




KNX city

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Sustainable cities

Urbanisation, scarce resources and global warming present enormous challenges for cities in the years to come. The world's cities account for two thirds of energy consumption, 60 per cent of total water consumption and 70 per cent of emitted greenhouse gases production. On top of that, cities continue to grow. For example, in 2010, 82 per cent of US inhabitants lived in cities ; by 2050 this will increase to 90 per cent. In China, the twelfth five-year plan state¬¬s that the urban population will increase from 47.5 per cent to 51.5 per cent by 2015. In Europe, too, urbanisation is on the increase.

In order to achieve sustainable urban development and deal with the challenges, cities have to improve their infrastructure to become more environmentally friendly, improve quality of life and reduce costs. Sustainable buildings are an essential prerequisite for sustainable cities. But that on its own is not enough. Interdisciplinary solutions are needed to equally deal with buildings, mobility, energy generation, infrastructure and communication. In other words, a comprehensive systems approach is needed. KNX offers systems solutions for the development of sustainable cities around the world

With more than 265 manufacturers from 31 countries, more than 7,000 KMX certified products and the worldwide STANDARD for home and building control (ISO/IEC 14543/3), today KNX already offers a variety of solutions for the sectors referenced below:

Building

What does the building of the future look like? The building of the future is energy-efficient and communicates with its surroundings (smart grid). KNX already offers solutions today for the intelligent interaction between lighting, shading, security systems, HVAC, monitoring, remote control, measurement, audio/video and domestic appliances in buildings. This topic area will even be extended in the future because of the many new challenges that lie ahead.

Mobility

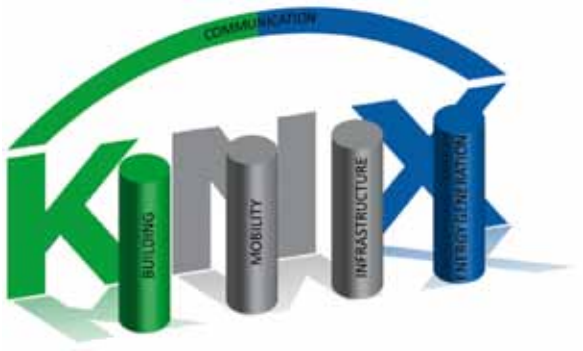
How will we get from Point A to Point B in the future? Of course, with vehicles (electric vehicles) and means of transport, whose energy will be supplied exclusively from renewable energy sources. KNX already offers solutions today that allow for excess energy, such as that generated by photovoltaic systems or small wind-powered generators of buildings, to be put to use for charging electric vehicles fully with renewable energy.

Infrastructure

How will energy management for entire urban districts or townships be managed in the future? Of course, by a solution that spans over multiple buildings. KNX already offers solutions today for distributed properties by linking them up via communication technology and IP/Internet as if they were one single building.

Energy generation

How will we generate the energy we need in the future? Of course, by using predominantly renewable sources, i.e. sun and wind. KNX already offers so-



KNX means connecting buildings, mobility, infrastructure and energy generation with one common communication system: the KNX Standard

lutions today that make it possible to counter the problem of fluctuating power generation in photovoltaic systems and wind-powered generators. This is done through load management, thereby increasing the proportion of renewable energy used.

Communication

What will future communication look like in the cities of tomorrow? Future smart grids and infrastructures will not be able to do without information and communication technology. This is the prerequisite for a comprehensive systems solution. KNX already offers today the worldwide STANDARD for home and building control and, in so doing, ensures the compatibility of more than 7,000 certified building system components from over 265 manufacturers, speaking a common language: KNX. KNX will provide all the necessary interfaces for communication infrastructures for smart grids, etc. in the city of the future.

On the basis of its comprehensive systems approach to buildings, mobility, energy generation, infrastructure and communication, KNX can already offer the city of the future innovative solutions that will vastly improve the sustainability of cities and fully exploit the potential for interaction between the sectors involved.

KNX city is not a vision

KNX city addresses current challenges relating to buildings, mobility, energy generation, infrastructure and communication, and provides appropriate KNX solutions. Internationally, these challenges can vary widely.

In Europe, and particularly in Germany, we are facing the so-called energy turnaround. This refers to changes in the energy sector - moving from fossil fuel production to primarily renewable energy generation. The key challenge of the energy turnaround is to ensure a steady supply of energy in spite of the fluctuating nature of renewable energy sources. Traditionally, energy supply has been adjusted to the demand; in the future, it will also be necessary to adjust the demand or load to the fluctuating nature of energy generation. In the future, many energy suppliers will offer time-variable electricity rates in order to motivate customers to use electricity when it is cheap rather than to use it during peak demand, in order to implement an indirect load management. The KNX city system provides solutions for addressing this.

Mobility is becoming increasingly important and, in the future, a large share of motorised traffic will be powered by electricity. However, electric vehicles will only be environmentally viable if charged with renewable electricity. This is not evident, as there is no provision for this in the conventional energy supply systems. Smart grids should change this. Solutions are needed where electric vehicles can be charged from renewable energy sources (e.g. own photovoltaic systems if available) or renewable energy sources from the local power network. KNX provides solutions to ensure that, at home or in other buildings, electric vehicles are charged exclusively with renewable energy.

The traditional KNX application domains

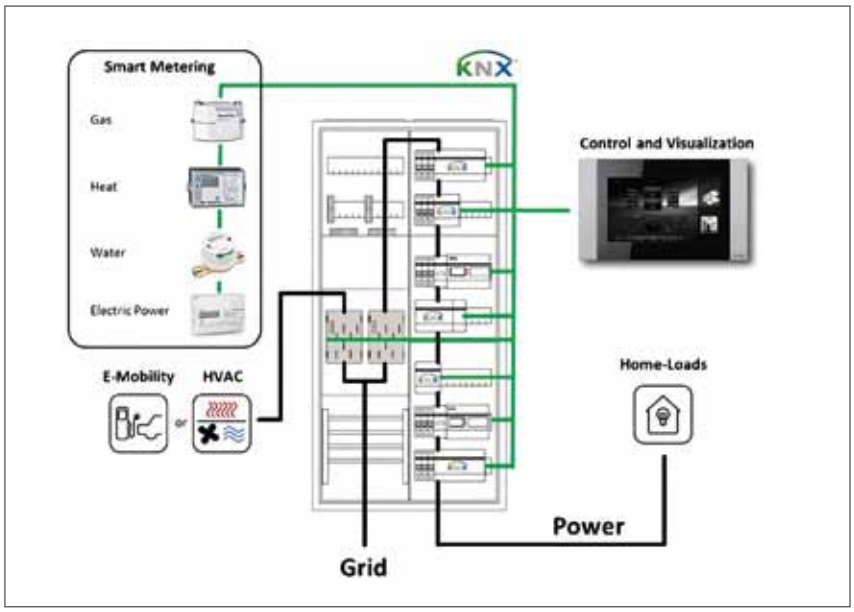
In our growing cities and especially in so-called "mega cities", large quantities of energy must be provided within a small area. In Asia in particular, where many of these mega cities are located, it is not possible to ensure a continuous supply of electrical energy. As a consequence, certain power circuits in buildings are simply switched off. This calls for new infrastructure concepts that provide solutions where necessary, based on the interaction between several buildings and the grid. Load management systems should span several buildings. KNX city includes intelligent building services solutions, such as load management, with which it is possible to vary a building's load/demand while maintaining the same level of comfort, in order to deal with the problems at hand. Infrastructure is becoming an increasingly important topic. It is already clear today that there is no single solution to the challenges presented by the supply of power based on renewable energy, and decentralised energy production in particular. In this scenario, many different systems have to be coordinated to work together to form a comprehensive solution. With KNX city, KNX presents a vision of the future city, a vision of how, in the future, KNX can contribute towards the interaction of the buildings, mobility, energy generation, infrastructure and communication. KNX presents solutions for how these different fields can be linked together with KNX in order to be able to draw the most benefit from their interaction.

KNX city's solutions include methods for making KNX buildings more intelligent and sustainable. You can learn how KNX electricity tariff management is handled and how, thanks to KNX, more renewable energy than fossil fuel-based energy can be consumed in case of time-variable electricity tariffs (depending on the availability of renewable energy). You can also learn how KNX links domestic appliances, HVAC equipment and electromobility into building automation systems, and thus enables unparalleled load management.

KNX Home as part of KNX city demonstrates intelligent living in a metropolis. KNX Home illustrates how smart metering, energy monitoring, electromobility, energy generation and load management / tariff management can be linked up in a residential scenario without a loss of comfort.

KNX and its comprehensive systems approach in sustainable city buildings

The future focus of KNX will lie on buildings, mobility, infrastructure, energy generation and communication, as well as their interaction.



KNX provides sensors and actuators for all application domains. The diagram depicts the typical topology of a KNX installation in a main power distribution board, including the electric meter for measuring consumption, for example, as well as HVAC applications or electromobility.

BUILDINGS

KNX facilitates the operation of intelligent and sustainable buildings

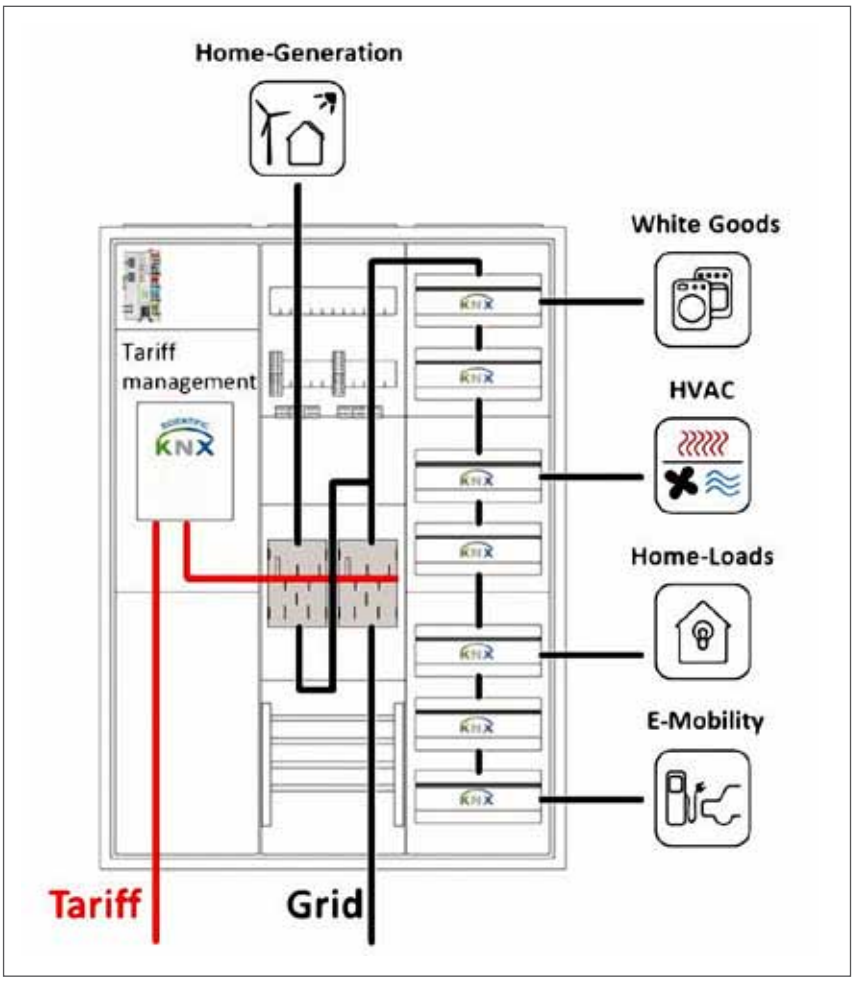
Energy efficient buildings are the basis of a sustainable city. Whether residential buildings or large commercial premises, KNX offers a range of solutions for greater energy efficiency, including options for load management. Any load management system needs sensors and actuators. Sensors will determine such variables as consumption or status, which will then trigger the respective actuators to open/close electrical circuits or such equipment as heat pumps, domestic appliances or other conventional loads, for example. A very beneficial device for this purpose is a KNX energy actuator that allows to measure, but also to switch electric circuits.

KNX touch panels also allow addressing household appliances so that these can be switched on via the device electronic circuitry. This is an important advantage over other systems because a household appliance, of course, cannot be started or stopped just by switching on or off the electricity. KNX provides versatile interfaces for heat pumps so that also these can be intelligently incorporated. A so-called „Home Charger" (charge boxes mounted on the wall) in the mobility sector can be connected via actuators. The charging process can be started or stopped via KNX touch panels, for example. If energy generating equipment such as a photovoltaic system is available, then a charge box connected to KNX can be used to recharge a vehicle with energy exclusively from one's own energy generating plant.

ENERGY GENERATION

KNX makes it possible to use renewable energy at the moment it is being produced

Aside from the traditional applications, renewable energy is playing an increasingly important role. These renewable energy sources fluctuate, producing only then, when, for example, the sun shines or the wind blows. This results in challenges for the power grids. On sunny days, for instance, local peak feed-in rates from photovoltaic systems can lead to voltage problems in the power grid if, simultaneous to the feed-in, a much smaller load is present, meaning when there is not a sufficient demand for energy. Just the opposite happens, when there is a high demand for energy with insufficient or suddenly collapsing renewable energy generation, resulting in an energy deficit, which must be compensated by a quick start-up of conventional power stations. An often debated solution is the storage of electrical energy. Yet, this is virtually impossible in the order of magnitude required. Generation management and load management systems are indispensable for the future. KNX provides load management solutions, which allow to easily adapt common electrical loads as well as electrical loads from HVAC systems, domestic appliances and electric vehicles, to the renewable energy generated in one's own building, or to time-variable electricity tariffs (depending on the renewable energy production in that part of the grid).
However, what is common to all current solutions is that although they can interact with each other within a building, they cannot do so with the outside world. That is about to change.



KNX main power distribution board including a metering and a distribution section. The current production of an energy generation system, as well as the consumption of the building itself, can be transmitted on KNX via the meter. KNX DIN rail modules can regulate loads in the distribution section depending on meter values. Moreover, the loads can be adapted to a tariff that was transmitted by an energy manager.

MOBILITY

KNX enables the integration of e-mobility into an intelligent building

As regards electrical supply to a city, electro-mobility means an increase in the consumption of electricity. Furthermore, the peak e-mobility loads are expected to occur during the evening hours, when people return home from work and their cars are hooked up for recharging during the night-time hours. These peak loads come on top of the private household peak loads already present and consequently present a risk to the safe supply of energy. The supply of energy is at risk because of on the one hand local transformer overloads and on the other hand additional generating capacity is required. The expected overnight idle time for a parked electric vehicle is normally longer than the required charging process. It is therefore in principle possible to shift the charging process from the evening hours to the night or to the early morning hours. This would significantly relief the distribution of the grid load. Switching the charging process off and on can also depend on variable electricity tariffs, in order to shift the charging process to a time when electricity is cheap or to increase the consumption of electricity from one's own photovoltaic system.

KNX offers comprehensive systems solutions for the sustainable city

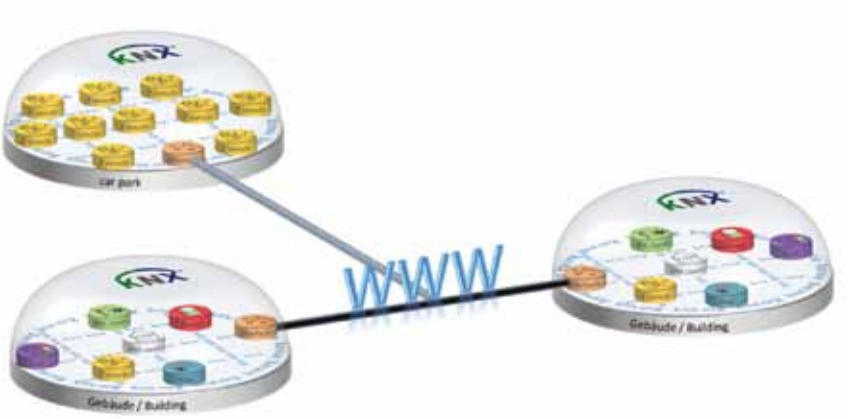
In the sustainable city of tomorrow, all sectors must grow together on a global scale and be connected through information and communication technology. This is referred to as an intelligent power network or "smart grid". Only in this way will it be possible to interlink the city's buildings, mobility, infrastructure and renewable energy generation, and, in doing so, contribute to the buffering of renewable energy or network stability through, for example, a comprehensive load management system.

The challenges faced by the cities or the municipal power grids are manifold. The further development of renewable energy sources will lead to even greater fluctuations in the generation of energy. This means that, in addition to generation deficits, there will be even greater generation peaks in the future that must be dealt with. One can distinguish between global challenges and local challenges. A global challenge is, for example, to buffer renewable energy to counter its fluctuations; at least in part. Local challenges arise in the cities' local power grids. Local challenges can be, for example, voltage instabilities that can occur in the low-voltage grid due to excessive feed-in rates (e.g. renewable energy) or excessive loads (e.g. electric vehicles).

The goal of an intelligent power grid is to come to grips with both the global as well as the local challenges through a systems approach (combination of buildings, mobility, infrastructure, energy generation and communication). A one fits all solution does not exist, but KNX can contribute to finding solutions for every sector.

In the mobility sector, KNX can help facing the local challenges when it comes to voltage stability in the low-voltage grid. KNX thus makes it possible to cope with the problem of high charging power required in the low-voltage grid (e.g. caused by the large number of electric vehicles in the future). High charging power demands can occur, for example, when many residents on the same power grid want to recharge their cars simultaneously, such as when returning home from work at about the same time. In the worst case, this can

KNX is already offering systems solutions for buildings



KNX also provides infrastructure solutions linking up several buildings within a city as if they were one building

KNX enables interfaces to the smart power grid. With methods such as tariff management, KNX can perfectly match the building loads or demand to the renewable power generated in an entire area.

lead to an overload of the grid, especially in countries with a rather unstable infrastructure. By connecting charging boxes with actuators to KNX the charging power demand in one power grid can be smoothened out by "controlled" charging, opposite to charging all at the same time. Charging of vehicles at the buildings in the sustainable city of tomorrow will start at a suitable time dependent on the parking duration and the power grid situation. Thanks to KNX, this is possible without any comfort loss.

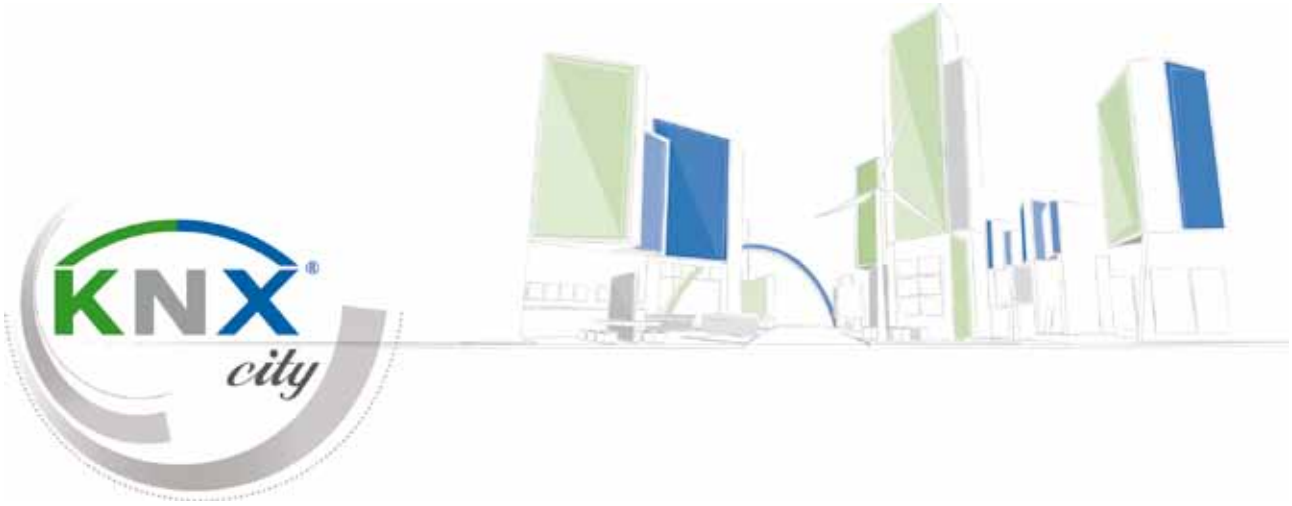
INFRASTRUCTURE

KNX makes it possible to link up several buildings

KNX also provides infrastructure solutions for linking up several buildings within a city as if they were one building. In the sustainable city of tomorrow, this solution will for example be of interest to building operators or building societies with several buildings or properties. If a building operator already has an energy generation (e.g. photovoltaic) system at one property and would like to establish a car park for electric vehicles at a second location, this KNX solution will make it possible to control the charging of vehicles in such a manner that they will be charged only when sufficient energy is being generated by the energy generation system on the before-said property. Of course, the infrastructure solutions are also suitable for all traditional KNX applications.

There will be KNX solutions for the energy generation sector in the future, that are not only able to adapt loads to one's own building and electricity generation, but also to the renewable energy generated in a power grid. The overall concept, as research initiatives agree upon today, should be controlled by time-variable electricity tariffs. When the level of renewable energy generation is high, the tariff levels would be lower than when the level of generation is low. Electricity customers will be motivated towards an indirect load management because of the tariff. At the building level in the future, domestic appliances, air conditioning systems, conventional loads and electric vehicles will be controlled depending on the energy generated and supplied by the grid of the sustainable city. Thanks to KNX, this will be possible without any comfort loss.

As regards communication in the sustainable city of tomorrow, integrated communication will be required, beginning in the power grid, flowing through the city, then into the buildings and households, and back again. KNX already offers today the worldwide standard for home and building control and will take over the communication at the building level in the sustainable city of tomorrow, and will provide all required interfaces to smart power grids to enable comprehensive tariff management, generation or load management, or storage management.

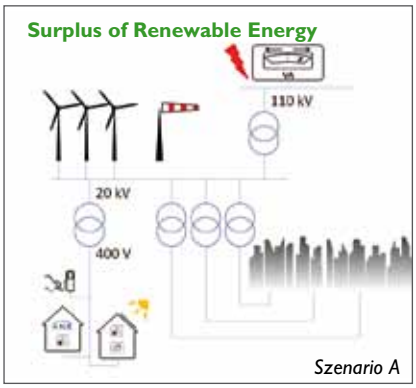


The interaction between KNX and the intelligent power grid (smart grid)

KNX city represents innovative solutions, how future sacrifices in comfort or electricity prices will not have to be feared, despite the use of renewable energy. For this, in addition to the individual KNX building solutions, it is also important to highlight the superordinate power grids or the superordinate city and their energy management. In the KNX City KNX interacts with the intelligent power network (smart grid). The following section presents five scenarios of a nested daily routine in the city of the future. Potential problems in the city are explained and the city's response based on KNX is given.

Scenario A: Excess renewable energy

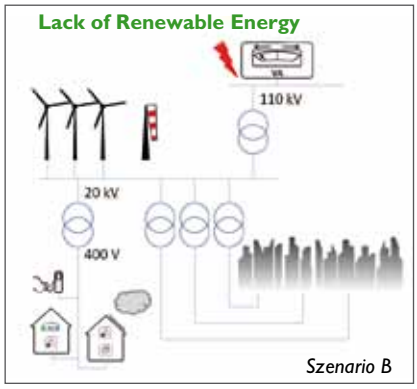
The network load in the city at night reaches its lowest level while at a time ample renewable energy is fed into the grid because of strong winds. This excess power should be used by the city. In order to do this, the excess is signalled to intelligent homes and apartments in the city by means of communication technology. They can then switch on loads connected by KNX such as domestic appliances and electric vehicles. In this way, the energy supply is balanced out by means of KNX.



Szenario A

Scenario B: Insufficient renewable energy

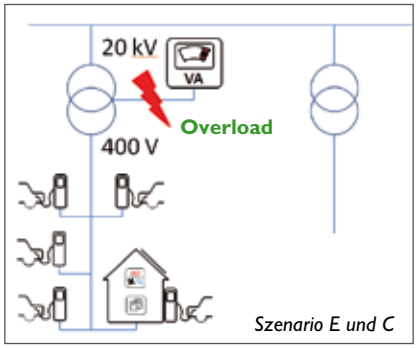
This problem can be seen as complementary to Scenario A. By way of example, KNX city demonstrates the diminishing feed-in from the wind-powered generators during the morning hours (stagnation). The city must respond by shedding some load, which is possible by means of KNX. The charging stations for electric vehicles are deactivated, domestic appliances are switched off and air conditioning units or heat pumps are set into Eco-mode. In this way, the energy supply is thus balanced out by means of KNX, without grid outage.



Szenario B

Scenario C: Peak load over the entire city

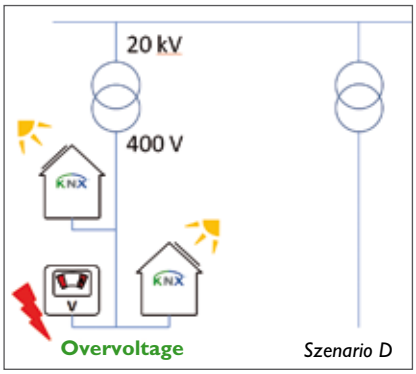
Grid load is highest, particularly during the evening hours when city residents return home. Peak loads are experienced in the household sector due to cooking, light usage in the evening hours, consumer electronics, domestic appliances and electric vehicles. This situation is further aggravated by the service industries and local public transport, so that bottlenecks can occur even during periods of normal or high feed-in from renewable energy sources. By means of KNX, connected loads can be reduced as already shown in Scenario B. An additional option would be, to feed energy stored in vehicle batteries in electric cars back into the grid in order to make additional energy available. KNX not only helps to relieve the city's grid in this way, but provides support for it, as well.



Szenario E und C

Scenario D: Local voltage rise

Photovoltaic systems installed on rooftops and facades in the city feed the energy generated into the low-voltage network. At times, particularly around noon, this can lead to a situation in a network segment where virtually no energy is taken from the higher voltage levels. In extreme cases, the low-voltage network even feeds energy back into the medium-voltage level. As a rule, the low-voltage network is not configured for this type of energy flow, which can result in unacceptable voltage increases. An intelligent energy supply with Smart Homes and Smart Apartments can work to counteract this problem by increasing the load on a local basis. For this to take place, the loads connected to KNX must be switched on or increased. Domestic appliances and electric vehicles can be switched on and air conditioning systems or heat pumps can be set to a comfort mode. KNX then helps to prevent a downward regulating of the photovoltaic feed-in.



Szenario D

Scenario E: Local transformer overloading

As already discussed in Scenario C, the highest network loading takes place during the evening hours. Before a situation similar to Scenario C arises, however, partial network overloading can already occur before that. This is typically transformer overloading, which might result when numerous electric vehicles are being charged at the same time. The vehicle charging process can be interrupted by means of KNX, alleviating the overload and preventing a local power outage.

KNX city – the solutions

ELECTROMOBILITY

Task

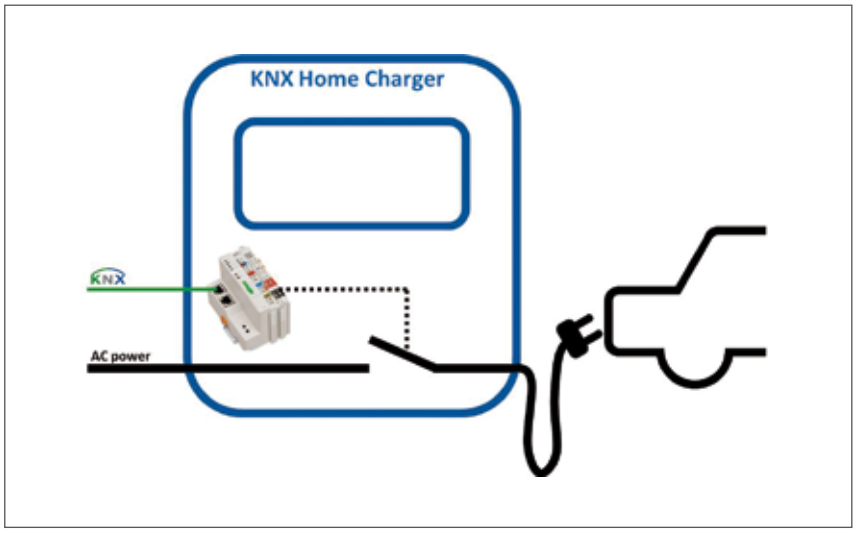
The limited availability of, and, at the same time, the increasing demand for oil on the world markets have resulted in continuously rising oil prices over the past years. For this reason, hopes in the sector of individual mobility have been placed in electromobility to ensure independence from oil. For the supply of electrical energy to the city, however, electromobility means an increase in the consumption of electricity. Furthermore, the peak e-mobility loads are expected to be during the evening hours, when people return home from work and their cars are hooked up for recharging during the night-time hours. These peak loads overlap with the then private household peak loads and consequently present a risk to the safe supply of energy. On the one hand it can lead to local transformer overloads , and on the other hand additional generating capacity is required.

Solution

While the expected overnight time for a parked electric vehicle is about 10 hours, the required charge time of three to five hours is significantly less. The charging process can in principle be shifted to the night-time or to the early morning hours, and would considerably relieve the grid situation. Switching the charging process off and on can also depend on the variable electricity tariff, to shift the charging process to a time when electricity is the cheapest.

Realisation

Charging stations use a plug especially adapted to the needs of the charging process. The plugs allow latching the charging station and the vehicle to protect against disconnection and they also check whether earthing of the vehicle is guaranteed during the charging process. Hence, closure of the charging contactor is permitted only after a successful test of the safety items mentioned. Charging stations can also be extended to include KNX Communication, on the one hand to report the presence of a vehicle (latched plug) to the building controller and, on the other hand, to enable remote starting of the charging process (closure of the charging contactor).



Function

By KNX integration of the charging station, the building controller gets control over one of the most powerful and energy-intensive loads in the household. In the event of an energy shortage, the charging contactor can be opened and the load reduced, or, if supported by the charging station or the vehicle, energy can also be fed back into the power grid. This also facilitates the adaptation of the charging process to a variable electricity tariff. If desired, the user can also initiate the immediate charging of a vehicle via a KNX panel if, for instance, the car would be needed again soon.

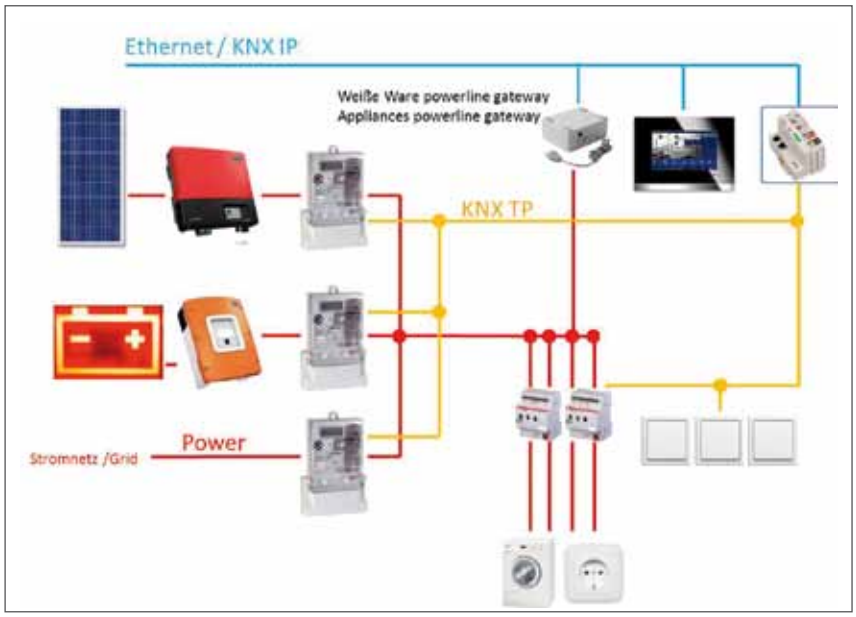
Advantages

Even a small number of electric vehicles on the grid needing to be charged are enough to provoke local transformer overloading. With the aid of the charging station connected to the Smart Home or Smart Apartment, receiving information on a pending overload situation from the Smart Grid, overload can be countered through a timely interruption of the charging process. Excess energy on the grid can also be used by then restarting the charging process.

LOAD MANAGEMENT

Task

Traditional energy supply adapts energy generation to energy demand. For this purpose, base-load, medium-load and peak-load power stations always supply the required amount of generated energy, subject to the grid frequency. The energy generation of renewable energy sources have the disadvantage that it fluctuates. Consequently, they cannot generate energy arbitrarily in the event a demand for generation arises. Thus, the traditional regulating principle does not function in the same manner for renewable energy. This can have an impact on the security of supply, in particular when furthering development of renewable energy sources and the simultaneous shutdown of conventional fossil power plants.
The solution that is currently under discussion is the smart grid. By using information and communication technology, this grid would make it possible for loads to be adapted to fluctuations in production.
The task is to realize a KNX load management, which can adapt building loads to one's own power generation rates or to a time-variable electricity tariff.



KNX Load Management: An algorithm based on KNX PLC guarantees the optimal switching of loads and white goods in relation to the present solar power system. And thanks to simultaneous energy sub metering of the KNX actuator loads, a power buffer can also be established if required.

Solution

For load adaptation, sensors are necessary, which measure the consumption of electricity on the one hand, as well as the potential generation from a photovoltaic system on the other. This can be ensured using KNX DIN rail meters or intelligent household meters connected to KNX. In addition to the sensors, KNX actuators are needed to switch on/off loads or domestic appliances. KNX switching actuators can be used for normal loads. For specific loads such as domestic appliances or HVAC systems, special KNX interfaces are used that can switch the units on via the device electronic circuitry. Last but not least, a control unit is required with an appropriate "program" for load adaptation. If a time-variable tariff is transmitted to KNX, the control unit can then also adapt loads to it. KNX logic modules, KNX panels with logic functions, or a PLC coupled to KNX can be used as control unit.

Realisation

Sensors:
Intelligent power meters are used for superordinate measurements. KNX DIN rail meters are used for subordinate measurement of the individual consumption.

Actuators:
Conventional loads are connected via switching actuators. ABB energy actuators provide a solution for this, as these can also both measure as well as switch, thereby uniting the sensor and the actuator functions in one device. Household appliances are connected via Powerline and the KNX Busch Comfort Panel. Air conditioning units are connected via the respective KNX interfaces.

Control unit:
A Wago PLC or a Busch Comfort Panel can be used as a control unit.

Function

- Load adaptation to one's own photovoltaic power generation
- Load adaptation to the electricity tariff

Advantages

- Thanks to KNX, household appliances can be connected via their Powerline interface. This is a far more elegant solution than simply activating the power connection.
- Cost savings through optimal exploitation of the tariff
- A high degree of automation

DISTRIBUTED PROPERTIES

Task

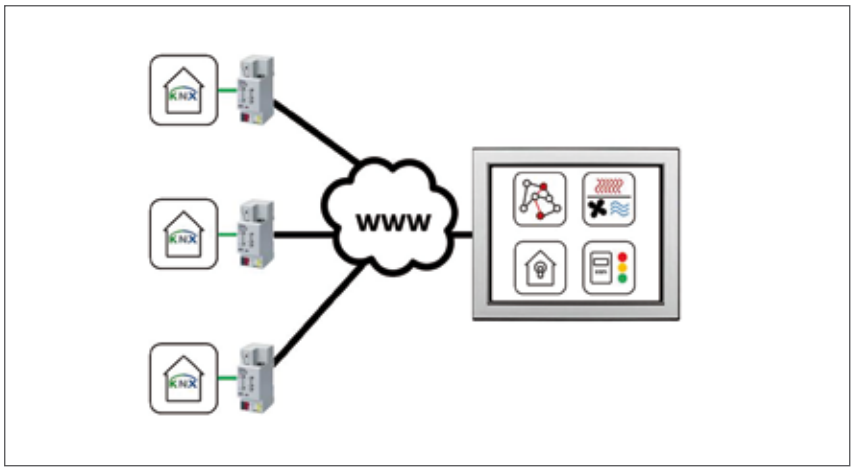
KNX already offers solutions today for distributed properties, where the buildings are linked up via communications technology and Internet as if they were one building. This is of particular importance for the administration of multiple buildings by building societies or for companies, whose multiple buildings are distributed throughout the city.

Solution/Realisation

KKNX-IP router couple the KNX-TP line from a building to IP. If an KNX-IP router is integrated into a network that has access to the Internet, then a secured tunnelling connection can be established by means of a VPN via the Internet to other buildings with KNX-IP routers.

Function

The transmission of measured values for balancing and billing purposes is simplified by linking multiple buildings to a common KNX installation. Additionally, a central visualisation of functions is possible at one or more locations.



Central visualisation for distributed properties

Advantages

Data for the accounting of consumption and feed-in values can be centrally collected. In a similar manner, property-spanning energy management can be implemented, which can be used, for example, to adjust the performance of the heating or air conditioning systems in the offices over the weekend. Systems and properties can be visualised, controlled and monitored from a remote location via the existing network or the Internet (VPN connection).

HVAC-SYSTEMS

Task

In order to maintain a balanced energy supply during periods of peak load in the cities, loads are needed that can be temporarily reduced or switched off. Because a large portion of the required energy in cities can be attributed to the provision of air conditioning in buildings, a small change in the temperature setpoint can have a great effect on the overall supply.

Solution

The temperature set points for heat pumps and air conditioning systems are usually set by the user. A room temperature regulator compares the actual temperature measured with the target temperature and regulates the heat pump or air conditioning system accordingly. By connecting the heat pump or air conditioning system to the KNX bus, it is now possible to automatically intervene into the setpoint specification process.

Realisation

The user can store various temperature setpoints in advance in a KNX panel. For example, values can be set and stored for a comfort temperature, a standard temperature and an eco-temperature. The preferred value can in the end be transmitted to the heat pump or air conditioning system by means of a gateway (e.g. Theben, Zennio).

Function

Intervention into the room air conditioning system can be undertaken according to the utilisation capacity of the grid. For instance, the air conditioning system could be set to the "Eco" operating mode during times of high demand. In so doing, the energy required by the heat pump or air conditioning system is reduced immediately. On the contrary, in the event of weak network loading or an excess supply of regenerative electricity, the "Comfort" operating mode can be set. The network load is thus increased in favour of a higher level of living or working comfort.

Advantages

Integration of the heat pump or air conditioning system into the KNX bus is beneficial because the building gets a variable load, with which it can respond to external signals such as network load and the price of electricity. These responses will be crucial in the future to ensure a stable energy supply, in view of the increasing proportion of renewable energy along with the increase in electric loads (e-mobility).

TARIFF MANAGEMENT

Task

Smart power meters will in future replace the conventional power meters of the energy providers. This is the prerequisite to be able to charge according time-variable electricity tariffs (which may have multiple levels in a grid section depending on renewable energy generation). This then allows to count every second the actual consumption or generation (e.g. from one's own photovoltaic system) in kilowatt hours. At the same time, these meters have a customer interface.
This tariff must be conveyed to KNX in order to enable KNX load management.

Solution

KNX offers various solutions for integrating these meters:

Energy data gateway (MUC)
Meters are read-out via a Multi Utility Communication Gateway, which transmits the meter values per IP to the KNX bus or transmits it directly via KNX RF to a display for visualization.

KNX RF interface
A KNX RF interface transmits the values directly to the KNX bus. The KNX RF signal can be converted to KNX TP via a media coupler.

Direct KNX meter
The intelligent meter provides a direct KNX TP interface

Realisation

The following section presents two examples of possible solutions:

Energy data gateway (MUC)
The smart power meter is connected via an energy data gateway (MUC) per KNX IP to the Busch Comfort Panel. This provides the meter values to the KNX bus. The values can then be visualised on any KNX panel. Moreover, values can be depicted on mobile devices. Furthermore, the meter values can be used for load adaptation through KNX actuators.

KNX RF
A Hager KNX RF interface is directly attached to the smart meter, which transmits the meter values per radio to the KNX bus. These can be visualised by means of a Hager domovea unit such as the Domovea panel or any other KNX panel. Furthermore, the meter values can be used for load adaptation through KNX actuators.

Intelligent household meter for photovoltaic and related systems, including KNX submetering.

Function

- Transmission of the current generated (PV) power as well as the current load to KNX
- Transmission of the energy generation and consumption to KNX
- Transmission of the tariff
- Visualisation

Advantages

- Meter value transmission is possible both wired as well as wireless
- No extra measurement sensors are required as with conventional power meters
- Automatic KNX load adaptation is made possible
- This is beneficial for the power grids as voltage instabilities due to a large degree of photovoltaic feed-in cannot occur and generation can be collected in a tariff-controlled way thanks to the KNX load adaptation.