

An illustration of a sustainable city. In the foreground, there are three white wind turbines on a green field. To the right, a modern building with a curved facade and a glass facade is visible. In the background, there are several other buildings, some with solar panels on their roofs. A train is visible on a track in the middle ground. The overall color palette is light blue, green, and yellow.

# LOW CARBON STRATEGIES

**Transnational Workshop for Applicants**

**Interreg CENTRAL EUROPE**

Prague, 8 November 2017

# European Policy Framework



- European Union committed in 2014 to non-binding targets by 2030:
  - Cutting carbon emissions by 40%
  - Achieving renewable energy share of 27%
  - Improving energy efficiency by 27%
- EU aims to
  - Remain the global leader in renewable energies
  - Boost employment and economic growth with clean energy jobs
  - Provide long-term economic perspectives

# Clean Energy for All Europeans



- Package of legislative proposals and non-legislative documents covering:
  - Energy efficiency
  - Renewable energy
  - Electricity market design
  - Governance rules for the Energy Union
  - Energy security
  - Eco-design

# Clean Energy for All Europeans



- Revision of Energy Efficiency Directive:
  - Binding target of 30%
- Energy Efficiency of Buildings Directive
  - Speeding up building renovation from current rate (0.4-1.2%)
  - Requiring Member States to produce strategies on how to de-carbonise housing stock by 2050 (interim goals 2030)
- Revision of Renewable Energy Directive
  - Improving frameworks for transition to renewable electricity
  - Giving principles on designing support schemes and simplifying administration
  - Advancing renewable heating and cooling
  - Introducing more low carbon fuels

# Challenges and opportunities in Central Europe



- Generally good progress towards renewable energy targets in Central Europe
- Frontrunner is Austria with 30.9% in 2011 (2020 target 34%)
  - Forecasted to reach about 46% of energy from renewables by 2020
  - Austrian policy frameworks could serve as a role model for the region

CENTRAL EUROPE Country	Share of energy from renewables in final consumption of energy, 2005 (%)	Share of energy from renewables in final consumption of energy, 2011 (%)	Renewables directive target for share of renewable sources in final energy consumption, 2020 (%)
Austria	23.3	30.9	34.0
Czech Republic	6.1	9.4	13.0
Germany	5.8	12.3	18.0
Hungary	4.3	9.1	13.0
Italy	5.2	11.5	17.0
Poland	7.2	10.4	15.0
Slovak Republic	6.7	9.7	14.0
Slovenia	16.0	18.8	25.0
EU27	8.5	13	20.0
Ukraine	1.9	5.5 (2009)	11.0

# Challenges and opportunities in Central Europe



- Outlook for energy efficiency far less positive (all of Europe)
- Most EU countries unable to meet targets: policies not yet in place
- Buildings offer large potential for energy savings (40% of energy use)
- Greatest impact: Retrofitting of buildings older than 10 years (80% of Europe's building stock)
- 8 Projects under “Cooperating to reduce carbon footprint of buildings in our cities and regions” (CE2007-2013)
  - 1 demo of low energy building
  - 2 energy efficiency in SMEs and new subsidy system involving ESCO
  - 5 local energy efficiency plans

# Policy frameworks in development cycle



## Saturated Markets

- Well-developed infrastructure for transport and logistics;
- Export initiatives and incentive schemes i.e. encouragement of internationalisation strategies and business plans;
- EU/Global technology leadership ambition;
- Demo investments in innovative energy solution (e.g. pre-commercial procurement);
- Dedicated international fairs and events;
- Involvement of world leading companies;
- EU leading R&D centres;
- Clusters of international scope.

## Mature Markets

### Renewable Energy

- Community ownership of RES enabling infrastructure i.e. grids, district heating and storage capacity.

### Energy Efficiency

- Multi-residential building and city district renovation efforts.



## Commitment and Planning

### Renewable energy

- Awareness-raising of hidden costs of fossil fuels in electricity generation.

### Energy Efficiency

- Awareness-raising of life-cycle performance and assessment;
- Business modelling (owner-tenant problem).

## Emerging Markets

### Renewable Energy

- Support to public acceptance and local ownership i.e. through co-operative schemes;
- Facilitation of permitting processes and spatial planning.

### Energy Efficiency

- Creation of Energy Service Companies (ESCOs);
- Performance regulations and building codes;
- Support for single-residency renovation;
- Energy performance labelling.

# Transnational cooperation for Energy Efficiency and Renewables



- Mutual learning
  - Different country backgrounds and levels in maturity
  - Different Motivation and Inspiration
- Access to skills
  - Advanced - least advanced
  - Similar development levels
- Development of transnational actions
- Political and social buy-in
  - Raise profile of issues in own region
  - Demonstrate that something is working in another country

# Recommendations for 3<sup>rd</sup> call



- Take a functional view on public infrastructures i.e. an airport or a train station
- Propose integrated **systems approach** combining
  - Technical control systems and measuring
  - Energy efficiency measures (insulation, efficient boilers, HVAC, etc. ...)
  - Heat recovery (local industry, waste water, geothermal heat, ventilation, ICT systems, etc. ...)
  - Integration of several renewables (PV, small wind, biomass boilers, geothermal)
  - Grid integration (electricity grid) and District Heating

# EE and RES usage in public infrastructure



- Public infrastructures owned by the public or for public use such as:
  - ~~Buildings (municipal buildings, schools, kinder gardens, military buildings,...)~~
  - Waste water infrastructure (disposal and treatment of wastewater)
  - Solid waste (generation, collection, treatment of household waste)
  - Transport infrastructure (aviation, rail and road transport, water ways)
  - Information and Communication infrastructure (ICT systems of information storage and distribution)

# Transport infrastructure



- Efficient systems approach with a functional view on
  - Train stations
  - Airports
  - Ports
- Combining:
  - Energy efficiency measures
  - Heat recovery
  - Integration of Renewable energy
  - Encouraging use of public transport and bicycle stations

# Waste water infrastructure



- Efficient systems approach also in combination with waste treatment facilities
- Use of biogas
- Heat recovery from sewer systems

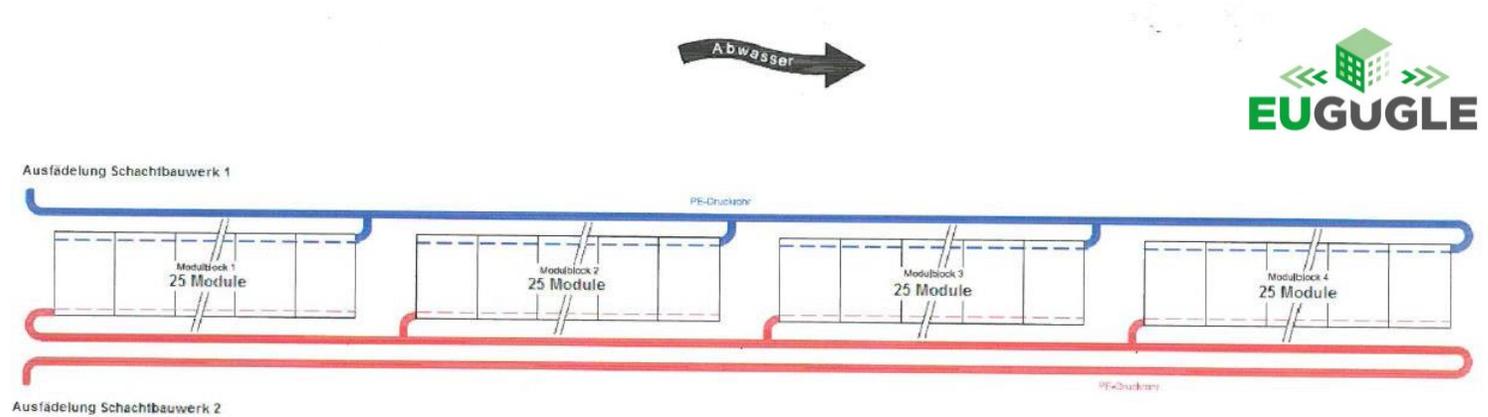


# Waste water infrastructure



- Heat exchangers installed in sewage systems

- Aachen
- Brastislava
- Budapest
- ...





# Aachen – Heat recovery

- Heat recovery from ventilation and sewage
- Heat pumps integrated in heat network
- Solar energy and efficient gas boilers

Ausschnitt Wiesental aus Wärmedargebotskarte Aachen



# Budapest Military Hospital – Heat recovery from sewers



## Budapest military hospital

The waste water in the sewage system is used to heat up and cool down a hospital

Sewage water is a heat source which provides a stable temperature of 10–20°C throughout the year. By exploiting this favourable condition, the Hungarian company Thermowatt developed a heat pump system which can make use of this alternative heat source. Therefore, since July 2014, such a system provides heating and cooling for a 40 000 m<sup>2</sup> building complex that is part of the large NATO Military Hospital in Budapest. The system provides 3,8 MW of heating and 3,3 MW of cooling using two approximately equal-sized Carrier water-water heat pumps, out of

which one is an inverter, thus providing better system work and higher efficiency. The entire system, including the filtration unit, is housed in a concrete underground structure located below a car park and occupies about 210 m<sup>2</sup>. Both heating and cooling are delivered through air handling units comprising large heat exchangers and operating at just 32°C, thus contributing to the high system COP of 6,5–7,1. The system is fed from a collector by using gravity, and its size was determined by the amount of wastewater available – 11 000 m<sup>3</sup>/day.



Technical details of the application	
Heating capacity:	3 800 kW
COP:	6,8
Refrigerant:	R134a
Heating source:	Water
Supplied temperature:	33°C
Cooling capacity:	3 800 kW
EER:	7,3
Refrigerant:	R134a
Heating source:	Water
Supplied cooling temperature:	6°C

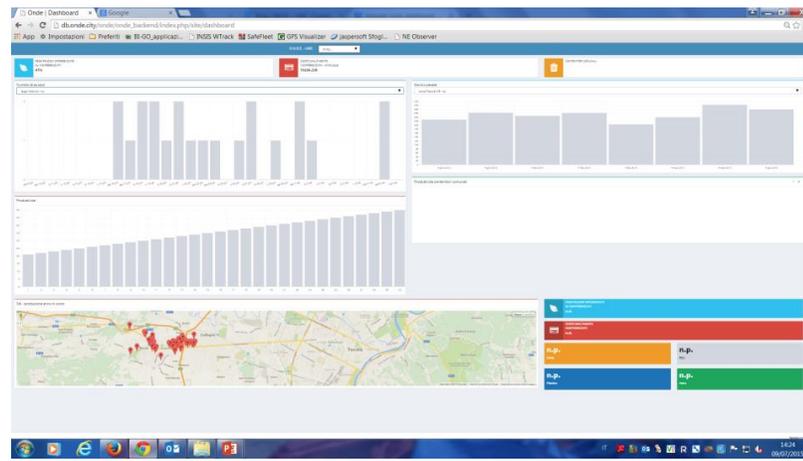
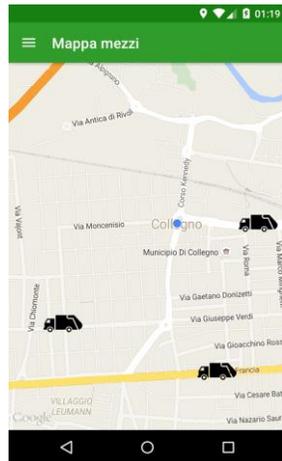
By **THERMOWATT**

Top left: Waste water heat exchanger  
Bottom left: Underground engine house  
Right: Carrier 30XWHP-1612 water-water heat pump  
Source: Thermowatt

# Waste infrastructure



- Integrated systems for waste transport
- Use of gas produced for waste lorries
- Intelligent guidance systems to avoid traffic congestions, CO2 emissions



The roof of the Waste Department car park in Munich, Germany integrates photovoltaic cells

# Waste infrastructure



- Integrated systems for waste treatment
  - Production of biogas for electricity and / or transport fuel for waste trucks
  - Use of organic waste and waste water sludge
  - Integrate PV and Wind power



# ICT infrastructure - Hamburg Computing Centre



## Hamburg's energy efficient office building

Waste heat from the computing centre is transferred to heat up a 13-floor building

In Hamburg, two modern heat pumps were installed and put into operation in the head office of Vattenfall Europe AG. The system uses waste heat of the in-house IT server rooms and computer centres. Heat transfer can cover 50% of the total basic thermal load of the 13-floor building of 50 000 m<sup>2</sup>.

This project reduces the negative impact on the environment by saving more than 600 tons of CO<sub>2</sub> per year. The temperature of waste heat is risen up to 45°C. It is then fed into the heating system by two highly efficient water-water heat pumps supplied by Ochsner. Each heat pump has a heating capacity of 360 kW. Turbo compressors

with magnetic bearings minimize friction loss and thus oil lubrication is no longer necessary. An intelligent control technology continuously adapts the performance of the machines on the cold and the warm side to the respective demand. Approximately 8 kWh of thermal energy (heat and cold) are produced for each electrical kWh. This corresponds to a coefficient of performance (energy multiplier) of 8.

The installation into the existing application was carried out during the regular business. Finally the sound insulation had to meet high requirements because the offices are located directly above the system.



Left: Heat pump – EHA Energie Handels Gesellschaft  
Right: Administration Building – Vattenfall  
Source: Ochsner

*“The system uses waste heat of the inhouse IT server rooms and computer centres. Heat transfer can cover 50% of the total basic thermal load of the 13-floor building of 50,000m<sup>2</sup>.”*

# Renewables cooperatives



**Renewable energy cooperatives** – Initiated, planned and owned by members of the community. Regional authority set frameworks, provide zoning advice, and make sure that the public are aware of the model.



# Thank you!



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