

Building innovation for new energy systems

Markus Bauer

Austrian Ministry of Transport, Innovation and Technology

World
Sustainable
Energy
Days
2017

Buildings and their role in future energy systems

- Buildings are expected to play a major role in future energy systems
 - Energy demand flexibility
 - Self-generation of energy (electricity, DHW)
 - Energy storage capabilities
- From passive consumers to active players (shift in role)
- Urban environment is getting more and more inter-connected
- Integrated perspective on buildings and energy infrastructures is needed
 - Energy technology research will continue to support the transformation and integration of the energy and building sector
 - Innovation and policy strategies are needed most urgently

SMART FARMING SMART ENERGY SYSTEM

vertical farming
facade greening
urban farming

smart
grids

smart
storage

Climate and Energy Goals of
the European Council

for **2030** ... compared to 1990

- reduce greenhouse gas emission to **40%**
- reduce energy consumption to **27%**
- increase renewable energy share to **27%**

Technologies for Smart Cities

**SMART
MANUFACTURING**
zero emission
production
+ Industry 4.0

SMART BUILDING

refurbishment
to plus-energy
standard;
thermal energy
storage

temper-
ature

electric
appliances

PV-facade

controlled
from remote

SMART SERVICES

open data &
e-government

crowd funding &
new business models

SMART GOVERNANCE

community building
& new forms of
information sharing

SMART MOBILITY

e-car sharing

bike sharing

everything
within easy reach

public transport

smart logistics

SMART ENERGY

solar energy

wind energy

hydro power

biogas

geothermal energy

SMART SENSORS

reduce energy
consumption

temperature
& weather

SMART WASTE

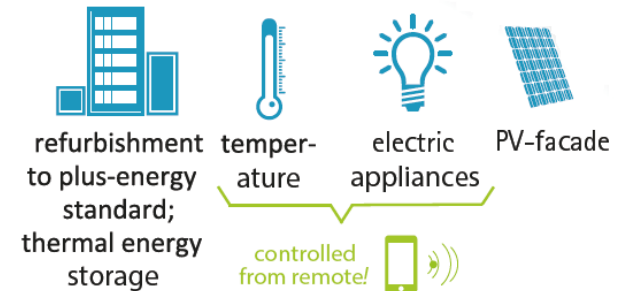
sustainable
separation
& disposal

urban
mining
& re-use

TU Vienna Plus Energy Office Building Austria's biggest plus energy office

- Core ventilation for automatized night ventilation and lower cooling demand
- Highly energy efficient building services
- 24 V grid for higher energy efficiency and centralization of power adapters
- 328,4 kWp photovoltaic system on the roof and in the façade (largest building integrated photovoltaic system in Austria)
- 9,300 components were optimised
- Demonstration project

SMART BUILDING

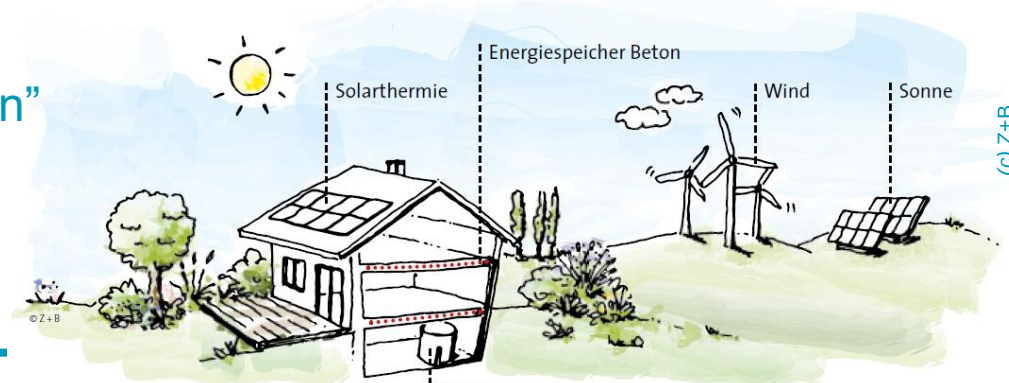
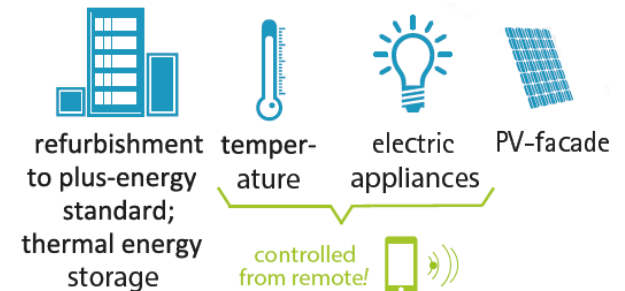


(c) TU Wien | Alexander David

Using buildings as energy storage – Detached house H and detached house F

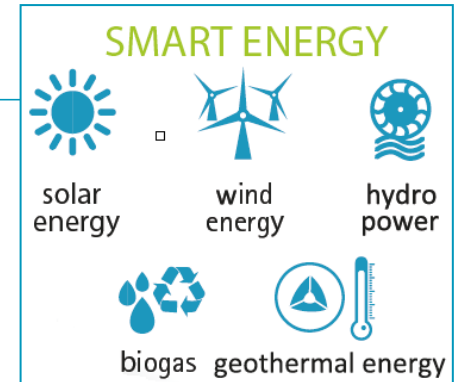
- Monitoring and comparison of performance of thermally activated building components
- Examination of the practicability of using excess energy from wind power production
- Assessment of the user friendliness of the control system and user comfort
- Publication: Planning guide
“Thermal component activation”
- Monitoring project

SMART BUILDING



P2H-Pot – Potentials, economic feasibility and system solutions for Power-to-Heat

- Identification of economically feasible potentials for Power-to-Heat (P2H) in urban regions
- Simulation of model-based scenarios up to 2050 of the Austrian and German electricity and heat market
- Three case studies of Austrian district heating grids
- Cooperative R&D project: technical university, utility, heat pump manufacturer, Danish project partner



(c) ecop Technologies GmbH



vertical farming
facade greening
urban farming

GreenPlusSchool – Highly efficient facade and roof greening in combination with PV; optimal solution for energy efficiency in overall environmental consideration

- School in the metropolitan area of Vienna
- Testing of several greening systems, substrates and plants in combination with photovoltaic
- Investigation of hygrothermal behaviour of the building, energy efficiency potential, indoor air quality and urban heat island effect (UHI)
- Cooperative R&D project including architects, landscaping architects and bioengineers

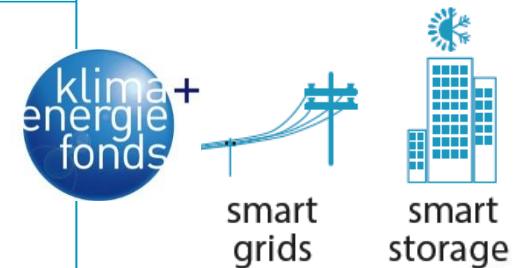


(c) TU Wien, Institut für Hochbau und Technologie

ROSA ZUKUNFT – Buildings as interactive participants in a Smart Grid

- Demonstration facility “Rosa Zukunft” provides flexibility by means of a combination of heat and electricity suppliers, storage and consumers
- All systems (CHP, storage facility, PV, heat pump) are coordinated via automatic control system
- 34 flats were equipped with indoor air sensors, room-temperature controllers etc. for monitoring purposes
- Project is part of Smart Grids Model Region Salzburg, including a large repertoire of emission-reducing initiatives and projects for climate protection

SMART ENERGY SYSTEM



(c) Salzburg AG

SURO – The urban underground as mine? Potential of secondary resources in subsurface infrastructure systems

- Overview of data requirements for mapping resources and actual data regarding supply and disposal networks in Austrian cities
- Resource cadastre of material inventories and stocks in subsurface infrastructure networks
- Requirements in order to increase the resource efficiency of supply and disposal networks
- Feasibility study

SMART WASTE



sustainable
separation
& disposal



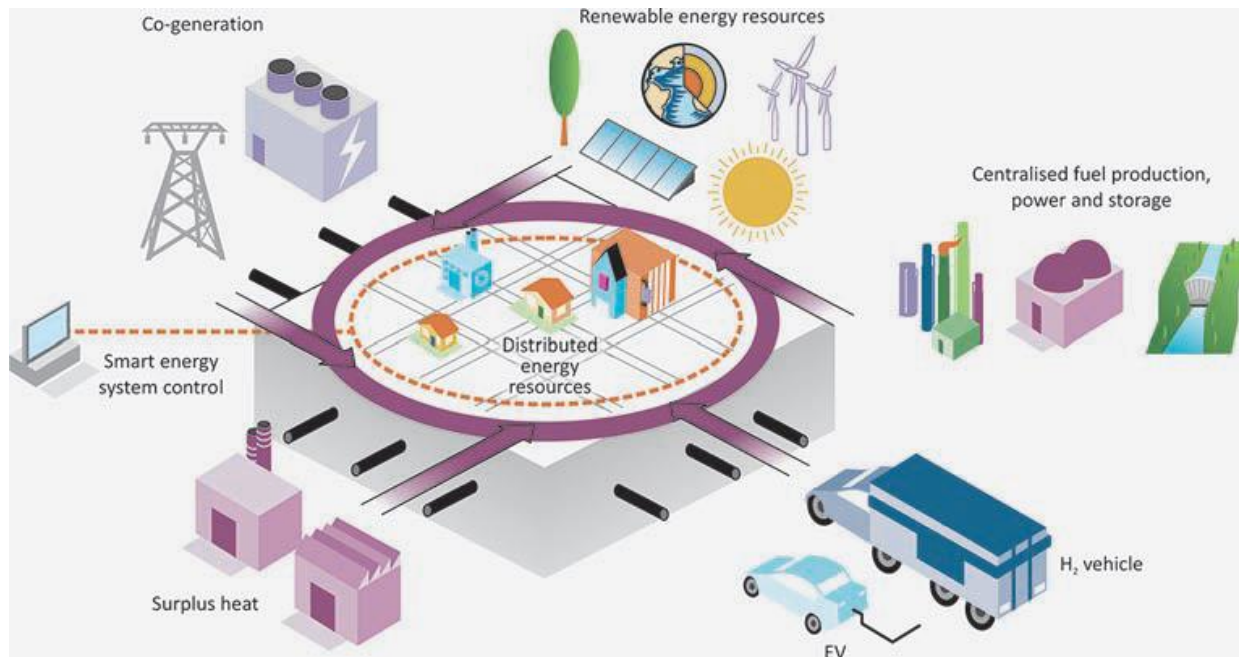
urban
mining
& re-use



(c) Tatwort/Fredmanky (2014)

Future role of the building sector

- Building sector has an important role to play in the decarbonisation of the energy system (in an integrated and intelligent energy network)



Transition to Sustainable Buildings (IEA 2013)

Building innovations for new energy systems

- Innovative renovation concepts
- Technology development for building optimisation and modernisation
- Energy spatial planning on district/ city level
- Energy-flexible buildings (on-site production, decentralised storage)
- Innovative light and ventilation systems
- Sustainable building & insulation material
- Energy efficient building services and monitoring



More Information

www.nachhaltigwirtschaften.at/en/sdz/

www.energy-innovation-austria.at/issue/eia-2016-04-en/?lang=en

Contact

E-Mail: Theodor.Zillner@bmvit.gv.at