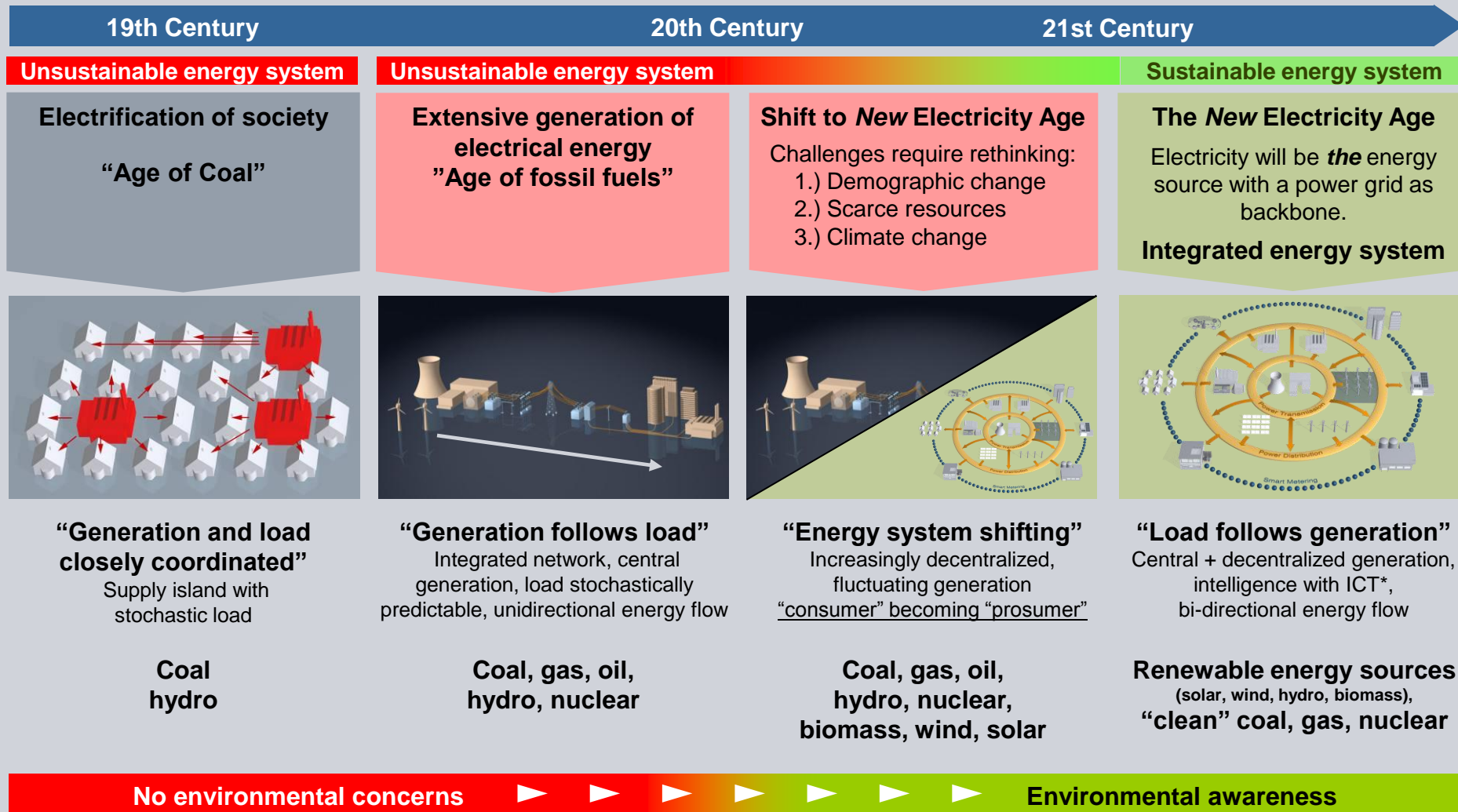


Intelligent, integrated energy systems for Smart Cities

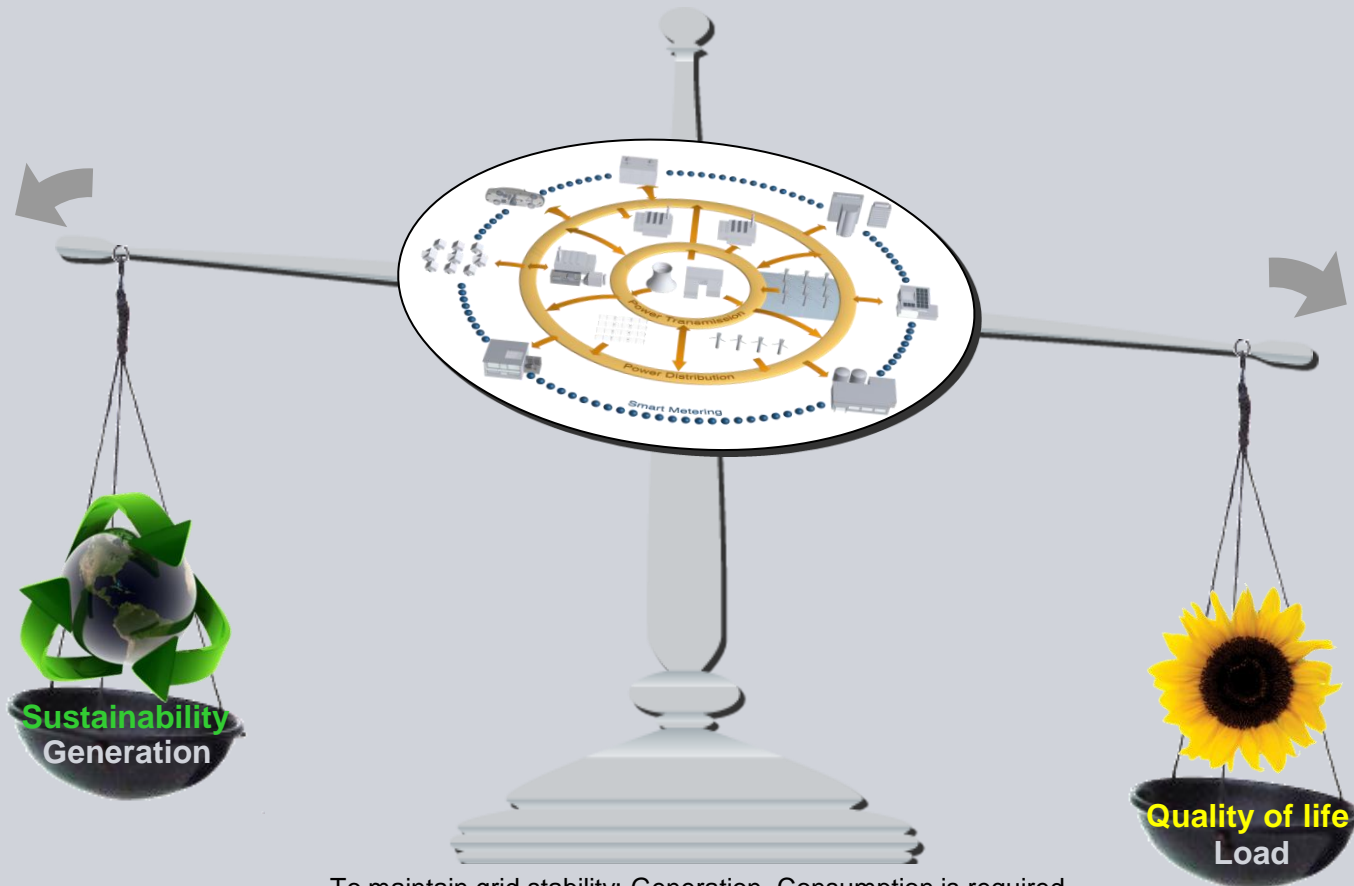
Dr. Rolf Apel
Siemens AG
(rolf.apel@siemens.com)

Paradigm shift in power grids: The **New Electricity Age**



*) ICT = Information and Communication Technologies

Smart Grids will ensure active load management and grid reliability



To maintain grid stability: Generation=Consumption is required

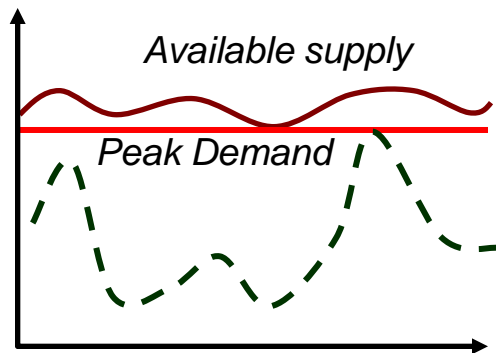
Stochastic renewable generation



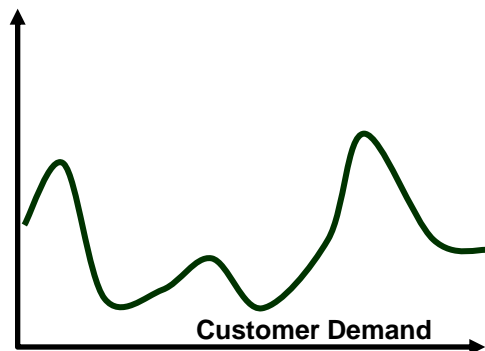
Large number of „Prosumer“

Smart Grid utilizes time flexible energy demand of consumers for an integrated optimization

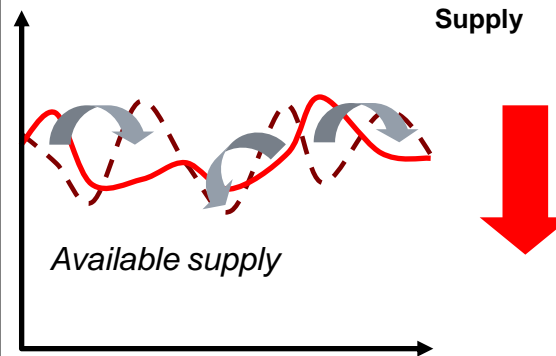
For traditional energy systems there is always sufficient controllable supply



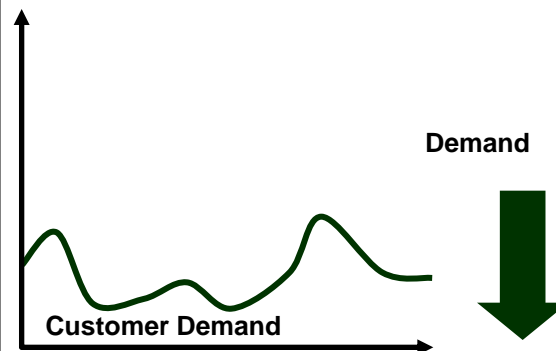
And uncontrollable consumption



Renewable supply capacity is uncontrollable - Storage and energy Management become key to network balancing



And the consumption needs to be flexible



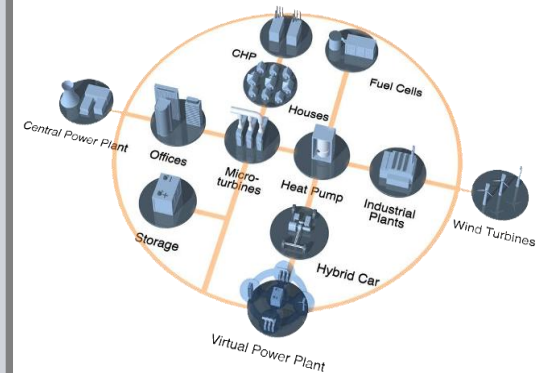
The "Smart Grid"

Optimising all sources to balance supply and demand without impacting Quality of life

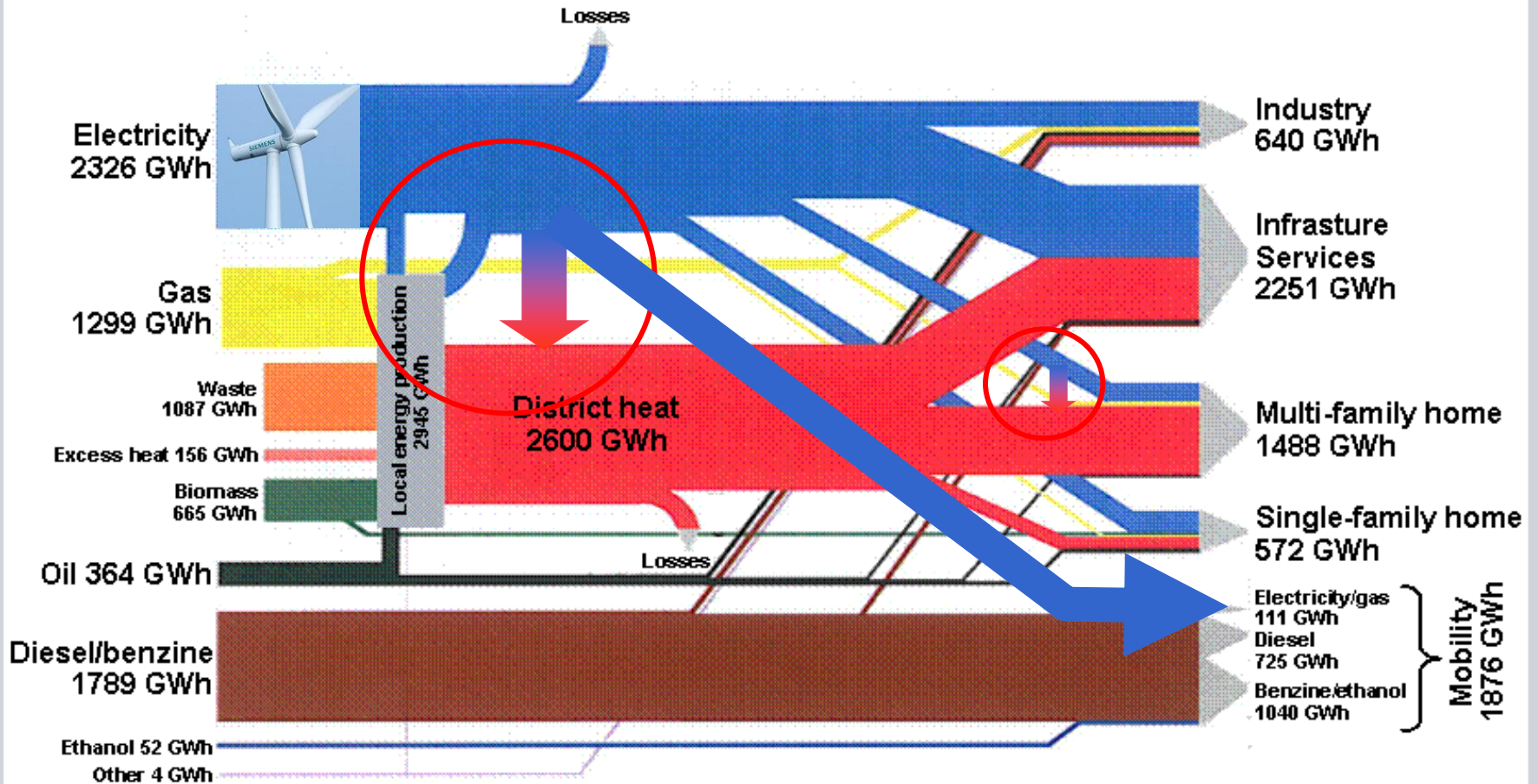
Using storage capability where supply and demand are imbalanced

Making real time decisions to maintain availability and quality

Using tools and techniques to manage supply and consumption to reduce risk



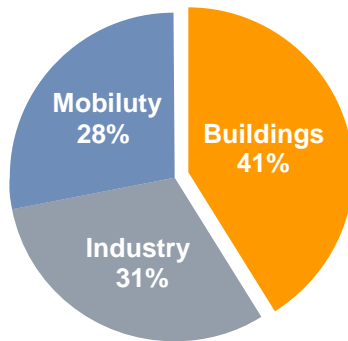
Energiebalance for the city of Malmö in 2006



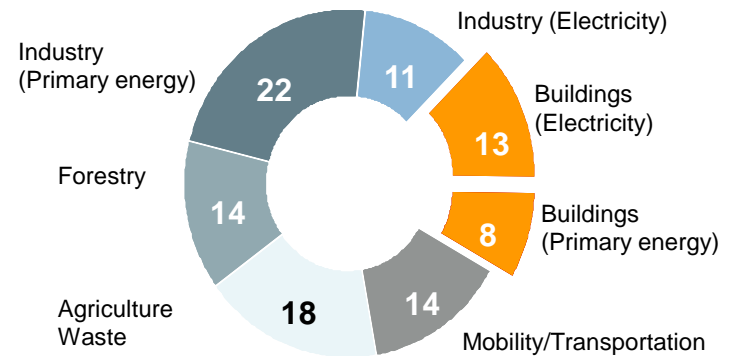
(Source: Grontmij AB, Malmö)

Buildings are the ideal Partner for the Smart Grid

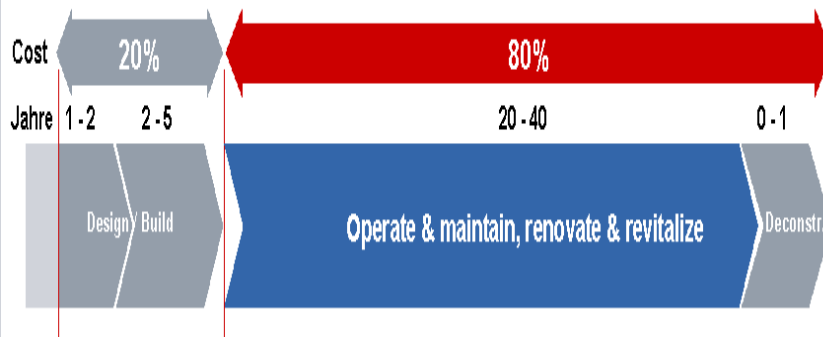
40% of world wide energy consumption*



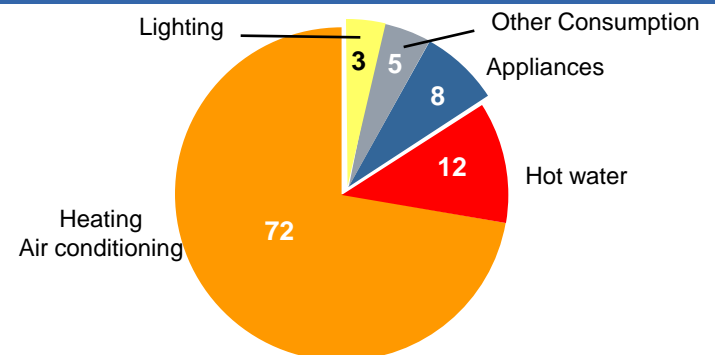
21% of the global green house gas emissions***



Energy accounts for 40% of the building operation cost**



80 % of residential load for HVAC/hot water*



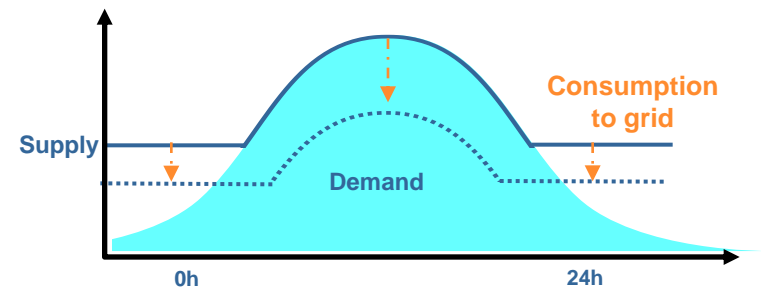
*International Energy Association, auf weltweiter Basis, im Jahr 2002 / ** Dena Congress, Berlin, 2008 / *** „Global Mapping of Greenhouse Gas Abatement Opportunities up to 2030“, Building Sector deep dive, June 2007, Vattenfall AB, basiert auf Information von IEA, 2002, % der weltweiten Treibhausgasemissionen; Total 40 Gt CO2e

Smart consumption is driven by:

Reduced KWh consumed

Savings of **20% to 40%** yet achieved

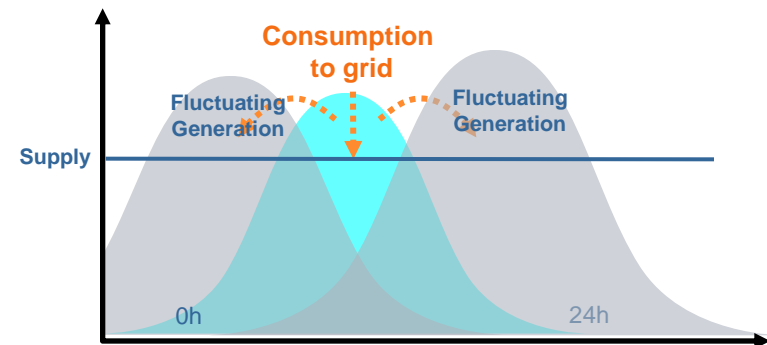
Reduce demand and peak load



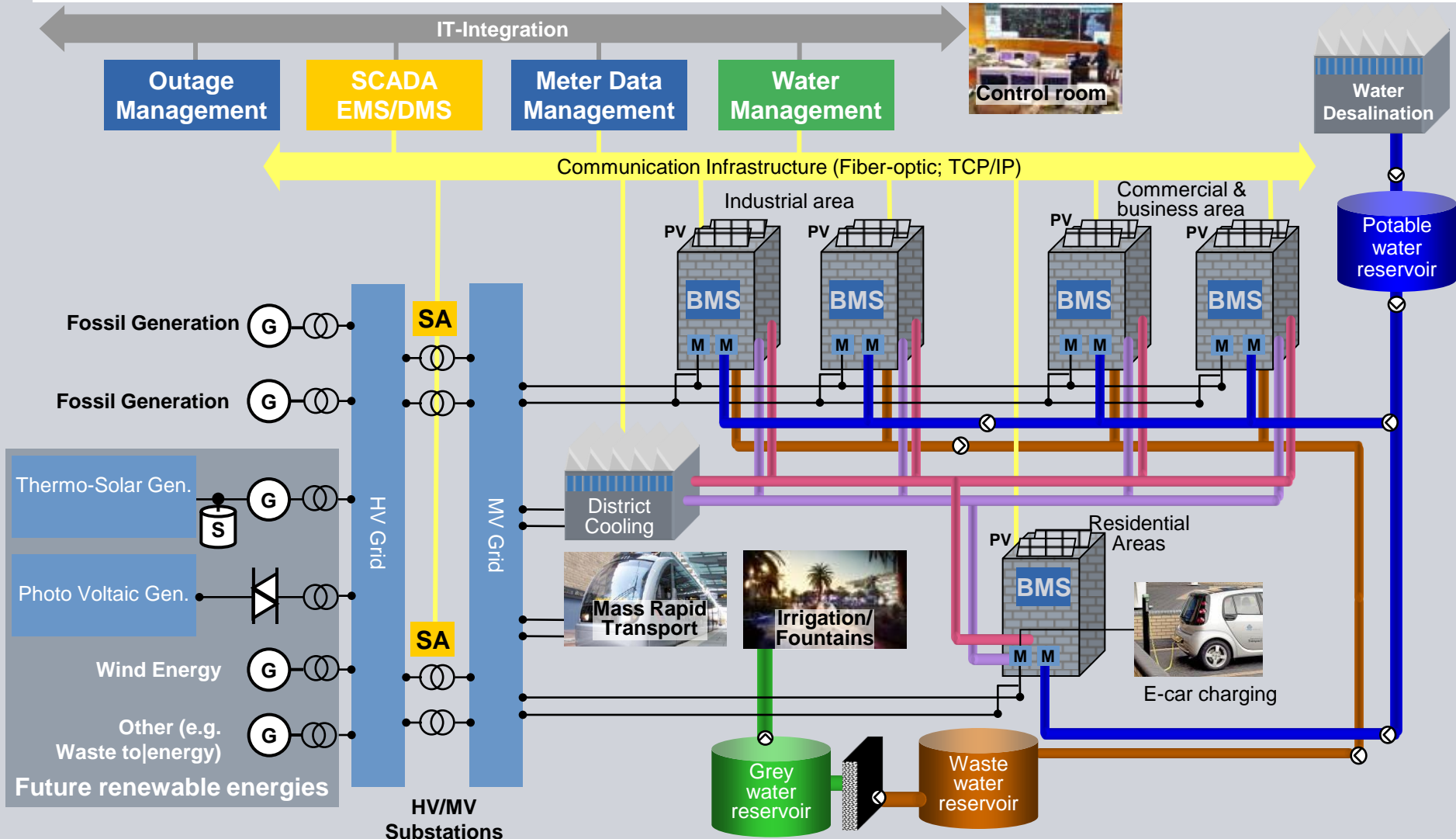
Balancing the grid to:

Savings of **10 % to 20 %** energy costs possible

Shed, shape and shift demand

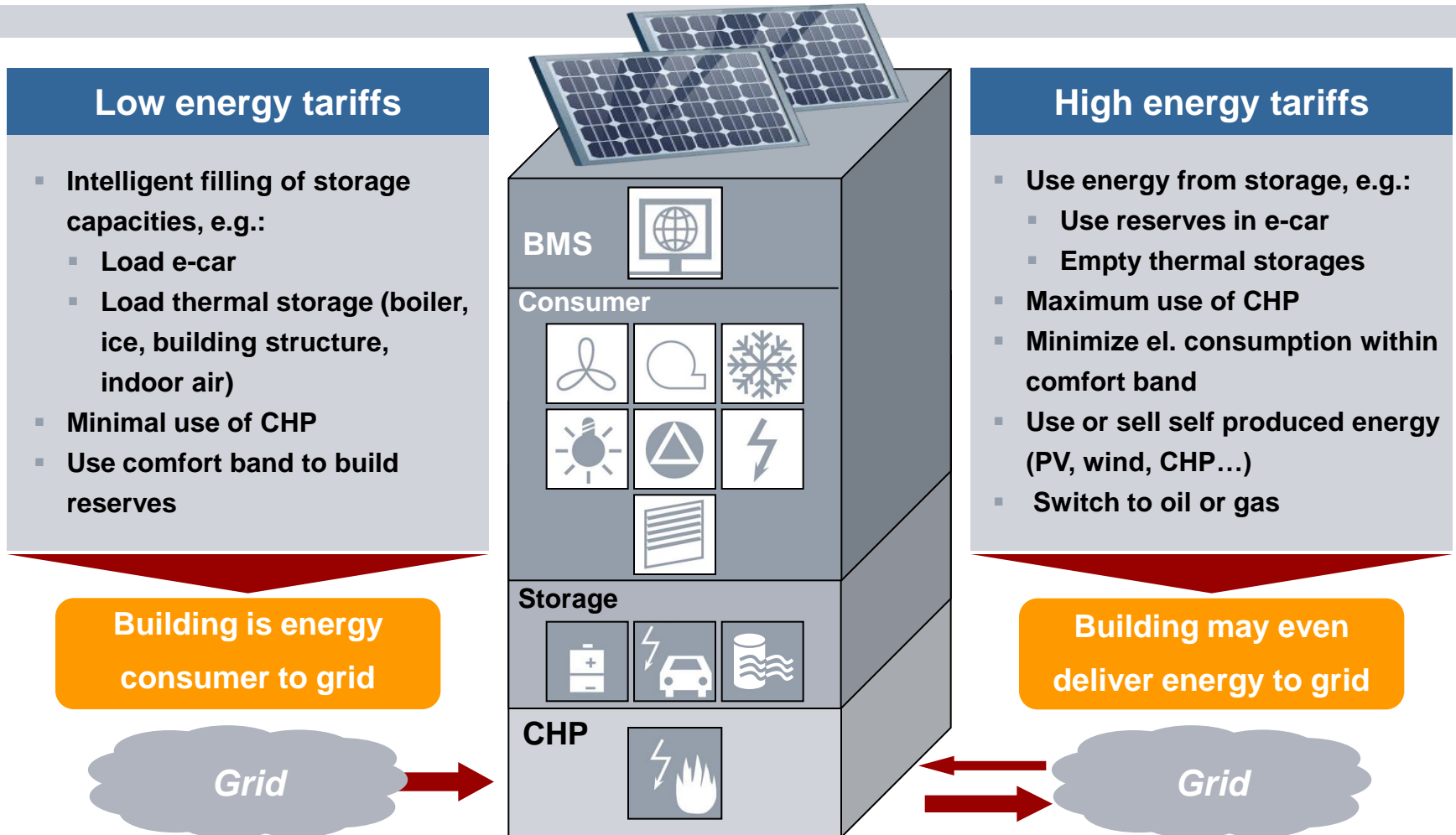


The Smart Grid is a multi Energy Grid ...



HV- High Voltage; MV- Medium Voltage;; M- Meter Devices; SA - Station Automation; BMS - Building Management System; EMS - Energy Management System; DMS -Distribution Management System

... and reaches down to the energy consumption



CHP : Combined Heat & Power

BMS : Building Management System

PV : Photo Voltaic

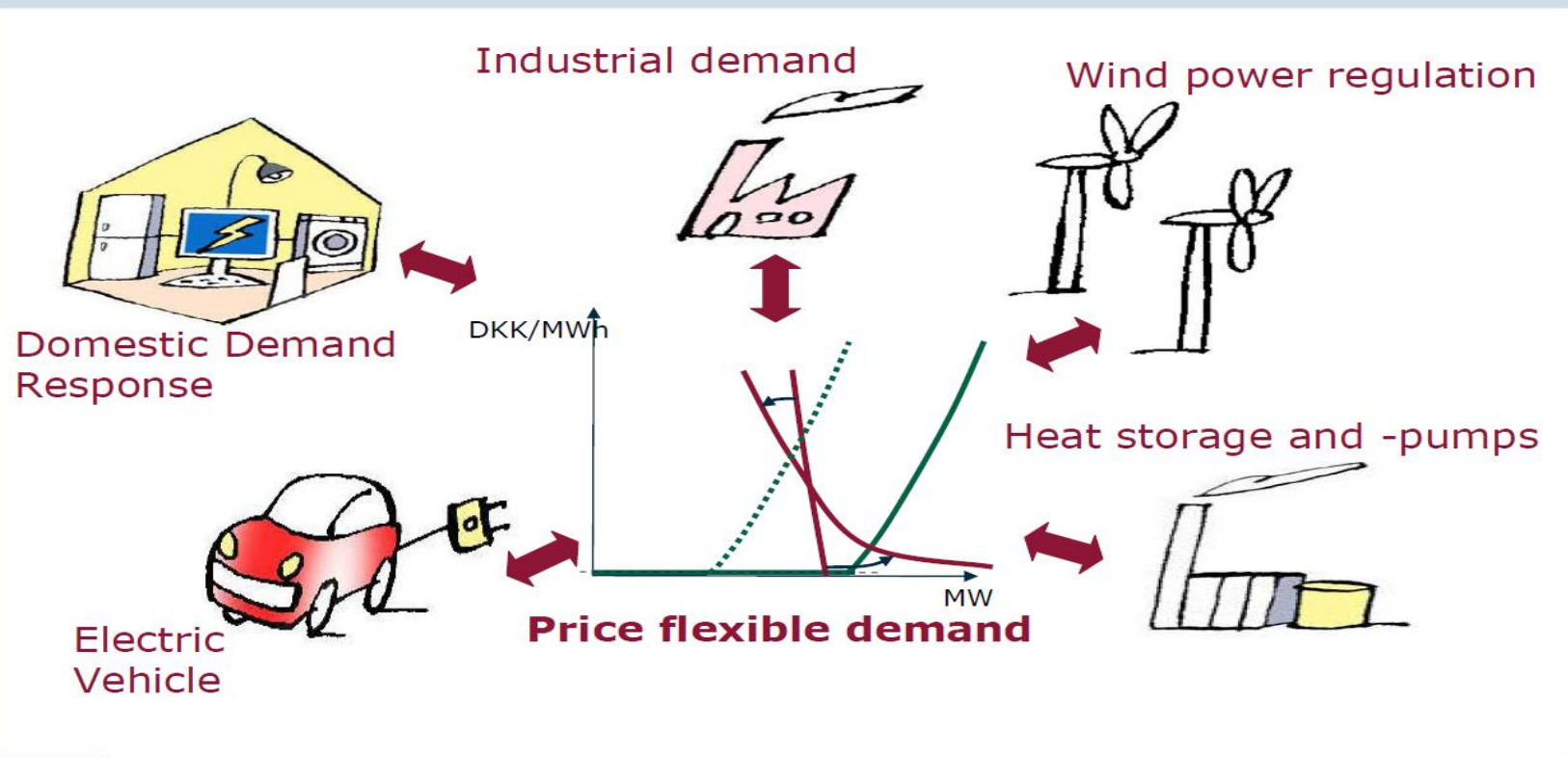
Masdar City (Abu Dhabi) the CO₂ neutral City of the future

Masdar City is designed to provide a quality of life to rival that of any world-class city – while also being uncompromisingly sustainable. Why? Because one of Masdar City's objectives is to demonstrate that environmentally responsible living is compatible with a commercially viable business model that offers people and organizations a desirable place to live and work.



Efficient integration of renewable Energy sources into Bornholm's energy system

Marked based participation of all resources



A person wearing a red shirt is sitting on a large, vibrant green field. In the background, there is a dense line of green trees, and beyond that, a city skyline with various skyscrapers under a blue sky with light clouds.

SIEMENS

**Thank you very much
for your attention**

© Siemens 2011