KNX city

Part 5: Introduction KNX city

KNX has its focus in the building…

… but considers Smart Grid and city issues

- Smart cities require buildings that interact with the city
- Different fields need to interact. Examples:
  - „Energy generation“ affects buildings, e.g. decentralized generation on roofs of “buildings”.
  - “Mobility” effects “buildings”, e.g. charging of electric vehicles
  - The building affects the “City”, e.g. by feeding in surplus energy into the grid.

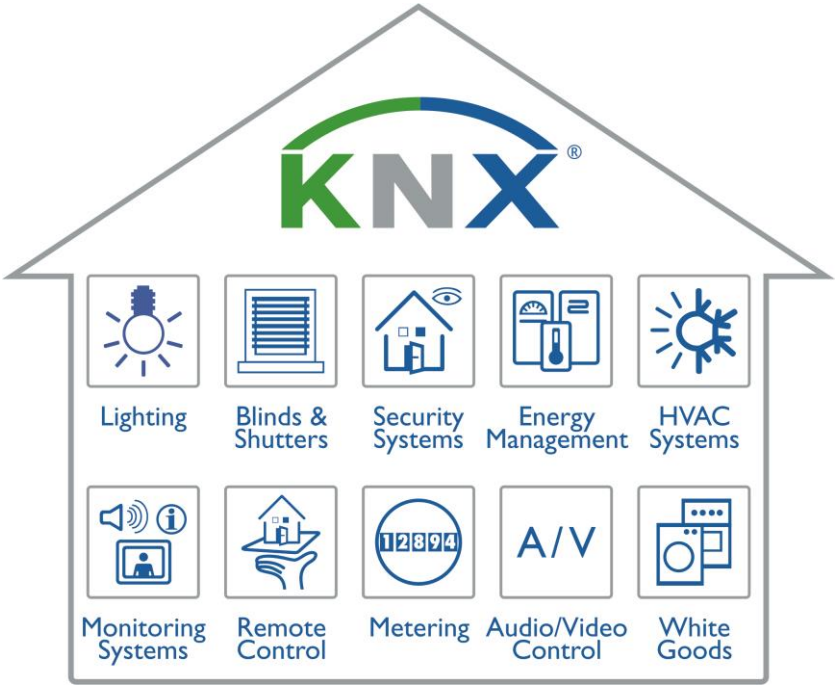
➔ Only systemic solutions lead to sustainable cities

➔ **KNX city sets a new focus with existing KNX technologies**

KNX Solutions

classic applications

- **KNX offers total building controls**
  - Lighting
  - Blinds & shutters
  - Security systems
  - Energy management
  - HVAC Systems
  - Monitoring systems
  - Remote control
  - Metering
  - Audio/Video
  - White goods



➔

KNX city

- **Definition of KNX city solutions:**
  - KNX city solutions are solutions which are implemented in buildings and which provide in aggegration over the total city an appreciable contribution to the sustainability of cities.
  - KNX city solutions interact with the outside of the building
  - KNX city solutions provide energy management systems for buildings, which are designed to optimize the energy efficiency of the entire city rather than to optimize only the building efficiency
  - KNX city solutions combine single soulutions to an entire solution as puzzle stones to an assembled puzzle

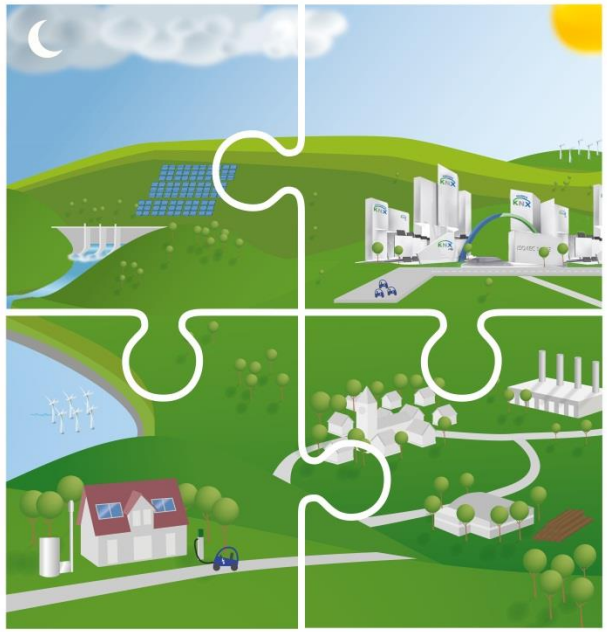
Sustainable cities and Smart Grids…

…require more than single solutions

A “Single solution” doesn’t meet city sustainability objectives

KNX city solutions shall

- …be combined
- …interact with the city
- …offer interfaces to the city
- …focus on the total building environment
- …involve all fields which affect living
- …

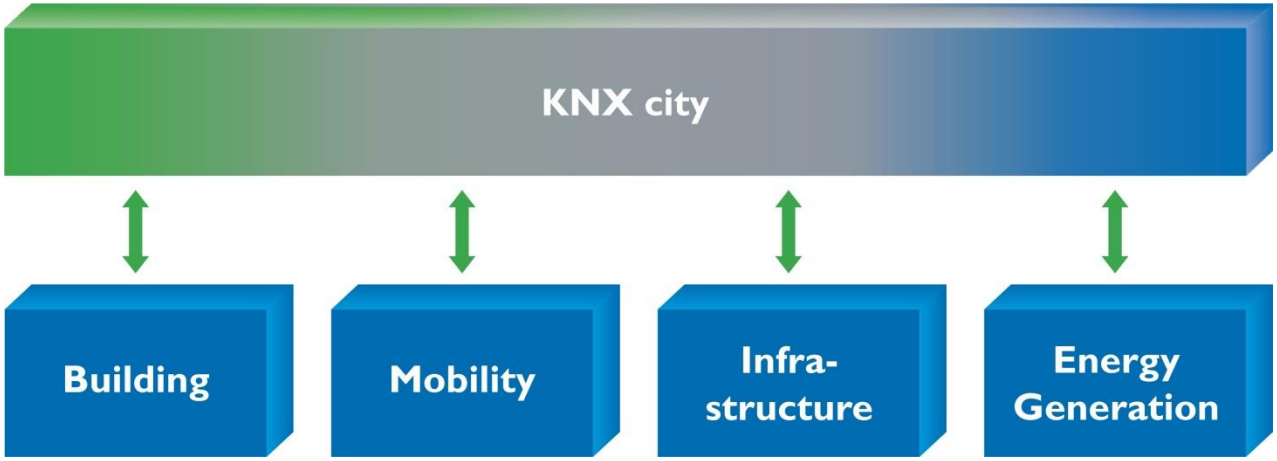


➔ **Systemic approaches which consider the interaction of different fields are necessary**

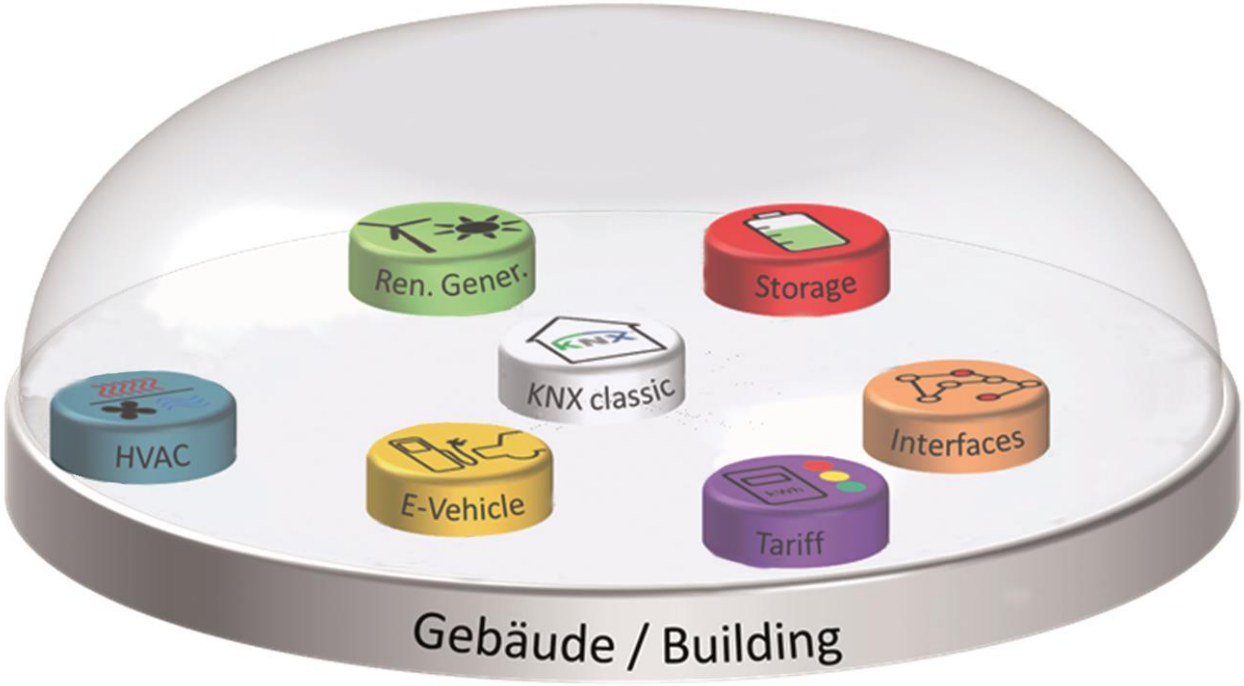
KNX city project

Solutions for sustainable cities

The KNX city initiative brings mobility, building, infrastructure and energy generation together



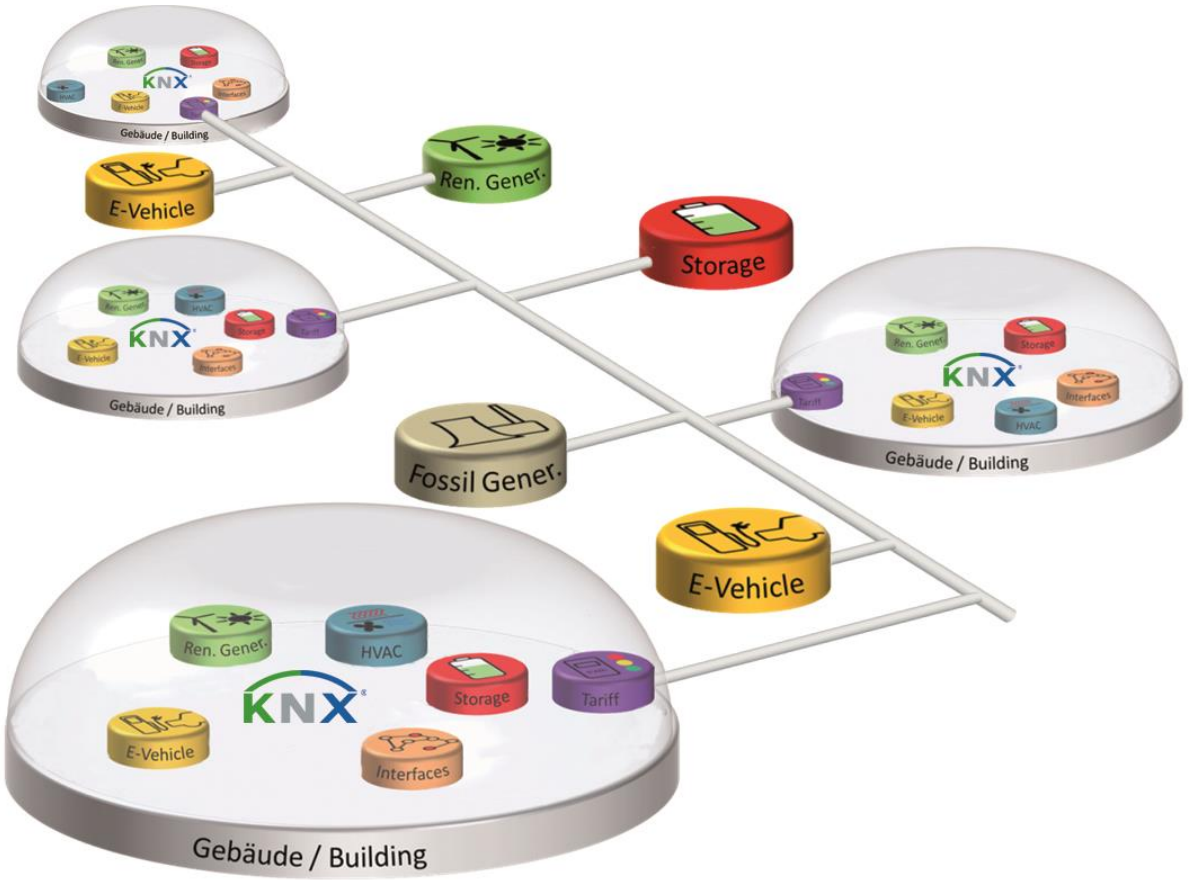
KNX in the building



KNX Smart Grid

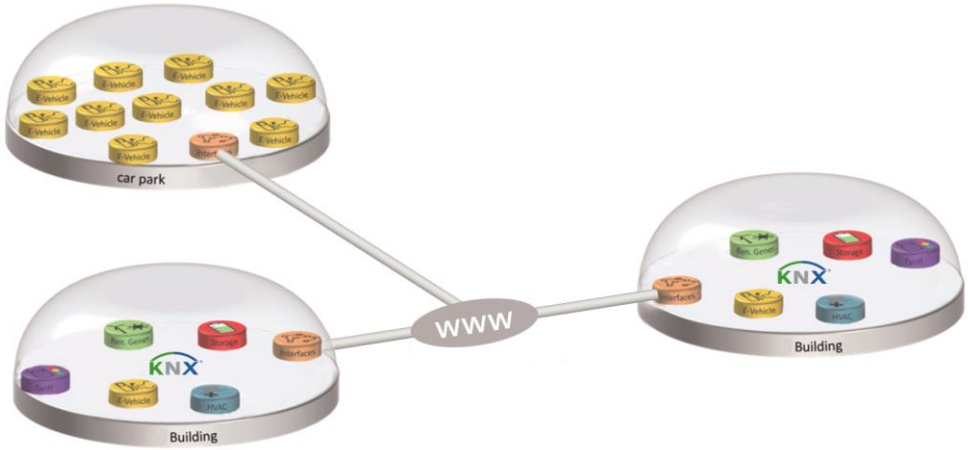
Smart Community

- KNX provides the in-house communication
- KNX provides the communication between distributed facilities
- KNX provides interfaces to the Smart Grid



KNX city distributed facilities

- KNX offers communication by twisted pair, IP and radio frequency
- Buildings can be connected to each other over distances by IP as if they were one building
  - Distributed facilities
  - Energy management over distances
  - Balancing of generation and consumption of different buildings.



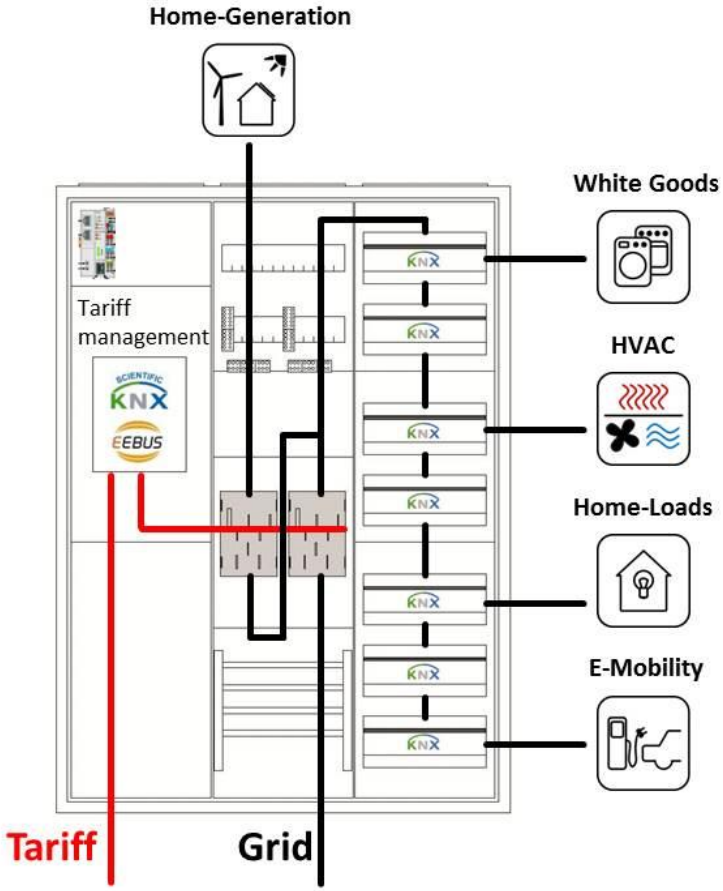
KNX city application: Building

City load management

- Tariff or Setpoint Curve is received by a KNX load manager

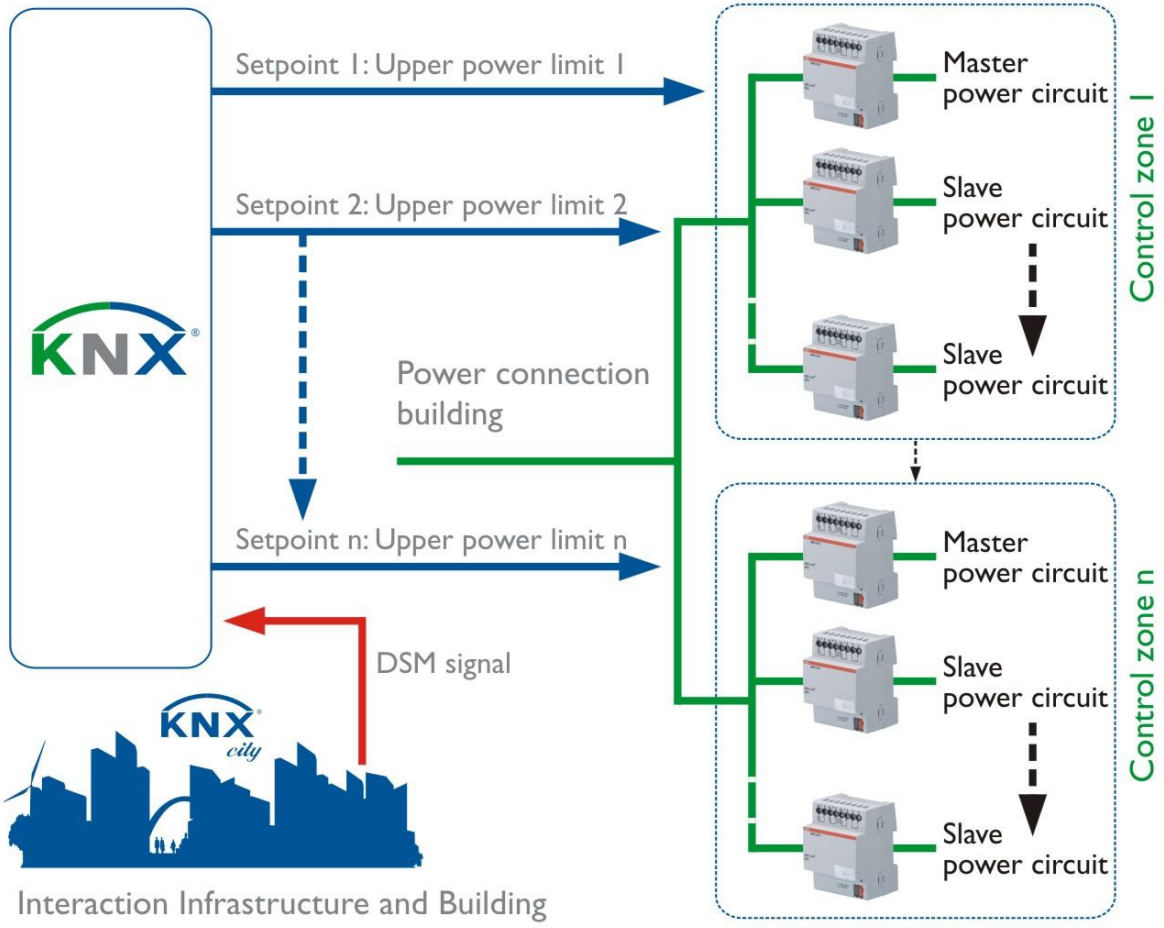
KNX solutions:

- Demand Side Management
- Demand Response
- HVAC automation
- White goods automation
- Decentralized energy generation management of e.g. photovoltaic



KNX city application: Building

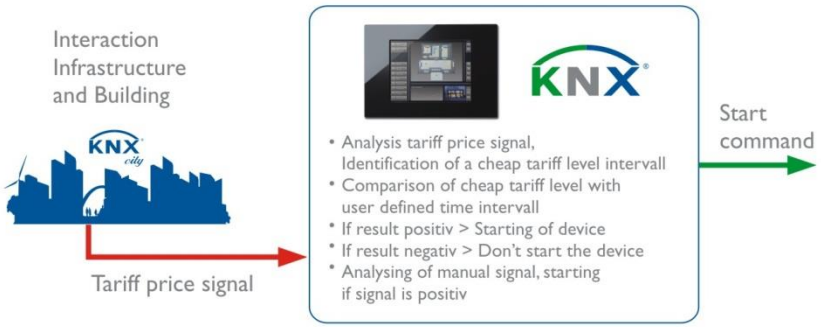
City load management



KNX city application: Building

City load management

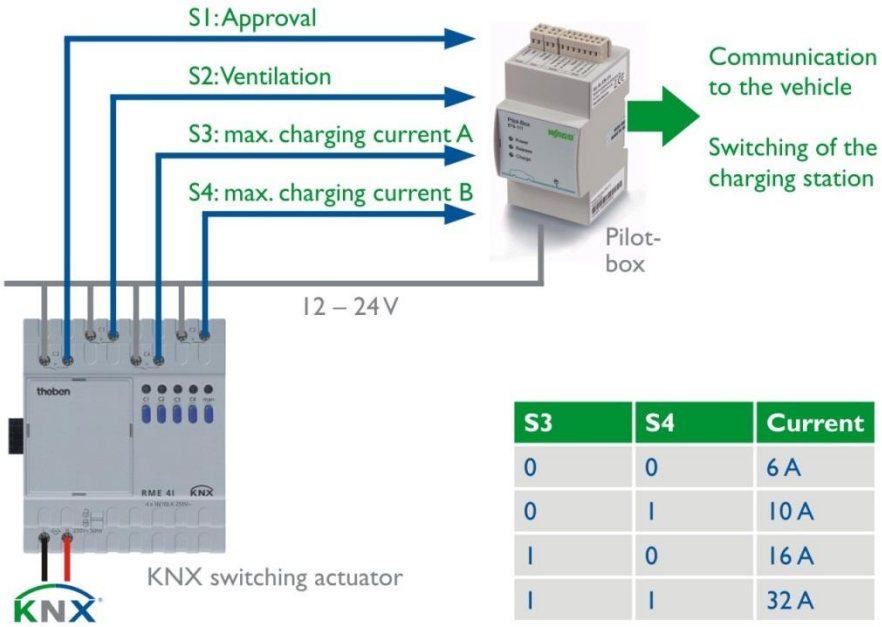
- Demand Side Management in dependence of an incoming signal from the city
- The signal can depend from…
  - … the amount of renewable energies which generate currently power
  - … situation of the power plants
  - …
- This KNX city solution helps…
  - …to consume generated surplus energy from renewable energies
  - …to compensate a lack of renewable generation
  - …to reduce peak loads occurring in the power grid



KNX city application: Mobility

Connectivity of Electromobility to KNX

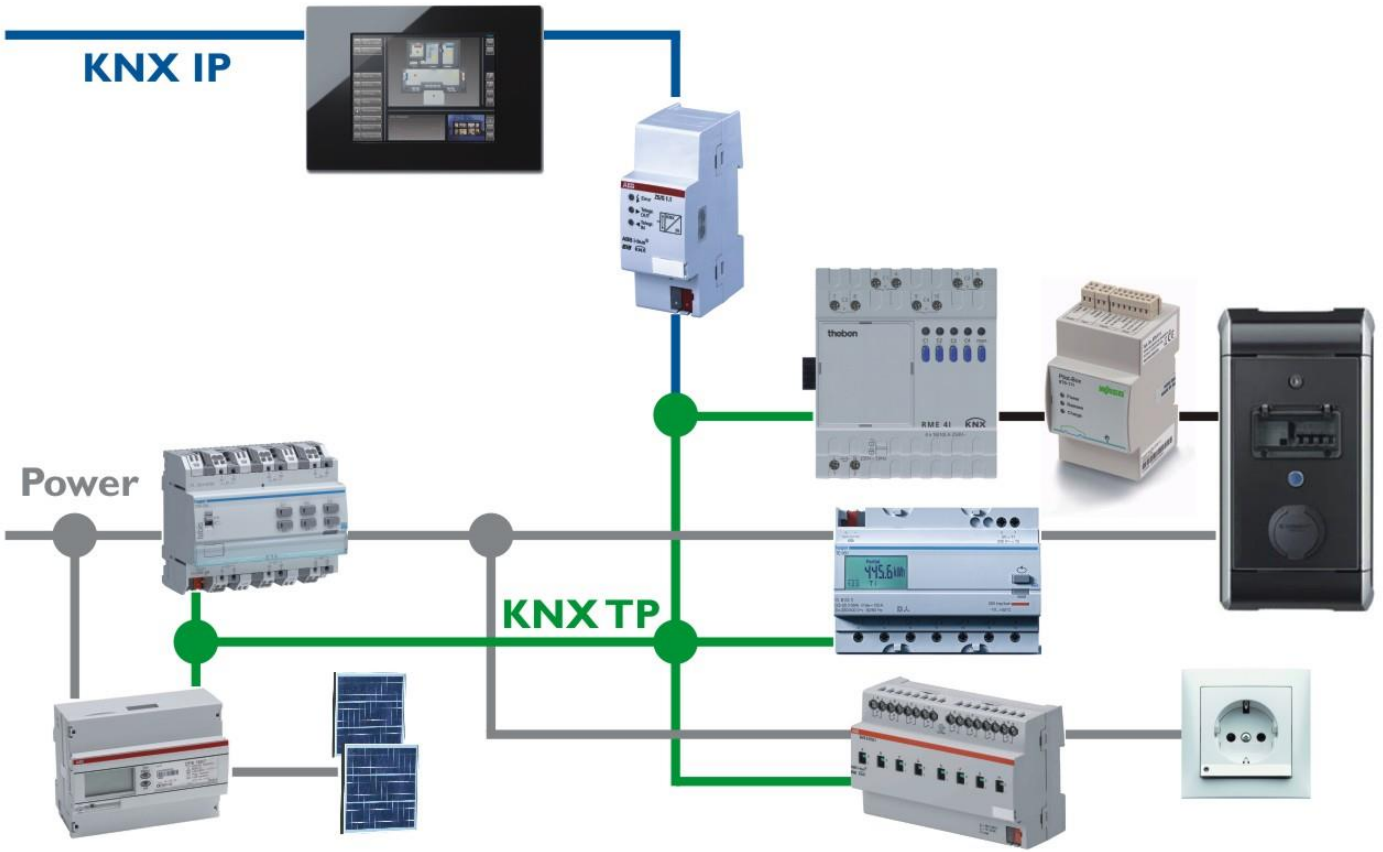
- KNX can charge electric eCars intelligently
  - Variation of the charging current and thereby the power
  - Demand Side Management with eCars
  - Predominant charging of eCars with generated energy from renewable energies such as the own photovoltaic system



S3	S4	Current
0	0	6 A
0	1	10 A
1	0	16 A
1	1	32 A

KNX city application: Mobility

Connectivity of Electromobility to KNX



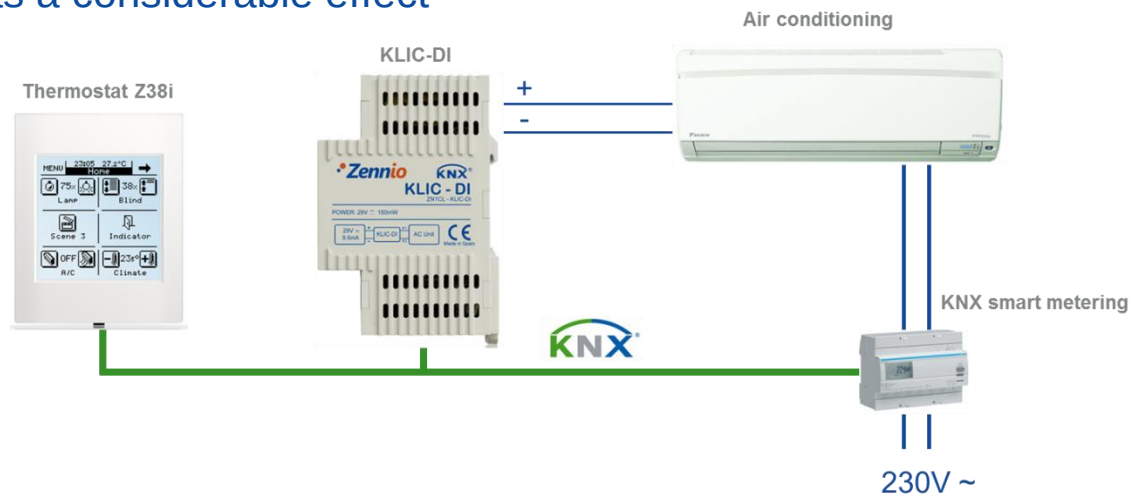
KNX city application: Mobility

Connectivity of Electromobility to KNX

KNX city application: Infrastructure

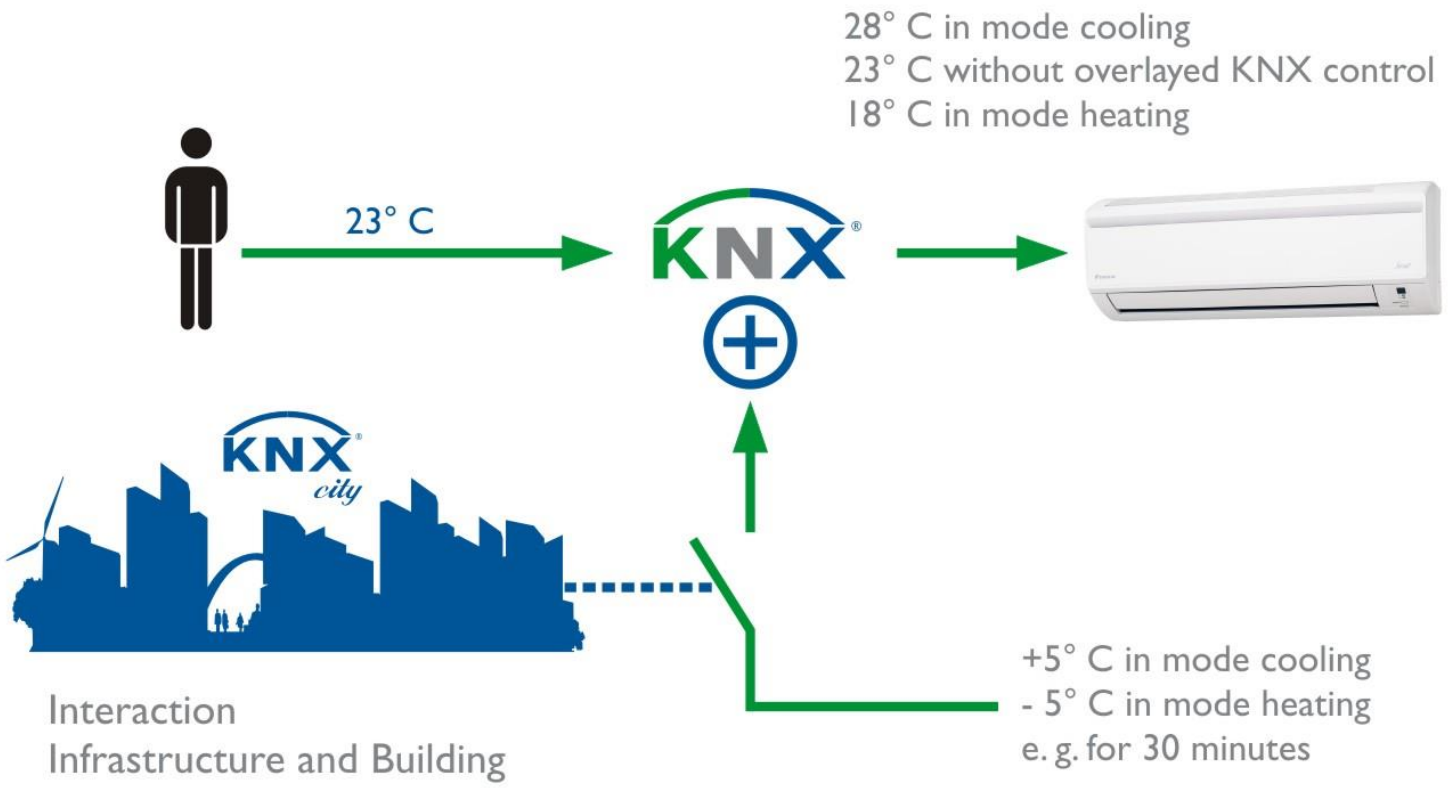
City air conditioning control

- A high amount of air conditioning systems can lead to peak loads in cities
- A central setpoint temperature control could reduce the peak load, when it occurs by…
  - Increasing the setpoint temperature for a short time period leads to a load reduction in that period
  - The benefit can not be noticed in one building, but in aggregation in the city it has a considerable effect



KNX city application: Infrastructure

City air conditioning control



KNX city application: Infrastructure

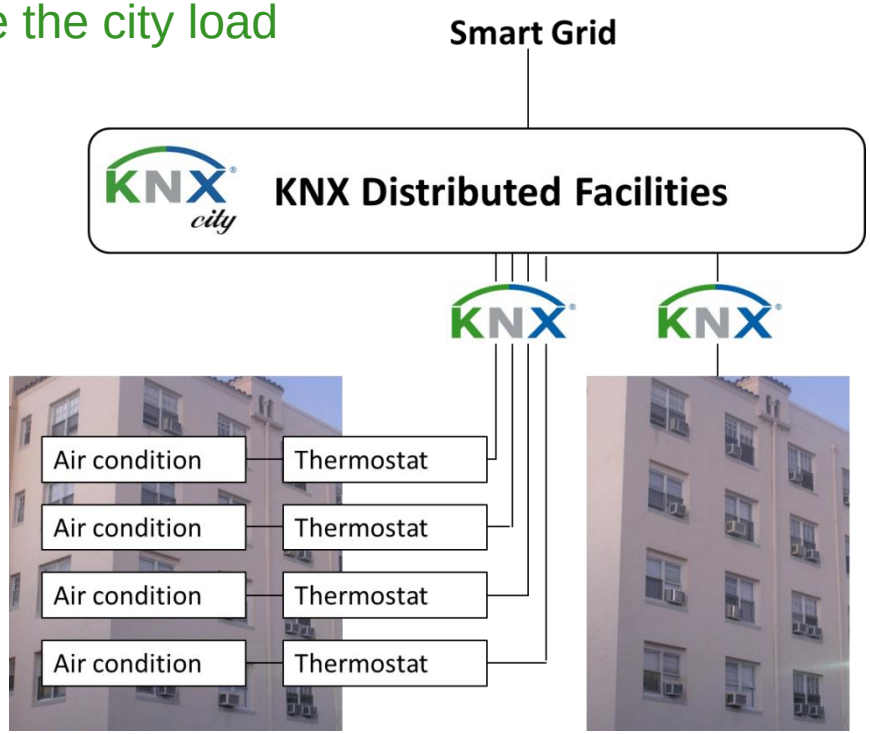
City air conditioning control

Air conditioning

- The load can vary between 2kW to 4kW, depending from the outside temperature
- KNX Thermostats can shortly stop cooling or change the cooling temperature in order to reduce the city load

Used technologies

- KNX air condition control
- KNX city distributed facilities



KNX city application: Infrastructure

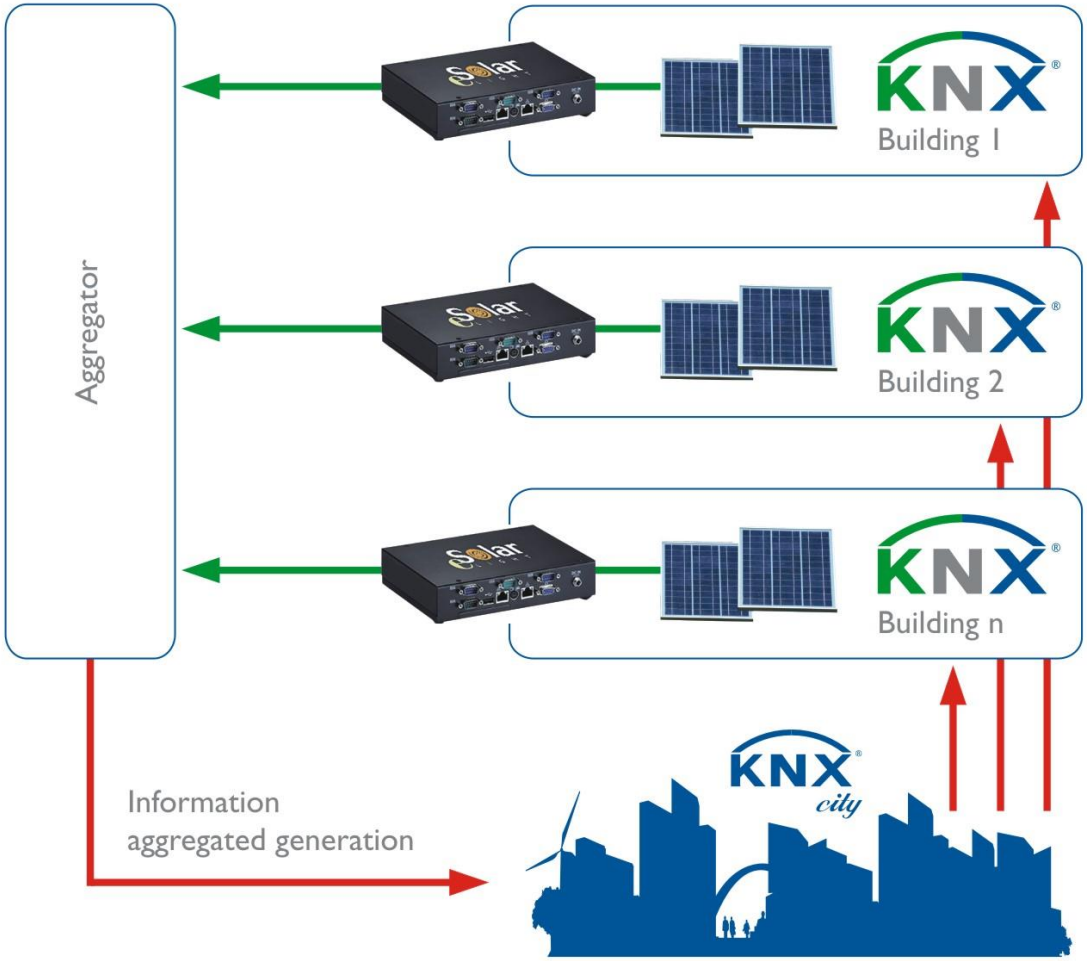
City air conditioning control

- Peak loads can be reduced
- User acceptance is provided due to the fact that temperature changes in short timed will not change the room climate
- Stabilizes the power supply

- This KNX city solution helps…
  - …to avoid peak loads
  - … to save energy
  - …to overcome shortly occurring bottlenecks in the power grid
  - … to compensate a lack of renewable generation

KNX city application: Energy Generation

City energy generation management



KNX city application: Energy Generation

City energy generation management

- Energy generation management helps to make the unpredictable power generation of renewable energies more transparent

- This KNX city solution helps…
  - …to avoid voltage-level violations in low voltage grids
  - … helps cities and utilities to implement demand side management solutions
  - …to avoid voltage-level violations in low voltage grids because the utility can react in time

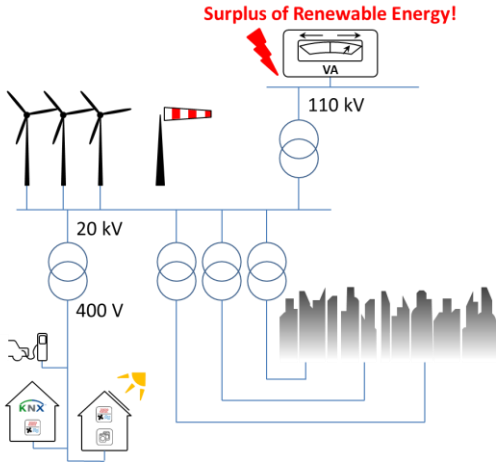
KNX city Energy management

What KNX can do for the Smart Grid and the city

Surplus of renewable energies

- KNX starts loads for consuming the surplus of energy
- Automatically or manually
- Tariff controlled by utility

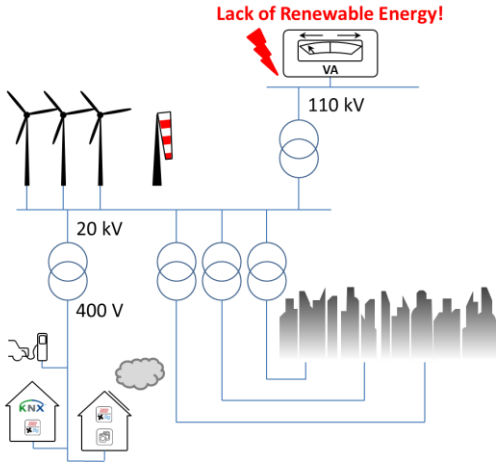
➔ **KNX helps to buffer renewable energies**



Lack of renewable energies

- KNX stops loads for reducing the total city load for a short time

➔ **KNX helps to cope with the lack of renewable energies**



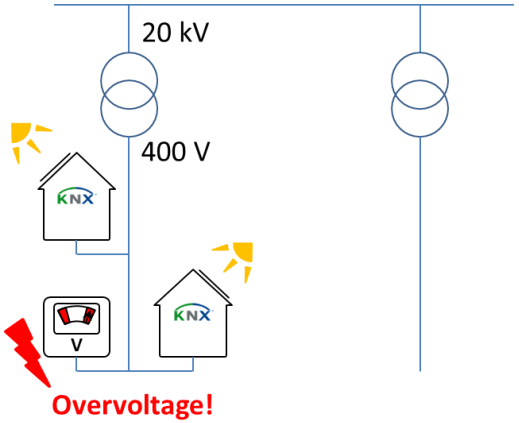
KNX city Energy management

What KNX can do for the Smart Grid and the city

Local overvoltage

- Results from high generation of decentralized renewable energies
- KNX increases loads

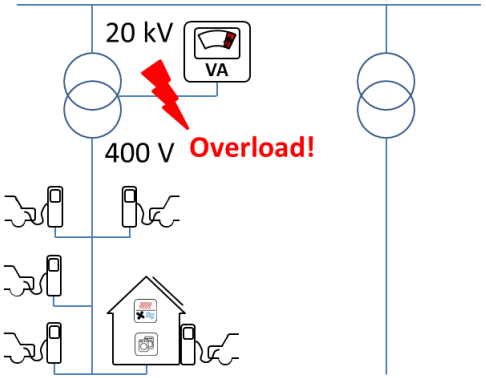
➔ Voltage gets stabilized



Peak Load

- Voltage drops
- KNX decreases loads

➔ **Voltage gets stabilized**



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