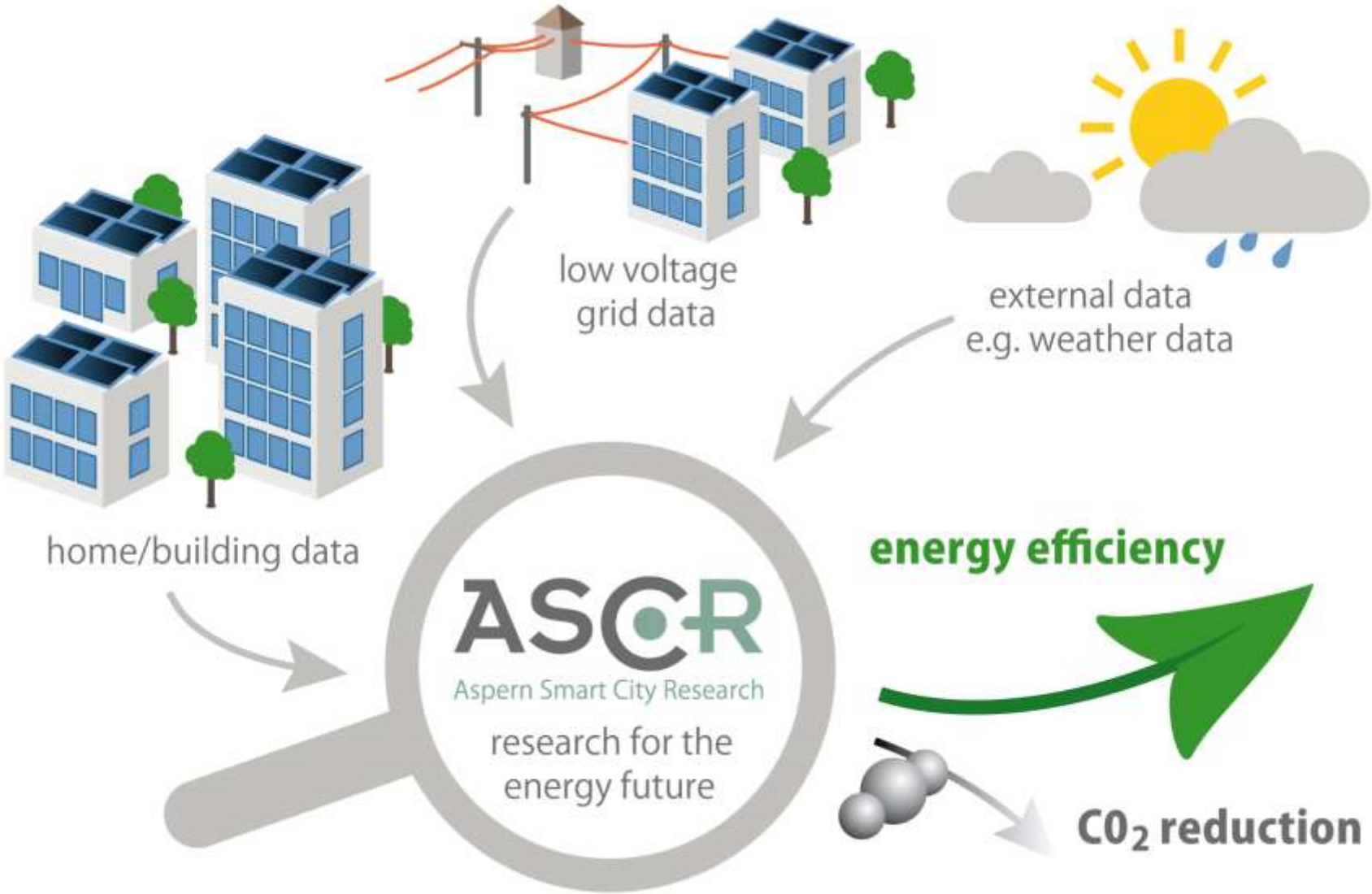
INTERACTION BETWEEN SMART BUILDINGS AND GRIDS IN THE ASPERN SMART CITY RESEARCH IN VIENNA

Andreas Schuster, Siemens AG Österreich / Aspern Smart City Research


low voltage
grid data
external data
e.g. weather data
home/building data
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research for the
energy future
energy efficiency
CO_2 reduction

Future energy infrastructure of Smart Cities

… require smart energy distribution and usage concepts

Security of supply
Energy must always be reliable and affordable

Renewable Energy
System integration and intelligent control of renewable to reduce CO_2 and increase energy efficiency

Low voltage grid control
In the future, millions of small power producers feed electricity into the grid. The low voltage grid provides stability in the network and balances production and consumption.

Consumption Control
Demand Side Management; Power consumption in real-time to adapt to price fluctuations

Energy storage
Since wind and solar energy supply irregular, power storage and management are necessary

Efficient use of Energy
Intelligent control of distribution networks and buildings will lead to energy savings

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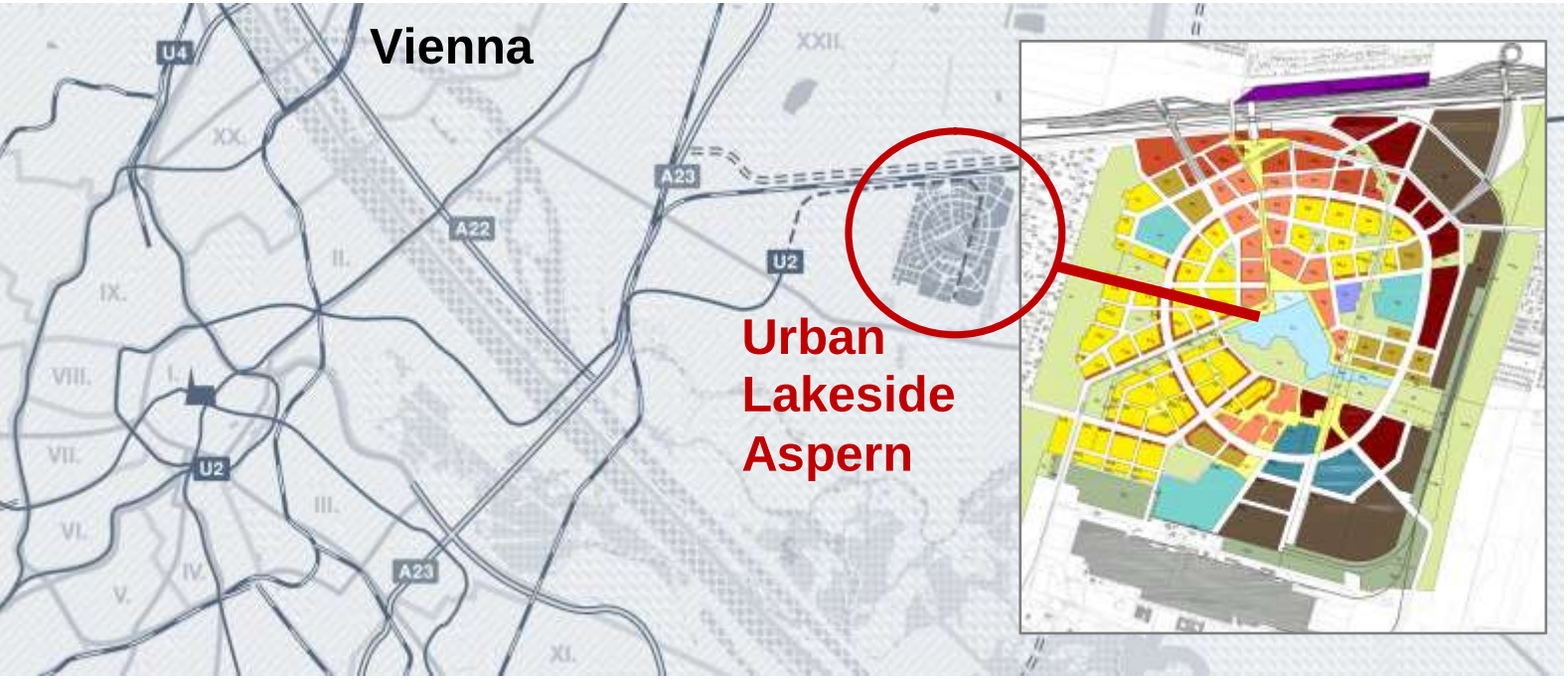
aspern – Vienna's Urban Lakeside

Facts

- 2,4 million m² area
- 2,2 million m² gross floor space
- 20.000 workplaces
- 20.000 residents
- 10.500 high class apartments

- Offices, production and service business, science, research and education
- More than 20.000 m² area for shops, pubs and small business in the whole Urban Lakeside



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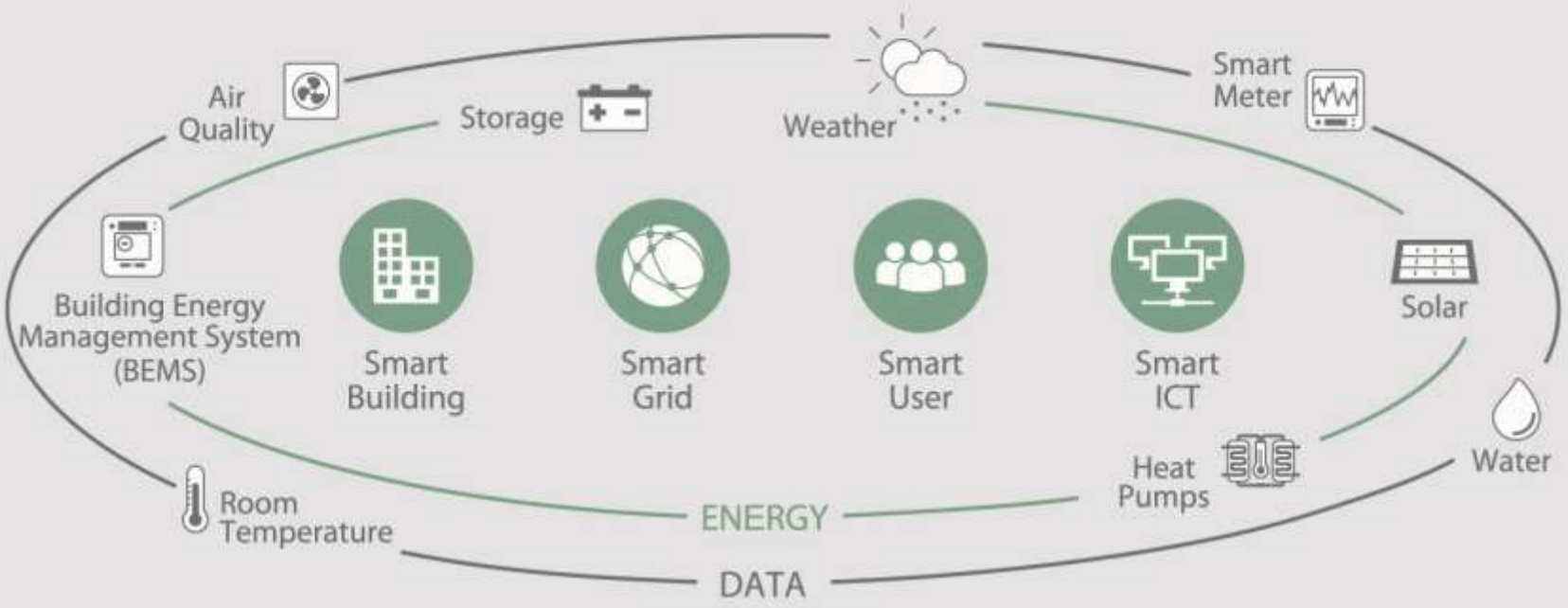
OVERVIEW OF THE

ASCR RESEARCH FIELDS



OPTIMAL HARMONISATION OF:

GENERATION ✓ DISTRIBUTION ✓ STORAGE ✓ CONSUMPTION ✓

ENERGY EFFICIENCY

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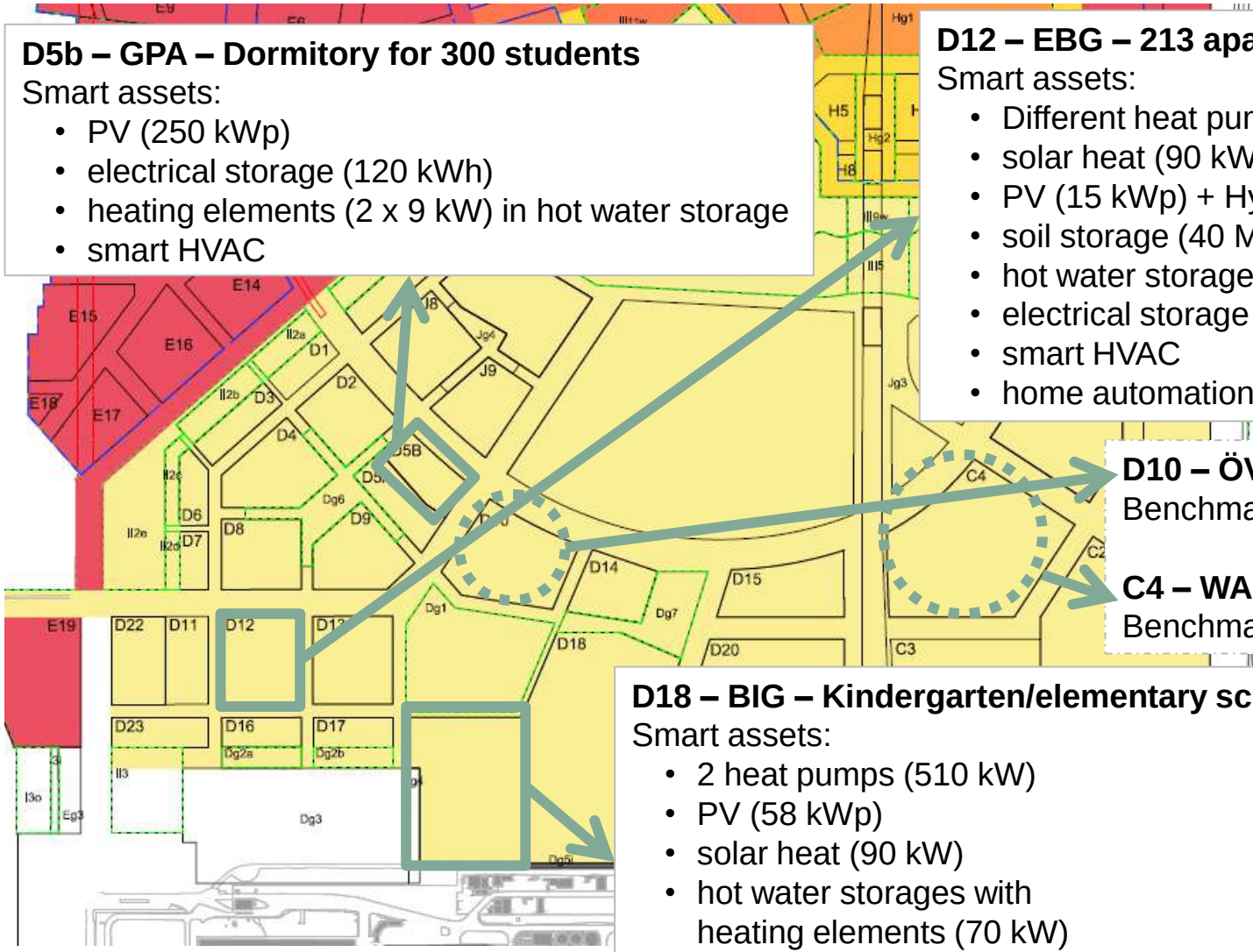
ASCR Testbed Smart Building

Map of the testbed and description of the infrastructure components



D5b – GPA – Dormitory for 300 students
Smart assets:
- PV (250 kWp)
- electrical storage (120 kWh)
- heating elements (2 x 9 kW) in hot water storage
- smart HVAC

D12 – EBG – 213 apartments
Smart assets:
- Different heat pump systems (800 kW)
- solar heat (90 kW) + Hybrid (60 kWp_{th})
- PV (15 kWp) + Hybrid (20 kWp_{el})
- soil storage (40 MWh)
- hot water storages
- electrical storage (20 kWh)
- smart HVAC
- home automation

D10 – ÖVW/EGW – mixed use
Benchmark object

C4 – WAB – offices
Benchmark object

D18 – BIG – Kindergarten/elementary school
Smart assets:
- 2 heat pumps (510 kW)
- PV (58 kWp)
- solar heat (90 kW)
- hot water storages with heating elements (70 kW)
- smart HVAC

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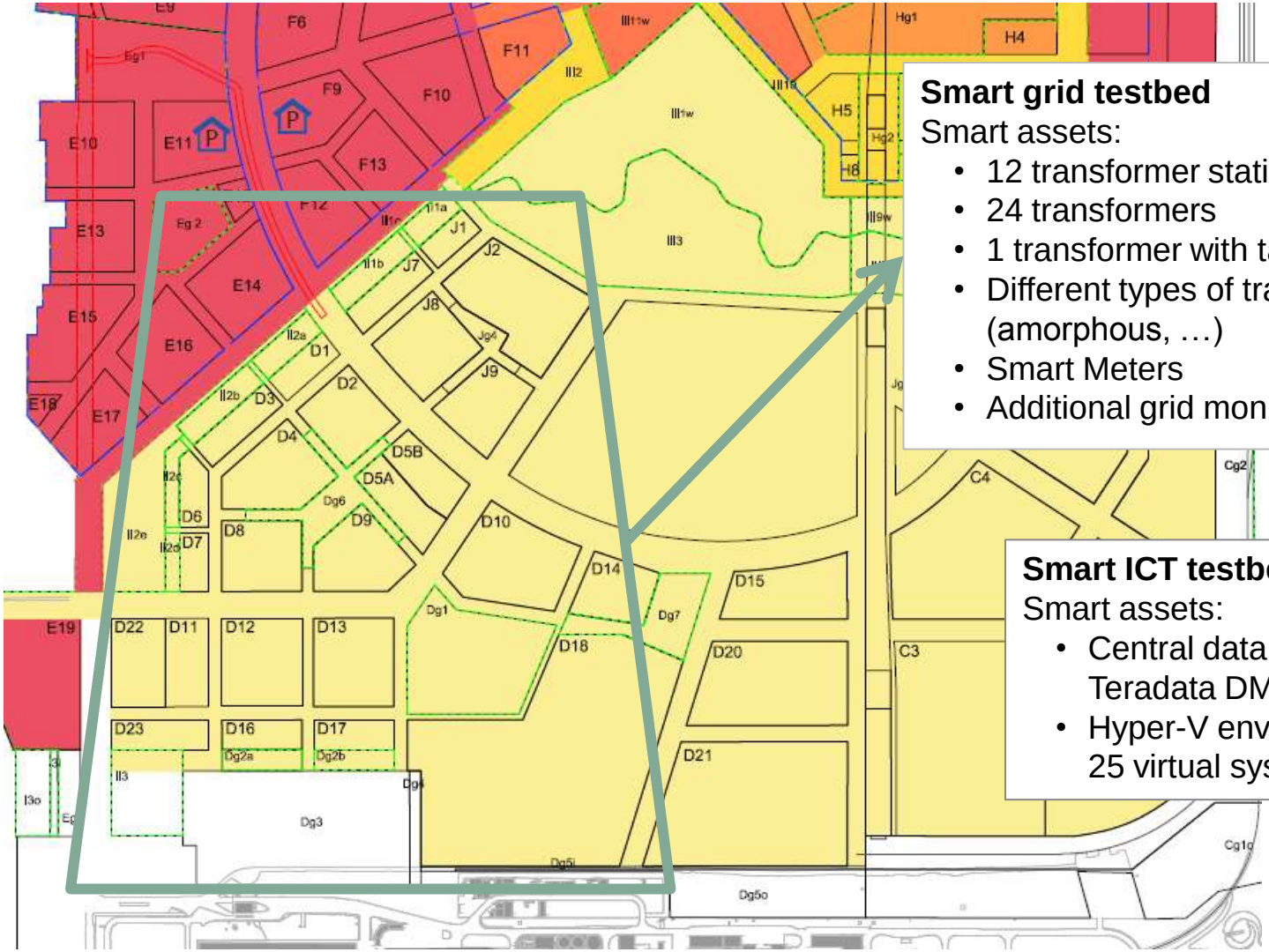
ASCR Testbed Smart Grid

Map of the testbed and description of the infrastructure components



Smart grid testbed
Smart assets:

- 12 transformer stations
- 24 transformers
- 1 transformer with tap changer
- Different types of transformers (amorphous, …)
- Smart Meters
- Additional grid monitoring devices

Smart ICT testbed
Smart assets:

- Central data warehouse: Teradata DM670C
- Hyper-V environment with 25 virtual systems

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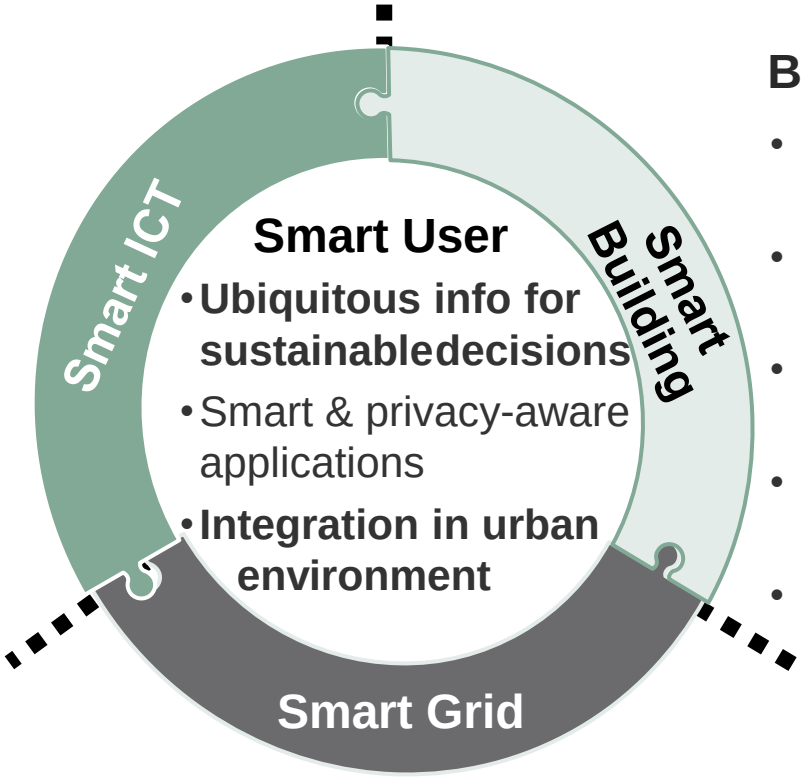
ASCR Program

The fundament of future Smart Cities

Information and communication technology

- **Cross-domain data driven applications**
- Modern data integration solutions
- **Big data analytics**
- Multitenant data aggregation and provisioning



Building

- Decentralized renewable generation of power & heat
- Innovative energy storage technologies
- **Intelligent optimization of self consumption**
- **Participation in energy markets**
- Context / situation specific home automation

Urban Grids

- Effective solutions for grid monitoring and alarm handling
- **Adaptive LV grid management**
- **Operative and strategic grid planning**

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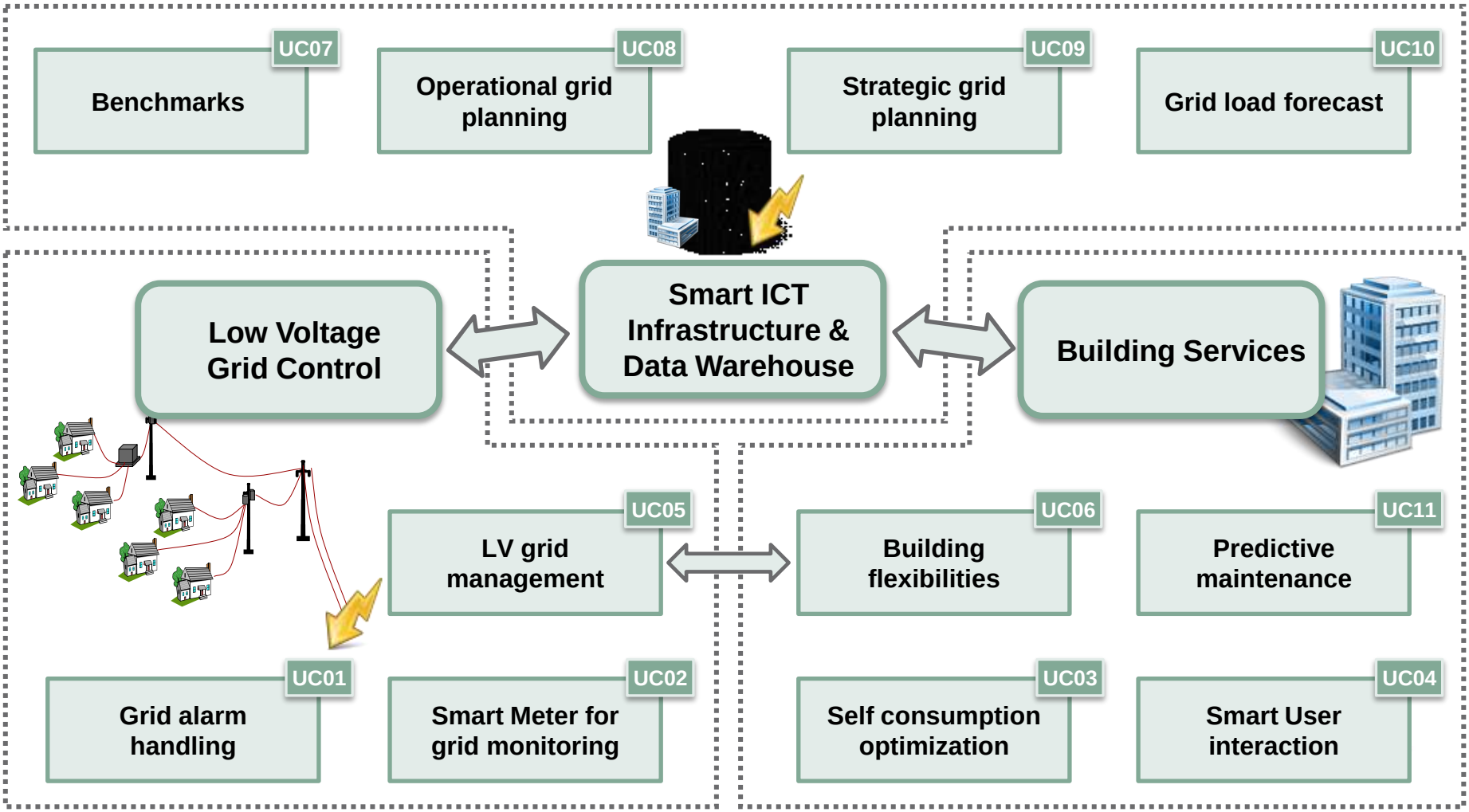
ASCR Programm – Use Cases

Use Cases to cover all research topics like optimization in grid, building and ICT



RESEARCH FIELD

SMART BUILDING

Smart Building | Smart Grid | Smart User | Smart ICT

DATA COLLECTION

- SMART METER
- ROOM TEMPERATURE
- WARM/ COLD WATER
- ROOM AIR QUALITY

ENERGY

PRODUCER	STORAGE	CONTROLS
Solar panels	Electrical and thermal	Building Energy Management System (BEMS)
Heat pumps		

FLEXIBILITIES

Building-related energy flexibilities are made available for the low-voltage network operator or offered on the electricity market by the energy pool manager

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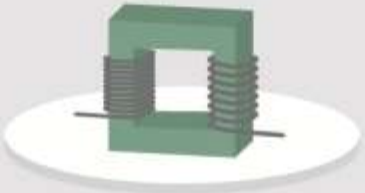
RESEARCH FIELD

SMART GRID

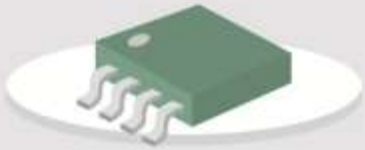
Smart Building | **Smart Grid** | Smart User | Smart ICT

12 SECONDARY SUBSTATIONS

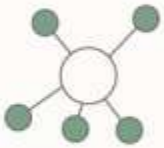
24 TRANS-FORMERS



NUMEROUS SENSORS



DISTRIBUTION NETWORK



- PASSIVE
- UNIDIRECTIONAL
- CENTRALISED

MIGRATION PATH

- NETWORK MONITORING
- MEDIUM-VOLTAGE GRID CONTROL & AUTOMATION
- LOW-VOLTAGE GRID CONTROL & AUTOMATION

SMART GRID

- ACTIVE
- BIDIRECTIONAL
- DECENTRALISED

DATA COLLECTION

SMART METER | FIELD SENSORS

INFRASTRUCTURE

- OPTIMISED COPPER USE
- SMART COMPONENTS
- VOLTAGE AND LOAD CONTROL

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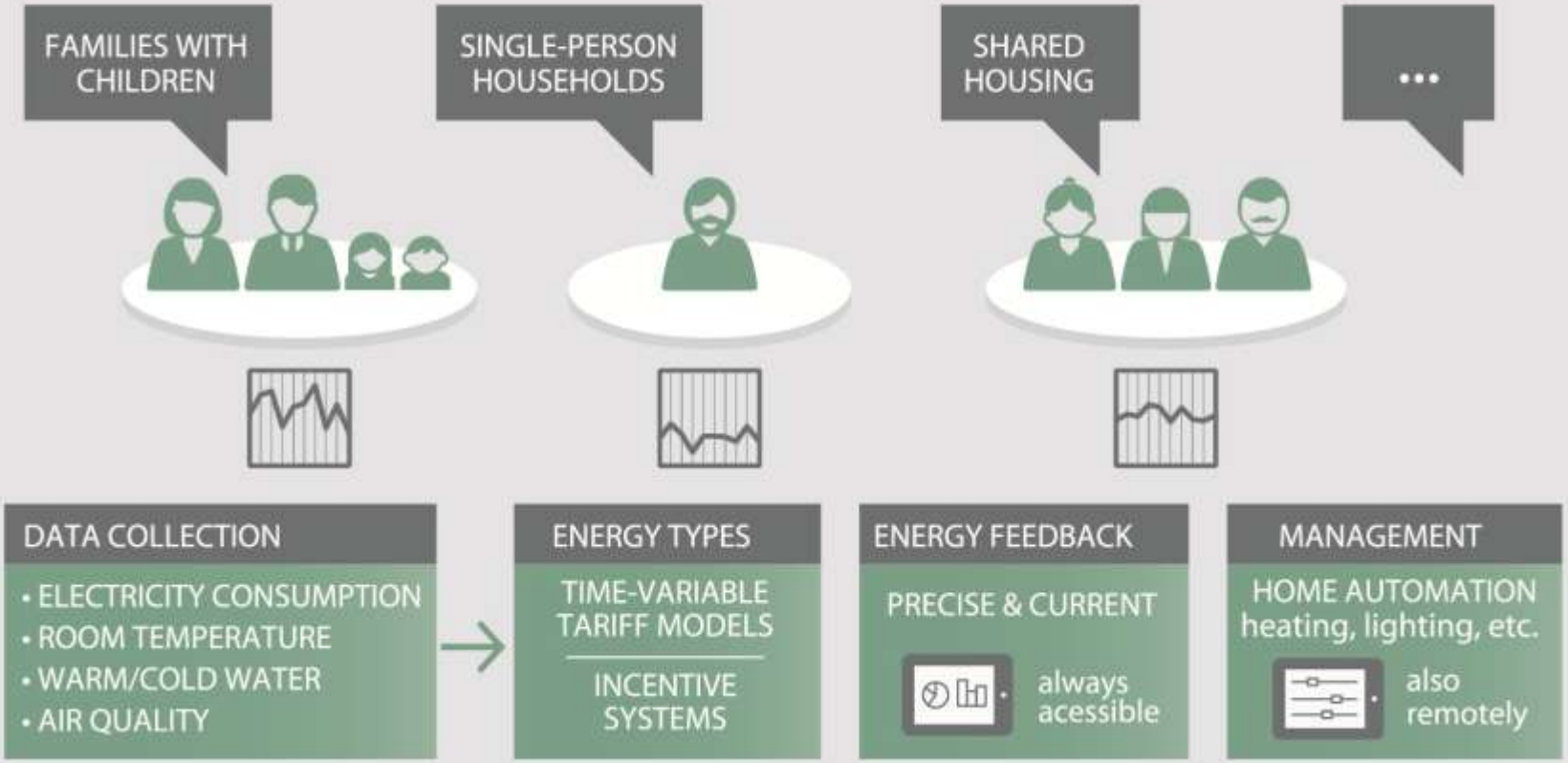
RESEARCH FIELD

SMART USER

Smart Building | Smart Grid | **Smart User** | Smart ICT



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RESEARCH FIELD

SMART ICT

Smart Building | Smart Grid | Smart User | **Smart ICT**

DATA COLLECTION

NETWORK | BUILDINGS | EXTERNAL FACTORS e.g. weather, events

EVALUATIONS

- REPORTING
- VISUALISATION OF INTERACTIONS
- RECOMMENDATIONS & OPTIMISATION MEASURES

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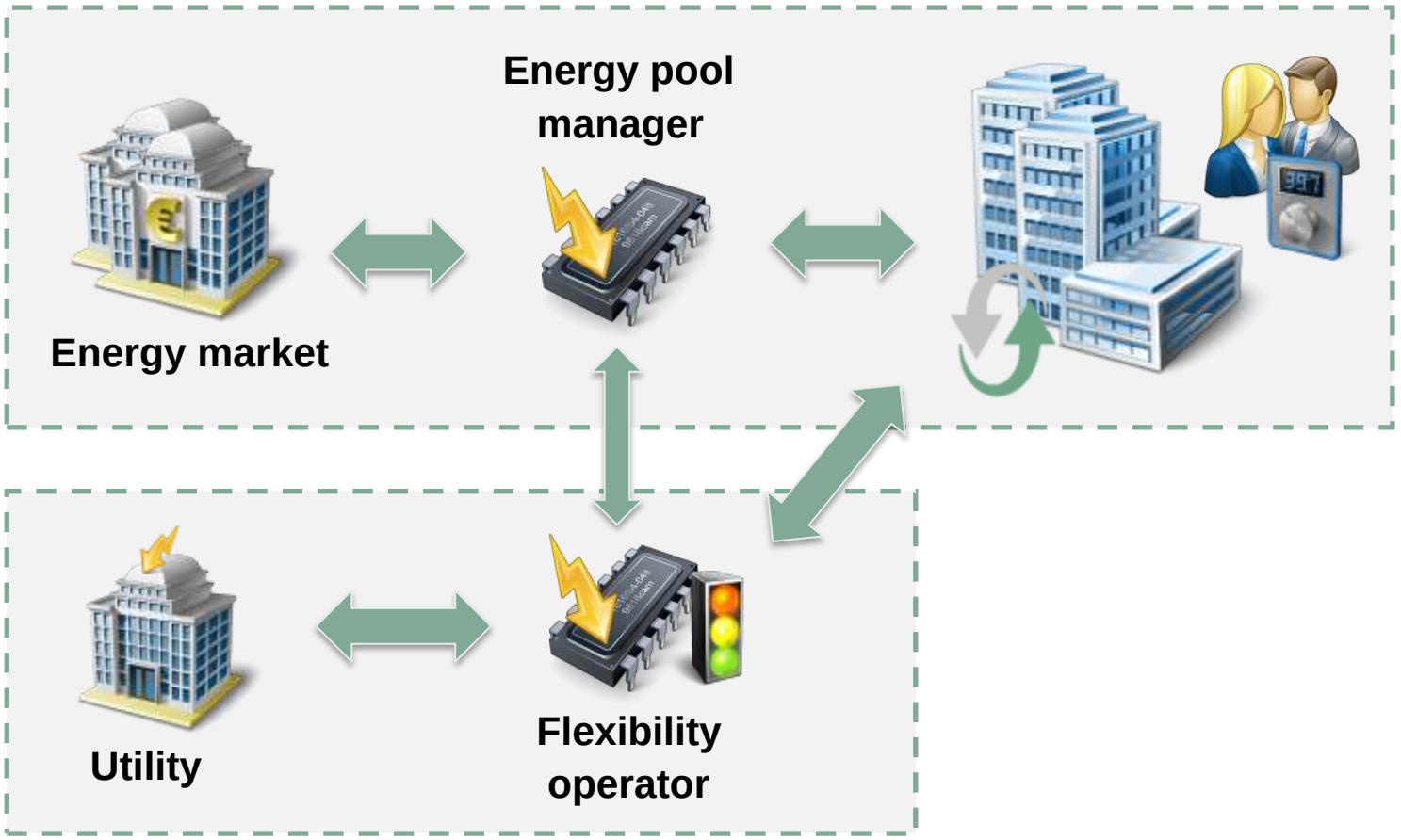
Integration building and grid

Smart City as aggregiate flexibility



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Impressions from the Lakeside

07.11.2013

View from ASCR office
(U-Line U2 above)

Drilling for the soil storage

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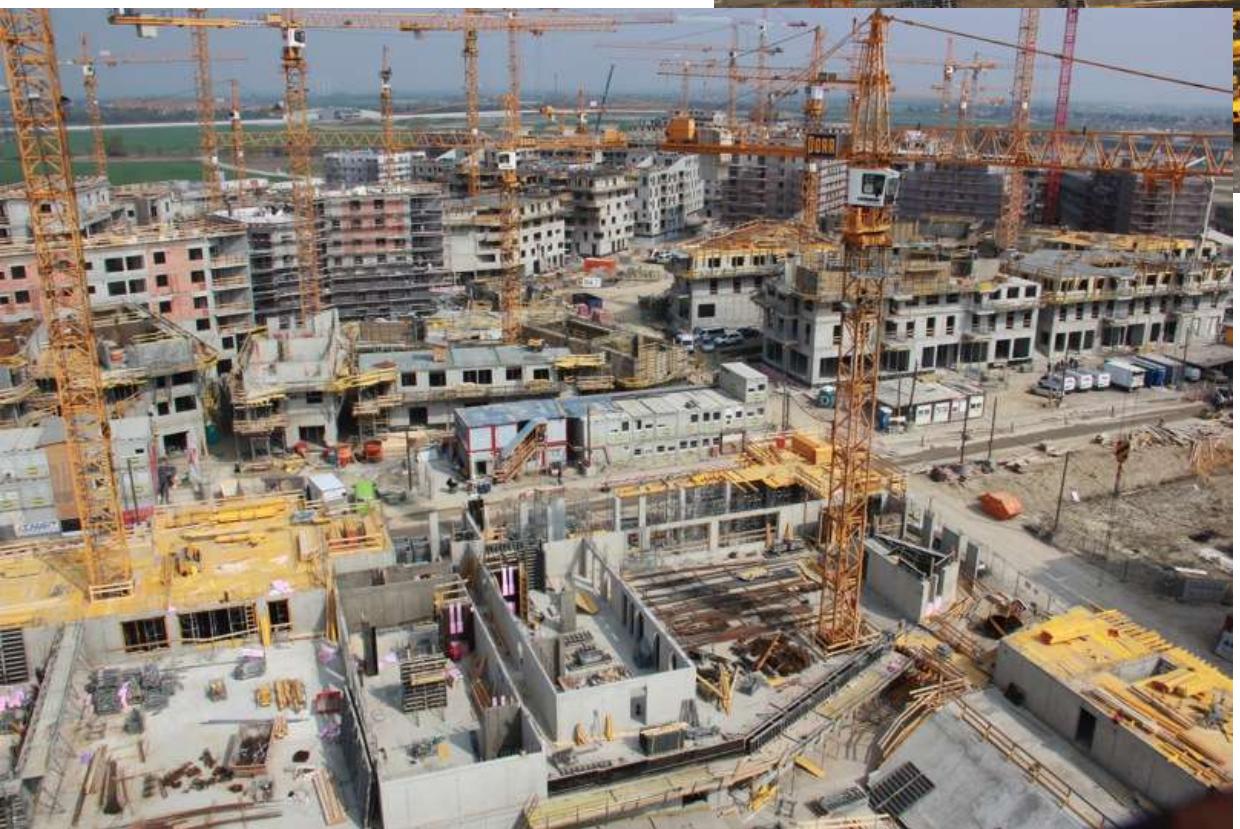
Impressions from the Lakeside

Development of the construction sites

20.01.2014

02.04.2014



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Impressions from the Lakeside

Current pictures

http://www.dronestagr.am/seestadt-apern/

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