



**CENER**

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ENERGY CENTRE



## Nearly zero energy building renovation, the EU-GUGLE project

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National Renewable Energy Centre of Spain - CENER

**Conference on Sustainable Renovation Models**

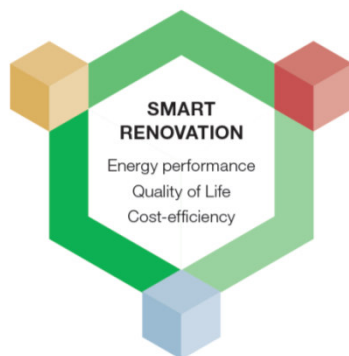
22nd April 2016, Aachen, Germany



EU-GUGLE is co-financed by the European Commission under the 7<sup>th</sup> Framework Programme for Research and Technological Innovation, and is co-ordinated by CENER, Spain's National Centre for Renewable Energies.

## The EU-GUGLE project

**European cities serving as Green Urban Gate towards  
Leadership in sustainable Energy**



**Call:** FP7-2012-NMP-ENV-ENERGY-ICT-EeB. Smart Cities call.

**Demonstration** of nearly Zero Energy Building Renovation for cities and districts

**Project duration:** April 2013 - March 2019 (72 months)

**Demo sites:** Aachen (Germany), Bratislava (Slovakia), Milan (Italy), Sestao (Spain), Tampere (Finland) and Vienna (Austria)  
**Follower Cities:** Gaziantep (TK), Gothenburg (SWE), Plovdiv (BG)

**Number of partners:** 21 (10 different countries)

**Budget:** 26,389,085 EUR ; EC Contribution: 15,257,775 EUR



### EU-GUGLE project: OBJECTIVE:

- To achieve 40 - 80 % primary energy savings per district, and to increase 25 % the share of renewable supplied in the buildings,
  - Sharing latest research results especially of retrofitting technologies and intelligent RES integration into buildings.
  - Taking the building-users and its public space as the connective environment to the project, with special attention to vulnerable groups and behavioral challenges.
  - Establishing adequate business environment favorable for Smart City demonstrations



## EU GUGLE district AACHEN

District	Aachen-North
Surface affected	41,802 m <sup>2</sup>
Type of buildings	Residential buildings: recent (70s) and listed buildings (20s-30s)
Target	53 - 59 % primary energy savings



### Technical measures

- Thermal insulation on facades, attic floor, roofs, cellar ceiling, windows, balconies
- Local heating network based on heat pumps using the thermal capacity of the sewer
- district heating

### Non-technical measures

- Energy efficiency campaigns with tenants, advisory activities to effect consumer behaviour.
- Launching innovation vouchers for consultations



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## EU-GUGLE District BRATISLAVA

District	
Surface affected	8.000 m <sup>2</sup>
Type of buildings	blocks of buildings, built after 1960
Target	From 60 % to 75 % primary energy savings



### Technical measures:

- Insulation measures on facades, roofs, cellar ceiling, windows
- Solar thermal and PV. Gas boilers with micro CHP
- Heat recovery from the sewage
- Smart meters,...

### Non-technical measures

- Financing models adapted to privately owned apartments (no social housing)
- Raising awareness of tenants, to reduce energy consumption through user's behaviour.



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## EU-GUGLE District MILAN

District	Zona 4
Surface affected	17.596 m <sup>2</sup>
Type of buildings	Three residential blocks and a public kindergarten
Target	From 66 % to 80 % primary energy savings



### Technical measures:

- Prefabricated Facade with Built-in Mechanical Ventilation & Heat Recovery System
- External insulation without glue
- Advanced Solar Protection, Night Cooling Ventilation
- Heat recovery system (Exhaust air pump)
- Building Management Systems. Smart Meters
- Photovoltaic power plant

### Non-technical measures

- Creation of an energy efficiency and deep renovation team inside the technical staff of the municipality
- Showcase information centre to give information and training
- Raising awareness campaign



## EU-GUGLE District SESTAO

District	Txabarri/El Sol
Surface affected	19.000 m <sup>2</sup>
Type of buildings	Social housing blocks. 222 dwellings
Target	From 66 % to 80 % primary energy savings

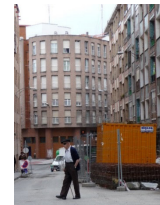


### Technical measures:

- Insulation measures on facades, roofs, cellar ceiling, windows
- Sustainable building materials
- Installation of biomass boilers and Solar Collectors
- Adding heat recovery to the ventilation system

### Non-technical measures

- Raising awareness campaign
- Promotion of the use of bicycles





## EU-GUGLE District TAMPERE

District	Tammela
Surface affected	31.433 m <sup>2</sup>
Type of buildings	Apartment blocks mainly from the 70s, mainly owned by private households.
Target	Up to 57% primary energy savings



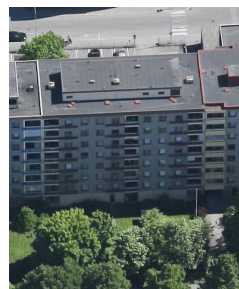
### Technical measures:

- Insulation measures (walls, windows, balcony doors, roof)
- Renewing the thermostat valves and adjusting the heating network
- Renovation of the heating system
- Installation of solar collectors
- Adding heat recovery to the ventilation system
- Air-source heat pump
- Metering for water consumption in every apartment
- Renovation of the drainpipe system
- Energy efficient lighting
- Remote monitoring of the properties



### Non Technical measures

- Specialized events for the residents and the other parties on energy efficient and environmental friendly renovating, building and living
- Promotion of the use of bicycles



## EU-GUGLE District VIENNA

District	Penzing
Surface affected	~67,500 m <sup>2</sup>
Type of buildings	residential buildings and social housing from the 50s to 80s, owned by the City of Vienna, housing associations and flat owners
Target	Up to 61% primary energy savings



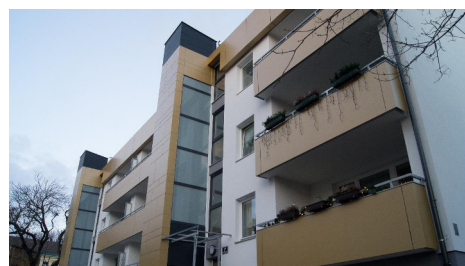
### Technical measures:

- High insulation and decentralised ventilation
- Thermodynamic optimisation via simulation and monitoring
- Multi-Active Façade combined with PV
- Building Integrated PV (BIPV)
- Replacement of decentralised fossil heating systems by centralised renewable heating plants allowing contracting



### Non Technical measures

- Socio-economic evaluation
- Participatory action research
- Symbiotic integration of green power marketing






### Current and Expected impacts of the project



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### Key figures. Investment and Environmental Impacts

EU GUGLE project	2016 (until today)	At the end fo the project
Investments (€)	27.054.846	81.021.443
Area retrofitted (m2)	48.758	186.318
Energy savings (kWh/y)	5.327.082	15.226.492
CO2 emissions (T CO2/y)	2.052	5.188

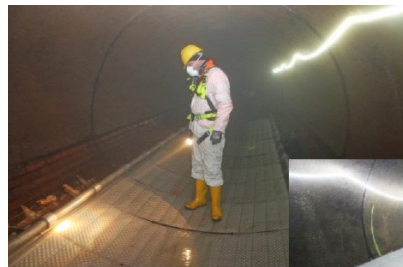


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## Demonstration of cost effective highly energy efficient solutions and technologies



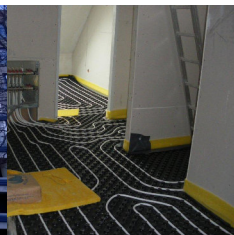
- Industrialized Facade with Built-in Mechanical Ventilation & Heat Recovery System.
- 100% RES supply for heating pilot (biomass boiler and Solar Thermal)
- RES integration (PV and Solar thermal)
- High efficient heat recovery in ventilation systems
- Heat recovery system in the sewage network



## Best practices data base for the construction sector based on innovation and competitiveness



- Bio-based deep refurbishment
- Building retrofitting based on ETCIS
- Advanced Solar Protection, Night Cooling Ventilation
- Energy refurbishment of listed buildings
- High performance. Cost-effectiveness approach
- Low disruption to the tenants and building owners
- Industrialized solutions



## Reduce the gap between theoretical energy use and real energy use after refurbishment



- Dynamic energy simulations before and after the retrofitting
- ICT based energy management systems. Smart meters
- Building users' empowerment

TAMPERE 7 PILOT - Pohjolankatu 18-20 (BEST 7)						
	Global Energy Results					
	SUPPLY SYSTEM	ENERGY NEEDS (kWh/y)	ENERGY USE (kWh/y)	DELIVERED ENERGY (kWh/y)	PRIMARY ENERGY (kWh/y)	CO <sub>2</sub> EMISSIONS (t CO <sub>2</sub> /y)
HEATING	DISTRICT HEATING (1)	322.673	322.673	322.673	225.871	67,4
COOLING	-	3.290	-	-	-	-
DOMESTIC HOT WATER	DISTRICT HEATING (1)	85.917	85.917	85.917	60.142	18,0
LIGHTING	ELECTRICITY	-	36.177	36.177	61.501	8,1
RES ON-SITE (THERMAL)	-	-	-	-	-	-
RES ON-SITE (ELECTRICITY)	-	-	-	-	-	-
<b>TOTAL</b>		<b>411.880</b>	<b>444.767</b>		<b>347.514</b>	<b>93,5</b>



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## Providing the construction sector with specific abilities



- High efficient nZEB buildings
- Air tightness, thermal bridges,
- High efficient HVAC systems and RES installation
- Bio-based materials
- Industrialised solutions



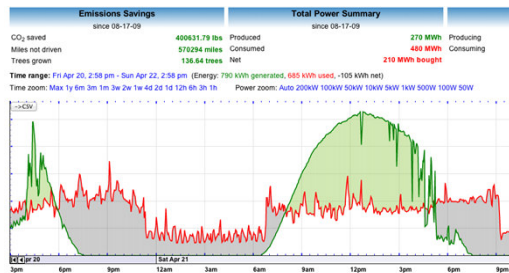
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## Common monitoring data structure and sharing of monitoring results



- Aligned with the new Smart Cities Information System (SCIS)
- Gathering monitoring data across Smart Cities, CONCERTO and EE-buildings-projects ("Technical Monitoring Database")
- making technologies comparable



EU Smart Cities  
Information  
System



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## Citizens engagement



- Information / Discussion meetings citizens and building owners
- Dialog with tenants and other stakeholders. How do we get everybody on board?
- Citizen empowerment and training
- Information available in other languages to reach cultural diversity.



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## Going beyond EU-GUGLE



- 6 pioneer cities is not enough to change the world !
- Our role is to **INSPIRE** others and **SHARE** our experiences (good and bad) to foster EU wide deployment of smart energy solutions
- EU-GUGLE launched two initiatives:

Collaboration with other projects

**My Smart City District  
community**



Knowledge sharing with other  
cities

**The Replication Cluster**



## Joining forces with other projects



**My Smart City District  
community**

- A Community of 8 smart cities projects, bringing together 25 pilot cities
- One portal to find them all: [www.mysmartcitydistrict.eu](http://www.mysmartcitydistrict.eu)
- One LinkedIn group to interact with them all: « **My Smart City District Community** »
- One Twitter account to stay in touch: [@MySmartCityD](https://twitter.com/MySmartCityD)



## Joining forces with other projects



My Smart City District community



### JOINT EVENTS

- June 2015: EU wide open doors events in pilot cities
  - June 2016: 5 lunch webinars on financing, scalability of solutions, stakeholder involvement, etc.
- => Visit [eu-gugle.eu](http://eu-gugle.eu) and [mysmartcitydistrict.eu](http://mysmartcitydistrict.eu) soon!



## The Replication Cluster

- A **joint initiative** of the SINFONIA & EU-GUGLE projects
  - **8 pioneer cities** : Innsbruck, Bolzano, Bratislava, Vienna, Aachen, Tampere, Milan, Sestao
  - **7 early adopter cities**: Gothenburg, Plovdiv, Gaziantep, Rosenheim, Seville, La Rochelle, Pafos



- A **community of like-minded cities** interested in designing and implementing their own district-scale refurbishment strategies.
- A framework to exchange ideas and engage in **knowledge sharing activities** (study visits, workshops, networking)



## The Replication Cluster today



8 pilot cities  
7 early adopters  
29 Replication cities

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## The Replication Cluster today



Does your city want to join the family?

**JOIN THE REPLICATION CLUSTER !**

Visit [www.eu-gugle.eu](http://www.eu-gugle.eu) or talk to us at the break

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On behalf of the EU-GUGLE team,

**Thank you for your attention !**



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