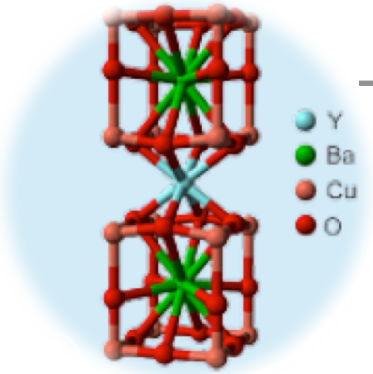
Research using neutrons offer progress in the energy area

Development of solar power

Superior energy storage



Enhanced fuel cells



The superconducting process

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- RESPONSIBLE
- RENEWABLE
- RECYCLABLE