



Brugge

College of Europe
Collège d'Europe



NatoLin

Energy and EU 2020

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Rising electricity consumption even in a slowly growing global economy

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Demographic dynamics



- **Population growth**
7.5 bill. in 2020 (+1.1 bill.)
- **Megacities** (>10 mill. people)
27 megacities by 2025

Source: UNO

Rising
energy consumption

Scarce resources



- **Geopolitics**
70% of global oil and gas reserves are located in just a few countries
- **Oil price fluctuations**

Due to efficiency increases:
Growing electrification of
society

Climate change



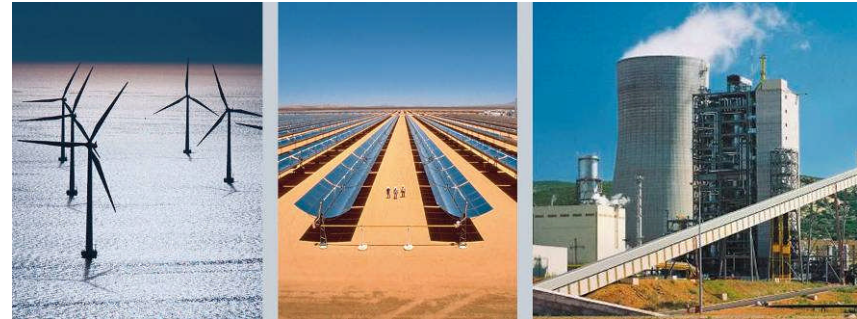
- **Climate goals**
Political programs aimed at long-term reduction in CO₂ emissions

Growing
demand for
“clean” electricity

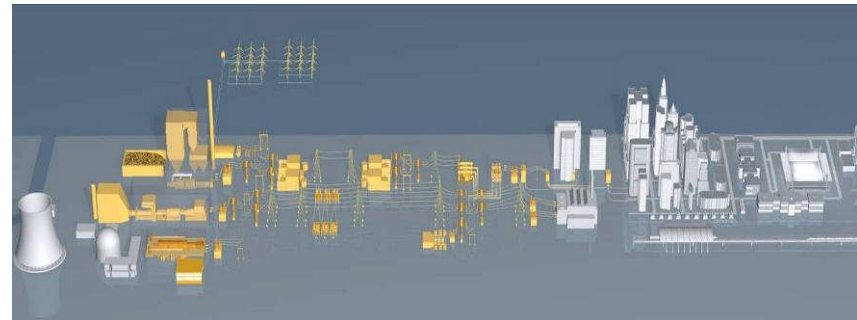
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Three steps to sustainable energy supply

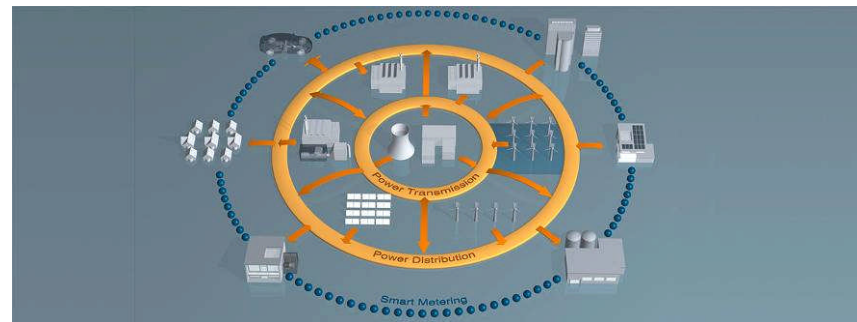
1 Optimization of the energy mix



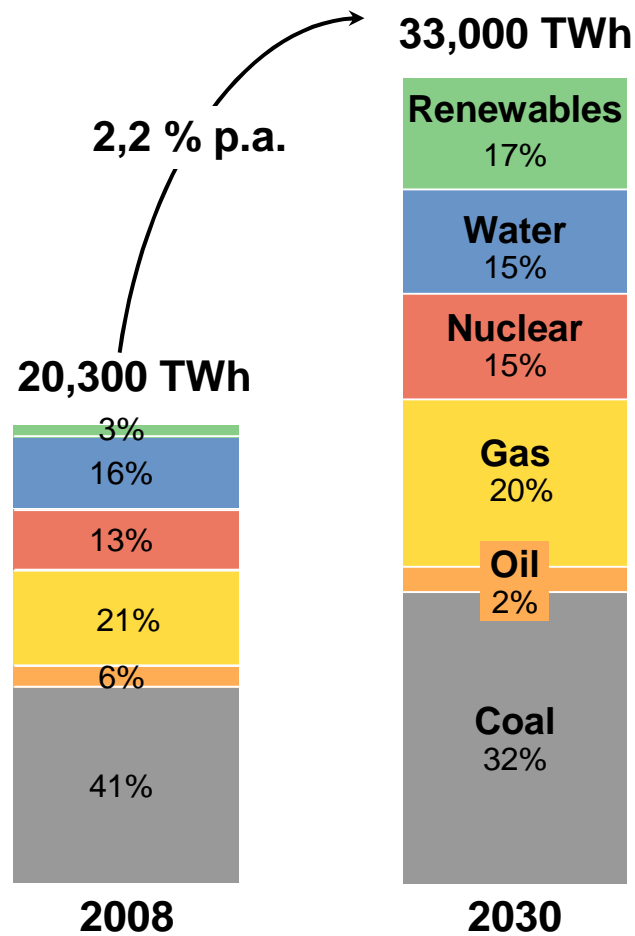
2 Efficiency increases along the entire energy chain



3 Systemic optimization / Smart Grid



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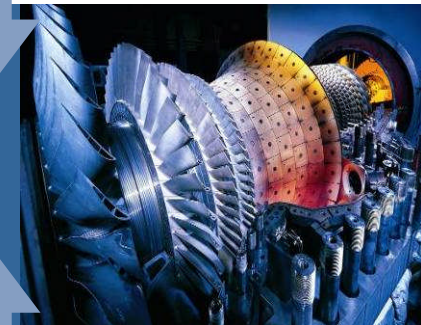
Privileged feed-in of renewables

- Wind power
- Solar thermal power
- Photovoltaic



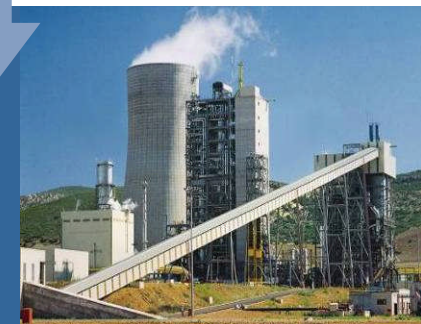
Intermediate-load/peak-load for load leveling

- With high efficient, high flexible combined cycle PP



Low-emissions base load

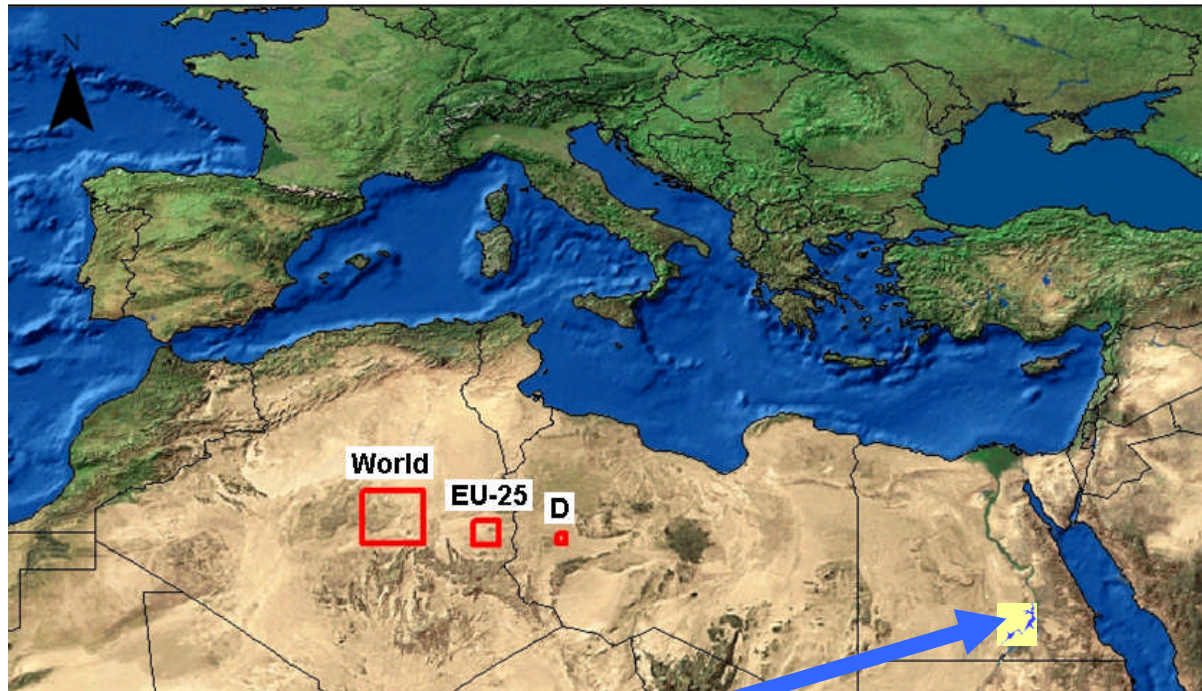
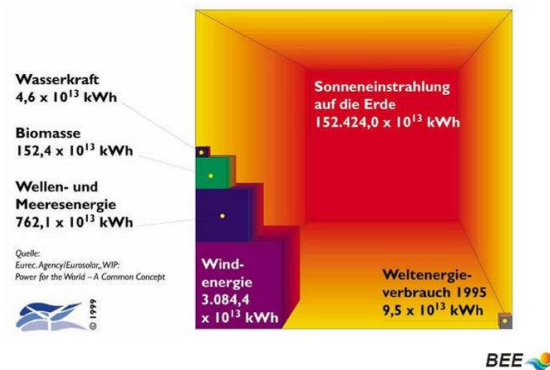
- CCS
- Nuclear
- Hydro



Power Consumption

Economic renewable electricity potentials vs. demand in Europe and MENA

- 1 km² of desert land may generate 50 MW of electricity
- 1 km² of desert land may produce 200 - 300 GWh_{el} / year
- 1 km² of desert land avoids 200,000 tons CO₂ / year



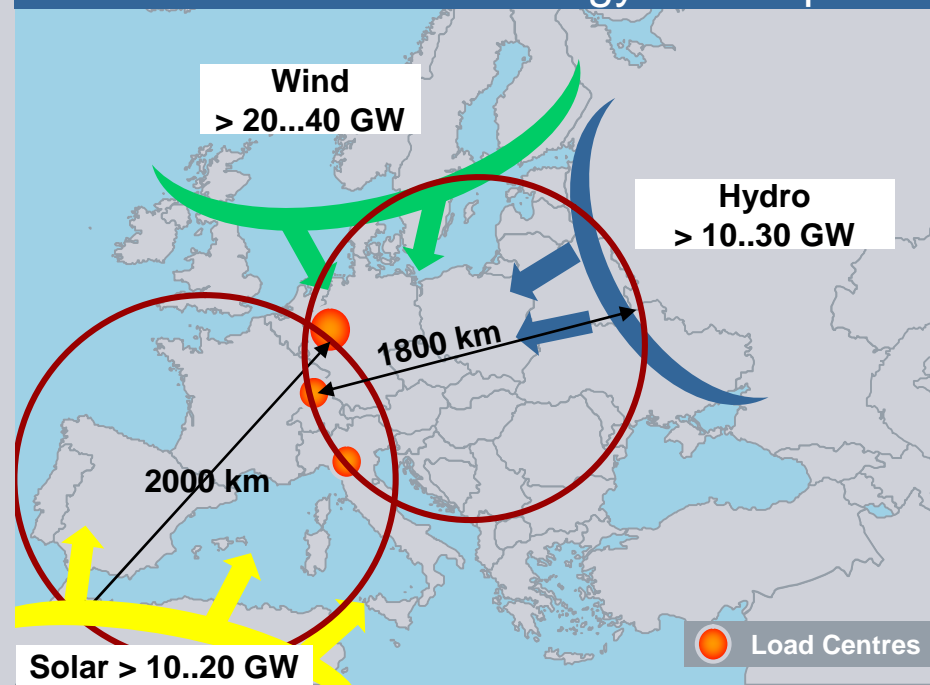
electrical energy solar power plant size of Lake Nasser equals the total Middle East oil production

Integration of Renewable Energies

Use of hydro power in China



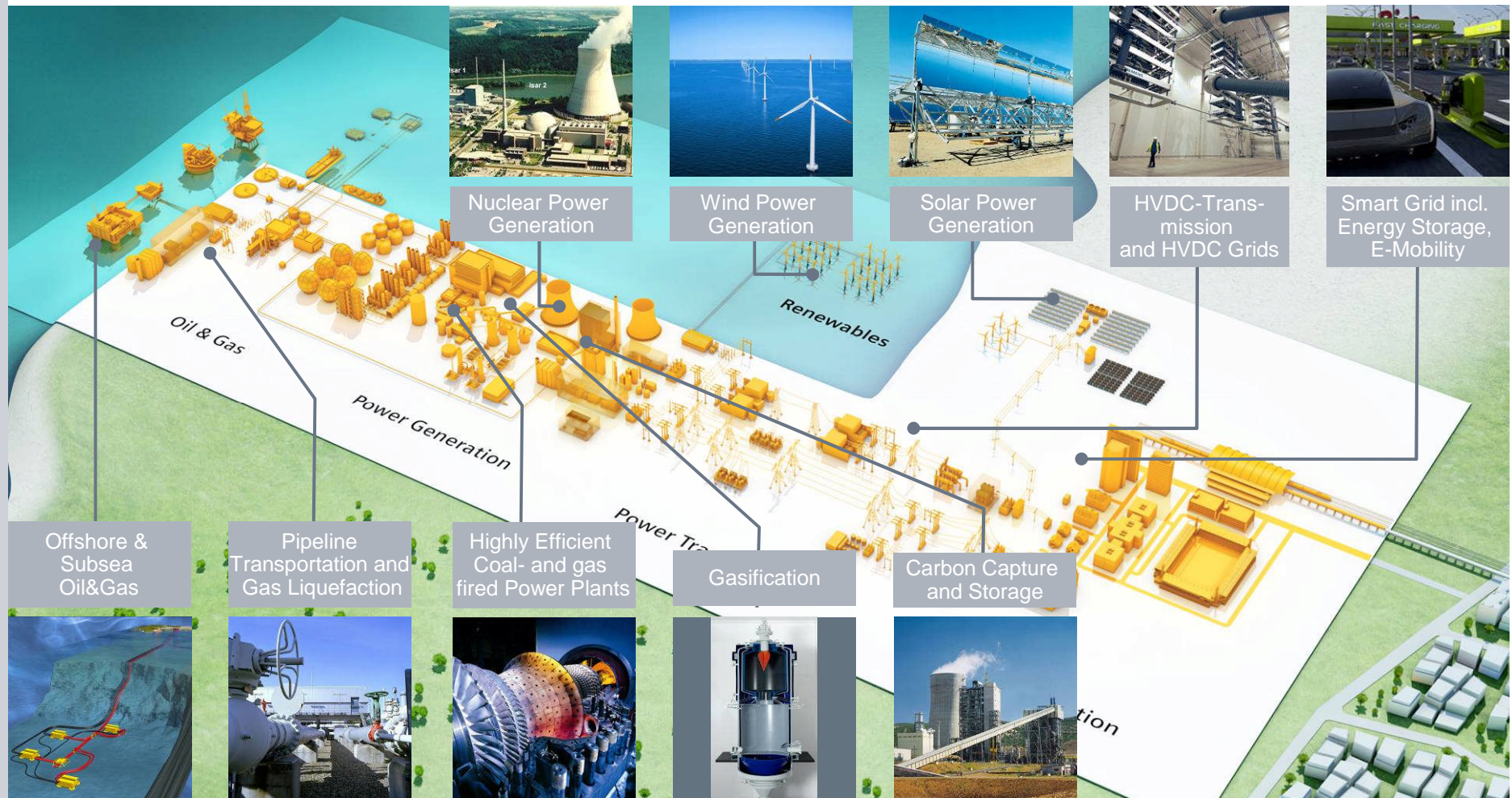
Use of renewable energy in Europe



- Worldwide most powerful wind energy plant mass-produced
- Wind off-shore plant with capacity of 3.6 MW
- High-efficient turbines for solarthermal power generation

- Integration of renewable energies via HVDC PLUS
- Energy lines with UHVAC and UHVDC
- Gas-insulated lines (GIL)

Energy efficiency along the entire energy conversion chain



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1.

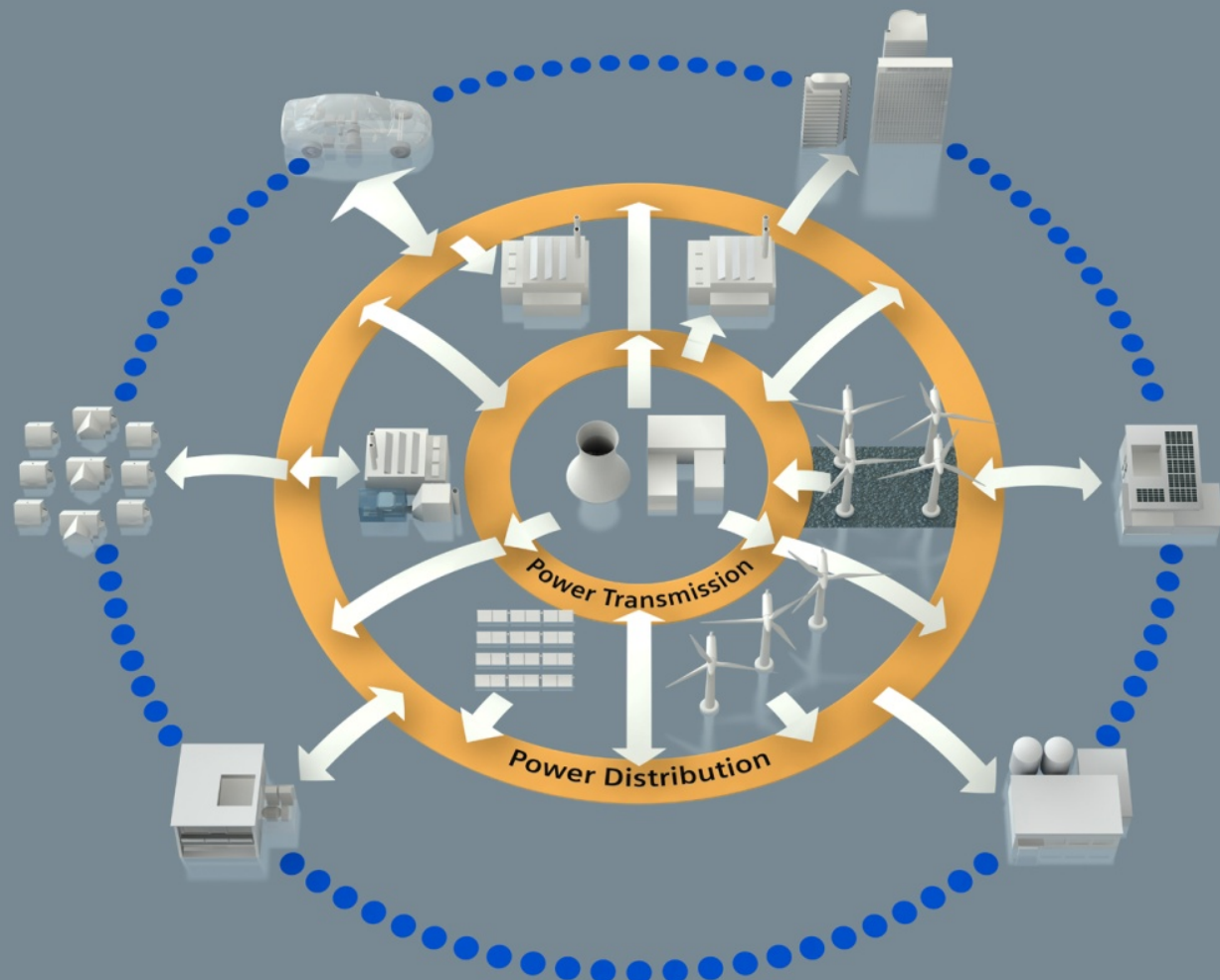
For consumers:
Smart Metering
Demand Response
Load Management

2.

For grid operators:
Grid Infrastructure
Grid Intelligence

3.

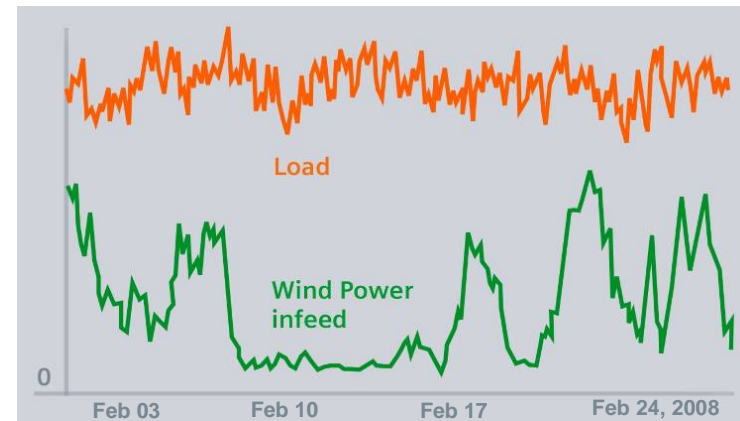
For Utilities:
Business Modeling
Resource Management
Utility IT



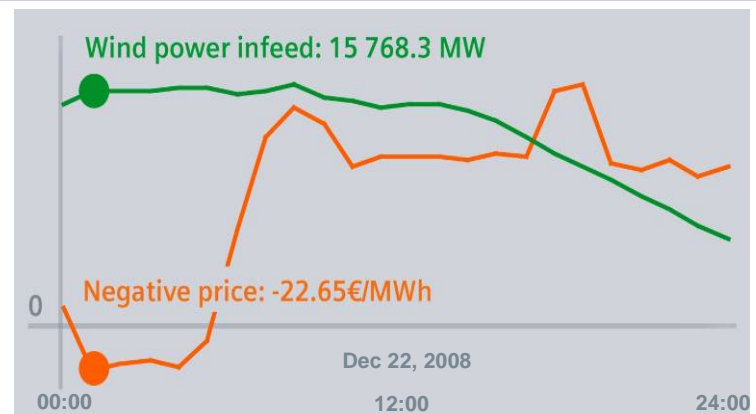
Efficient integration of renewables enhances free trading of electricity

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Need to balance fluctuating in-feed from large scale renewables

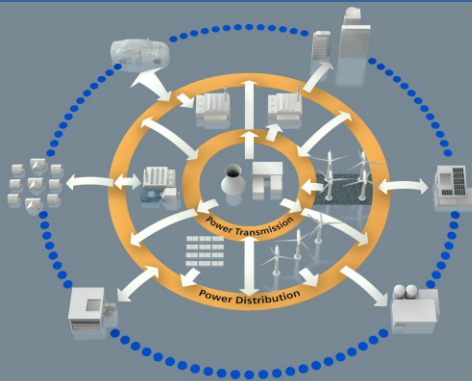


Need to enable free trading of electricity



Integration of producers and consumers

Smart Grid technologies integrate dispersed generation and large variety of consumption



Need to bundle multiple generation sites to virtual power plants



Micro grids with increased independence from main grids



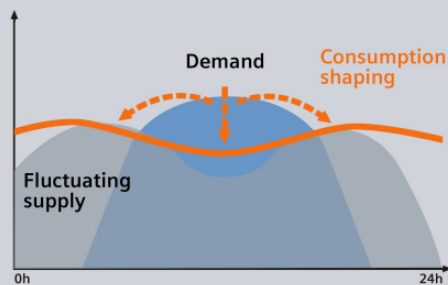
Need to connect millions of e-cars



Buildings can actively contribute to shifting energy load taking a role as a flexible energy storage

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Buildings provide enormous potential for energy savings



40% energy consumption worldwide
20% total CO₂ emissions
Saving of
20 - 40%
energy consumption is possible today

Passive consumers become active prosumers even in residential areas



Smart buildings optimize their internal energy flow ...



... and communication with the smart grid will allow for automated energy trading



Expanding new grids and reinforcing aging assets: Consumers demand sustainable energy supply

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Overstretched grids



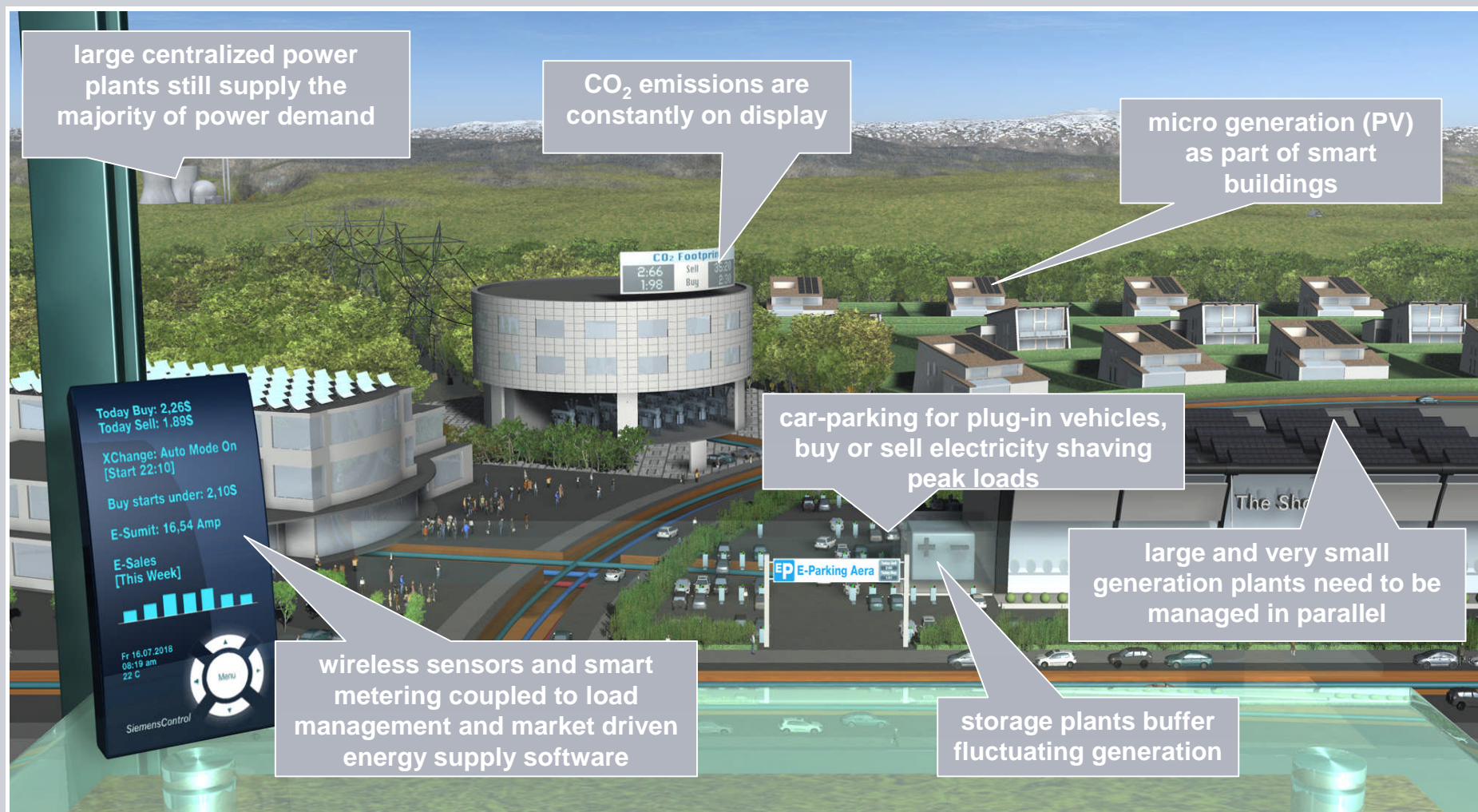
More transparency for consumption and cost



Millions of e-cars



From a vision to a more sustainable EU 2020



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