

Die Forschungsstrategien

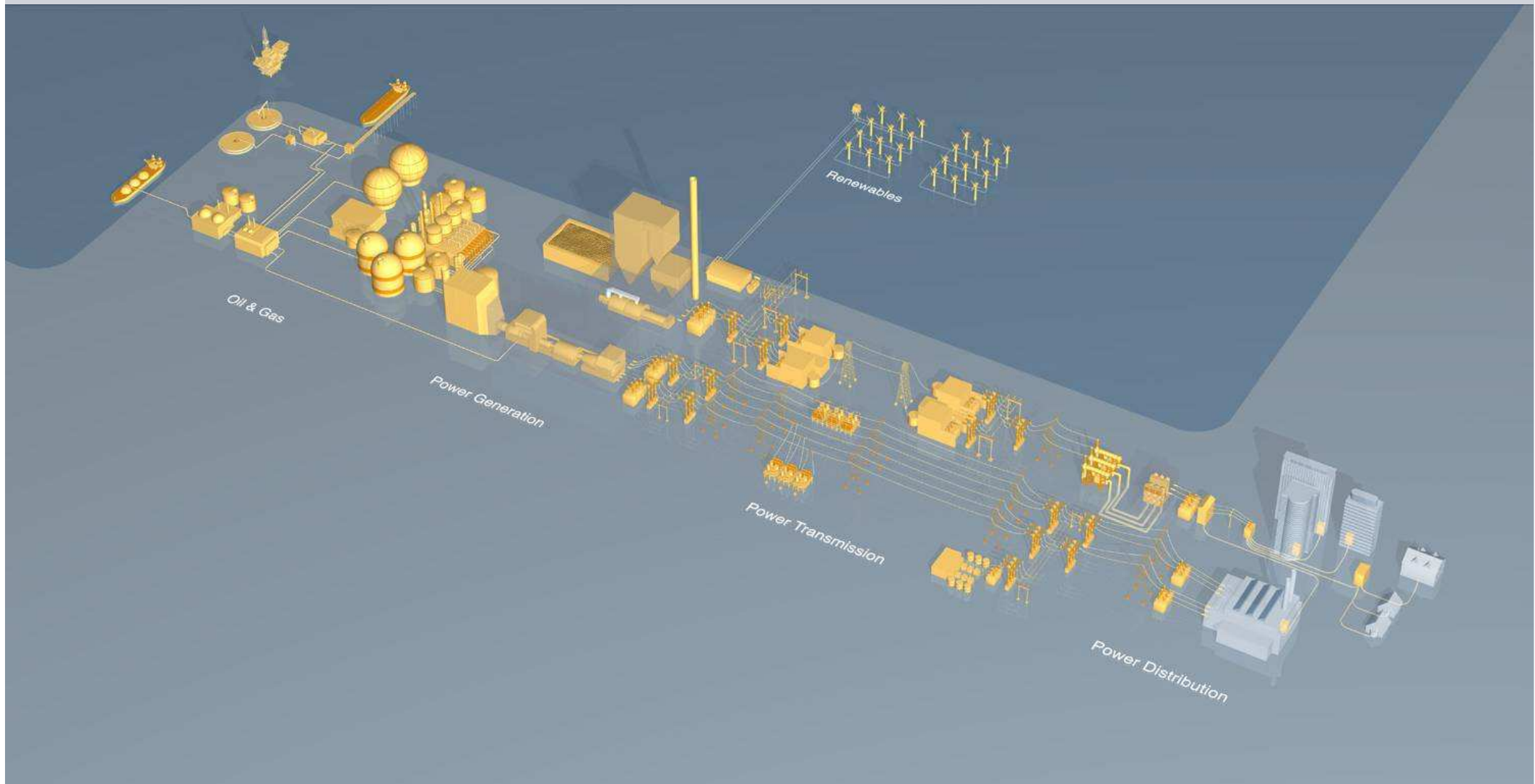


Dr. Michael Weinhold
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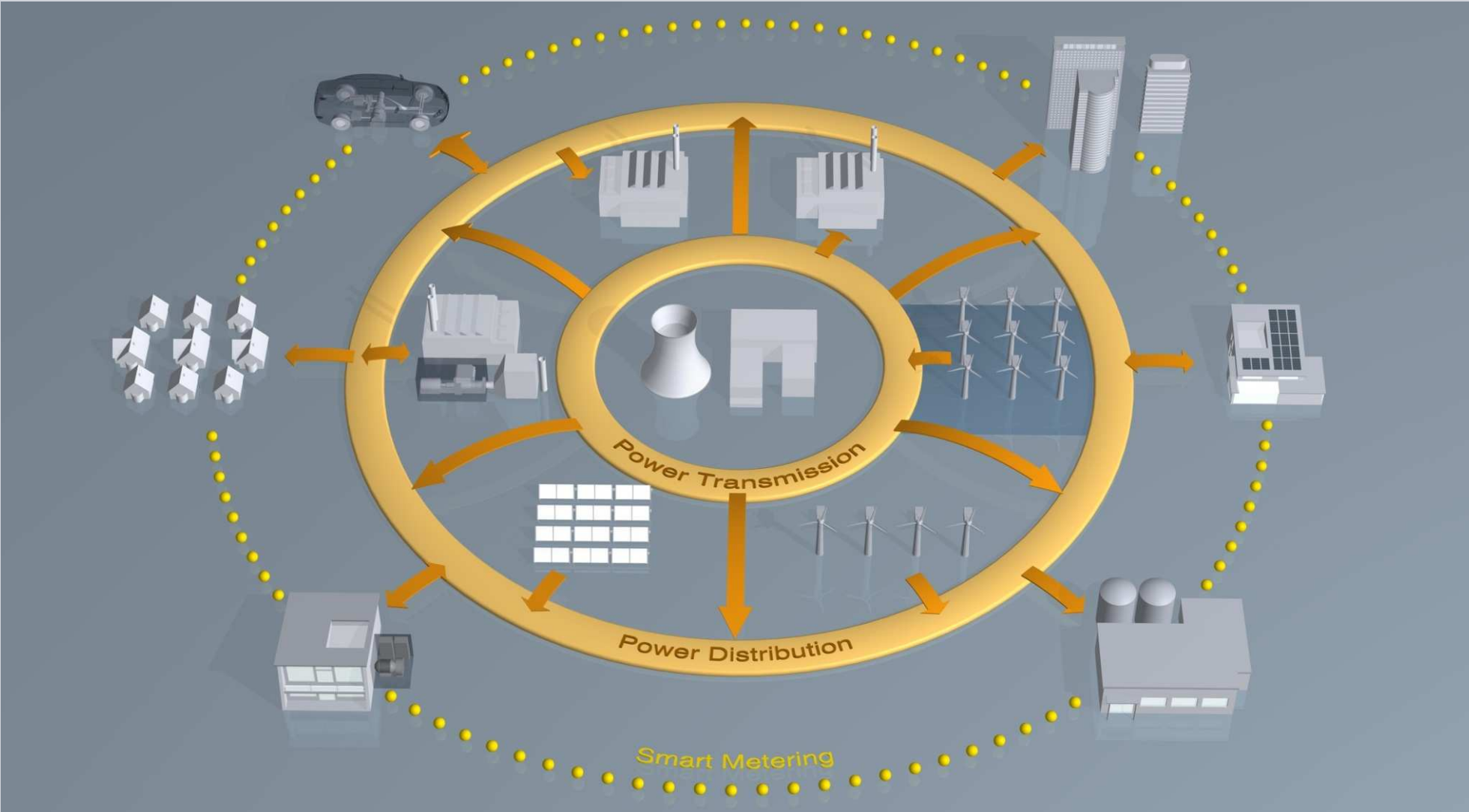
Forum für Zukunftsfragen e.V.
 Berlin, 18. Februar 2009

Electricity Network is backbone of the integrated energy system

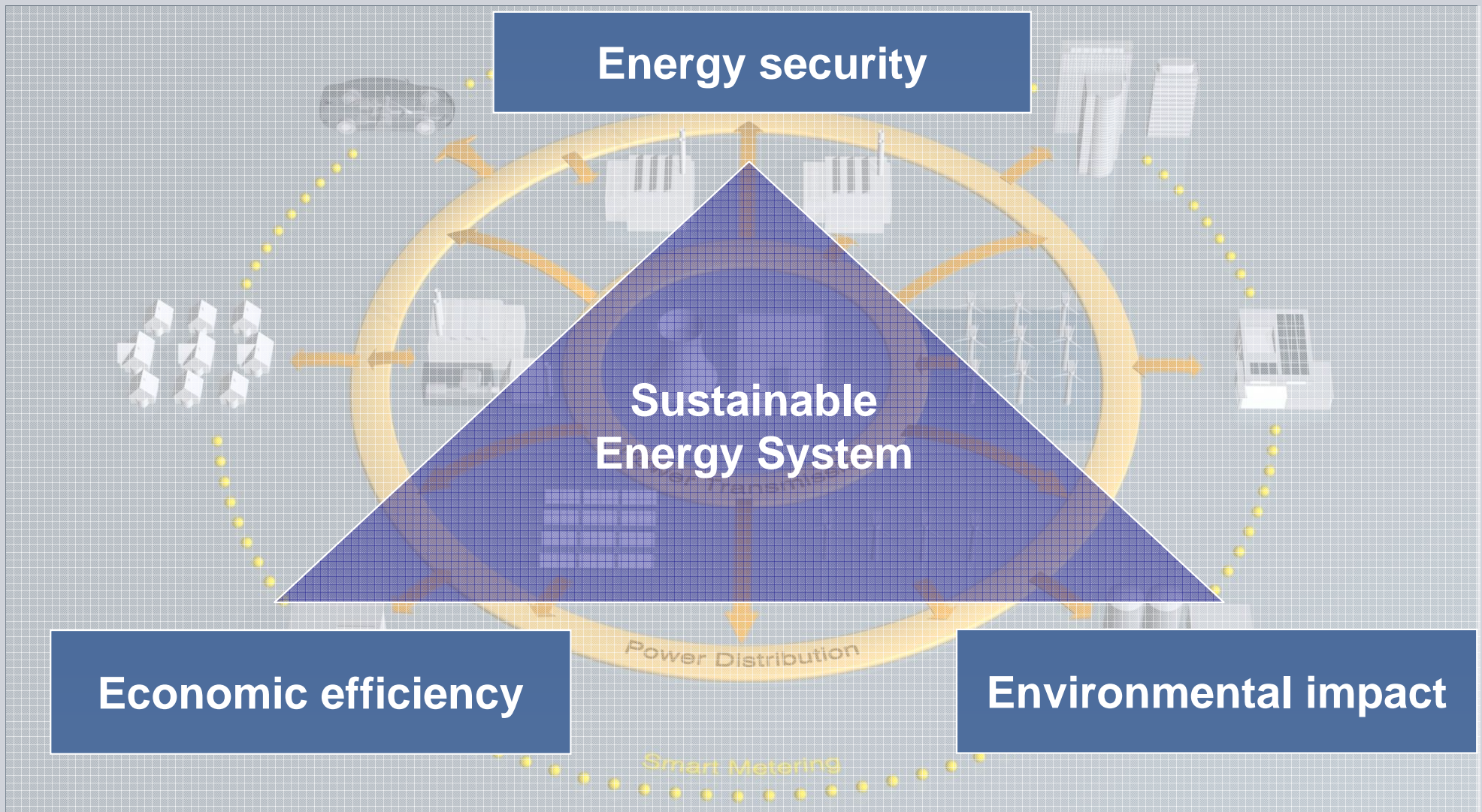
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Increasing complexity and more infrastructures connecting



The 3 pillars of a sustainable energy system



What is needed:

1 Intelligent Energy Mix

2 Efficiency in all individual stages & components

3 Systemic efficiency

Technology options for tomorrow's low-emission and secure power mix

Privileged feed-in of renewables

Renewables:

- Wind power
- Solar thermal power
- Other



Intermediate-load/peak-load for load leveling

Gas-fired combined cycle power plants:

- High efficiency
- Low emissions
- Fast startup



Low-emission base-load

▪ Coal-fired power plants:

- ⇒ Clean, high-efficiency STPP
- ⇒ IGCC pre-combustion capture
- ⇒ Post-combustion capture for retrofitting and new plants

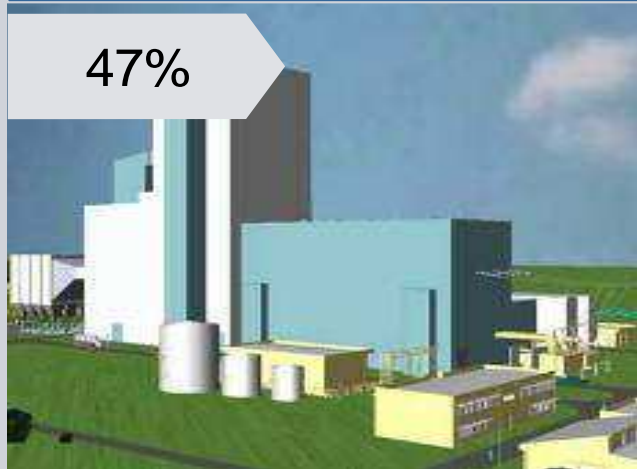
- Nuclear power plants
- Hydro power plants



Siemens Fossil Energy Solutions: Technology options for tomorrow

Hard coal-fired steam power plant

47%



Reference STPP (>600 MW)

Combined cycle power plant, H-class

>60%



Irsching 4 plant (530 MW)

IGCC with and without CO₂ capture

>43% with CO₂ capture



IGCC >400MW with CO₂ capture

Development of efficiency and reduction of CO₂ emissions

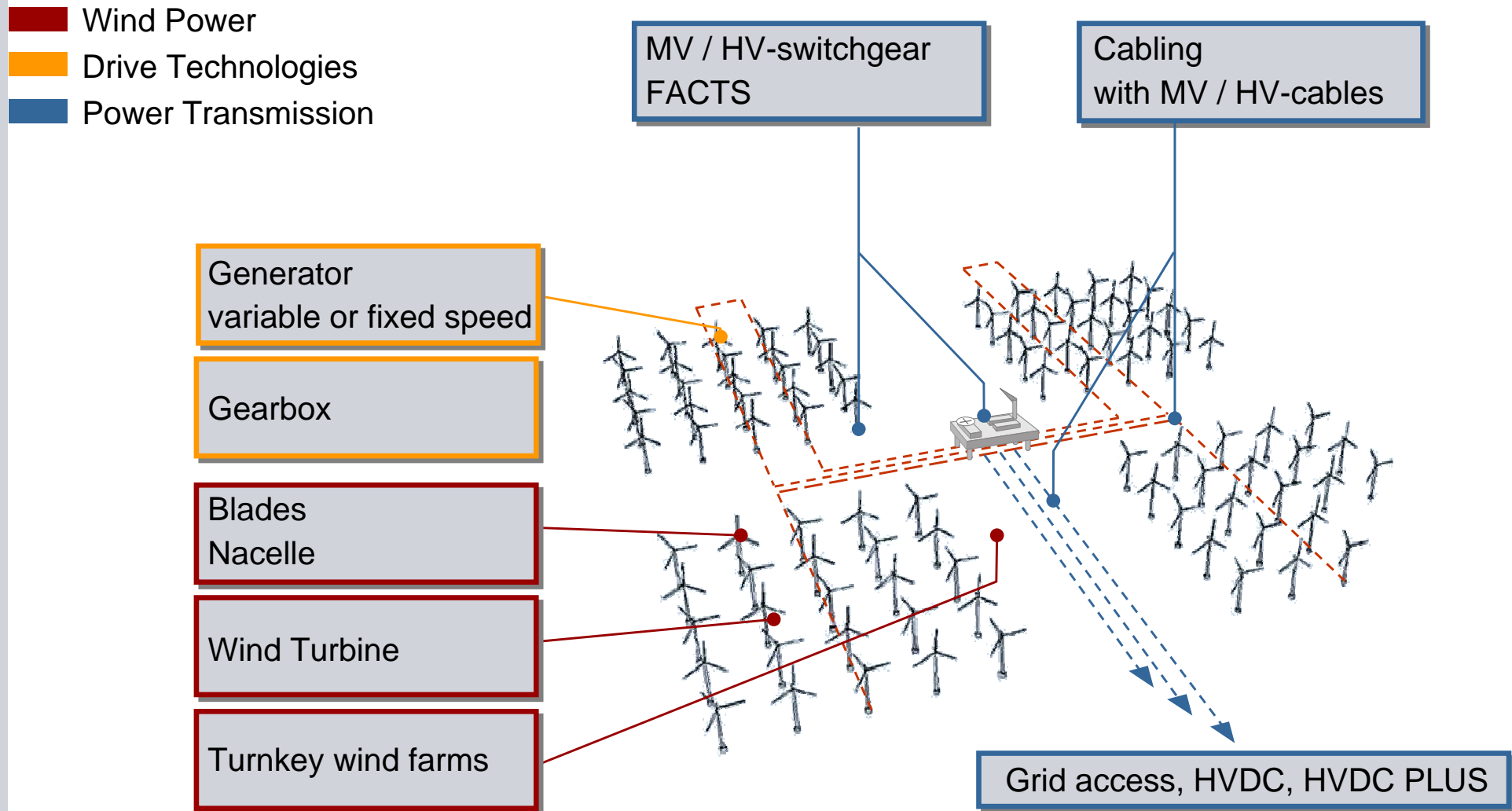
	Efficiency	Δ CO ₂
1992:	42 %	basis
2007:	47 %	-11%
2020 target:	> 50 %	>-16%
with CCS	> 41 %	>-90%

	Efficiency	Δ CO ₂
1992:	52 %	basis
2010:	> 60 %	-13%
2020 target:	> 62 %	>-16%

	Efficiency	Δ CO ₂
1992:	42 %	basis
2007:	47 %	-11%
2020 target:	>50 %	>-16%
with CCS	>43 %	>-90%

New technologies are essential to meet economic low-emission power mix

Grid infrastructure for wind farms



Technologies for low-loss power transmission and distribution

Transmission of large electricity volumes with minimum losses

- High Voltage Direct Current Transmission (HVDC)
- Optimal capacity of lines available with energy automation systems
- Reactive power compensation



Reliable and efficient Distribution

- Gas Insulated Switchgear (GIS)
- Gas Insulated Line (GIL)
- Low-noise transformer
- Power electronics-based technologies – such as medium-voltage, back-to-back coupler

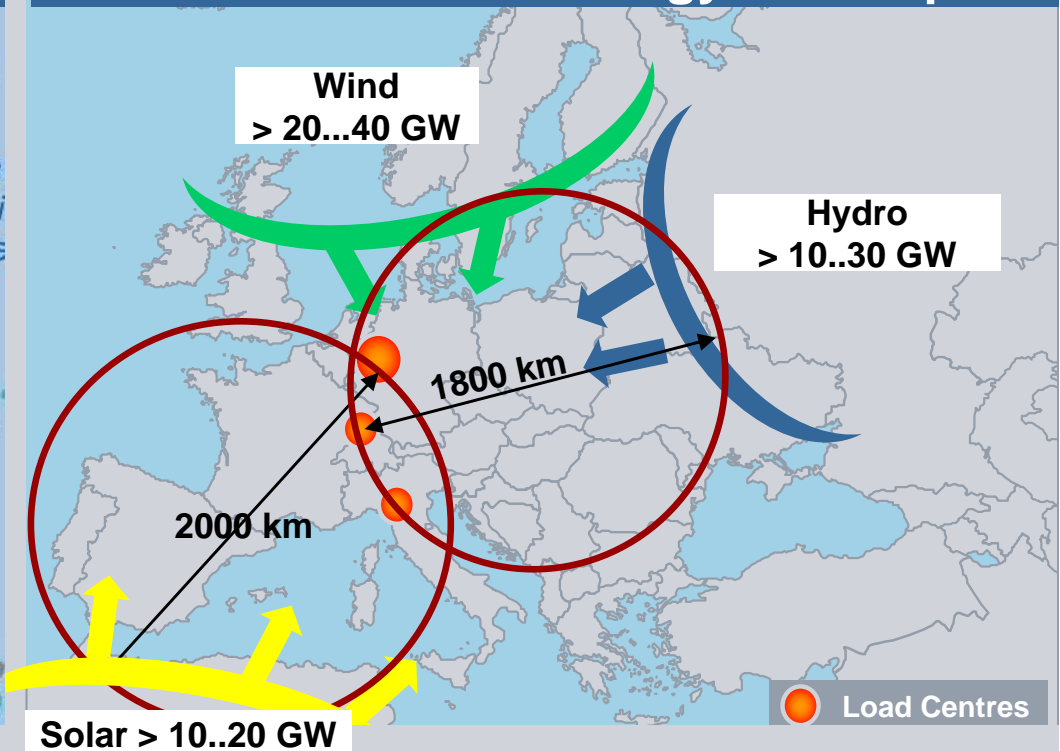


Grid access for large scale renewables

Use of hydro power in China



Use of renewable energy in Europe



Power generation from renewable energies and the grid access solutions

- On-shore and off-shore wind power
- solar thermal power generation
- Large scale Photovoltaic installations
- Integration of renewable energies via HVDC
- Energy lines with UHVAC and UHVDC
- Gas-insulated lines (GIL)

Three forces are needed to enable the future sustainable energy system

Climate-compatible energy technologies
 Efficiency increase, CO₂ sequestration, wind, solar thermal ...



Only through joint forces of politics, academia and industry the sustainable energy systems can become reality.

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