New μ-CHP network technologies for energy efficient and sustainable districts

Technologies for energy efficiency at district level: FC-DISTRICT

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ECTP Conference, 2011-10-04
Overview

New μ-CHP network technologies for energy efficient and sustainable districts

- Project Coordinator: Mostostal Warszawa S.A. (Poland)
- Work programme topic addressed: EeB.NMP.2010-2
- New technologies for energy efficiency at district level
- Technical Coordinator: National Technical University of Athens (Greece)
- 22 partners from 11 European countries
- Duration: 4 years (starting date: 01.09.2010)
- Total budget: 11,837,575 € (funding 8,000,000 €)
EeB.NMP.2010-2 New technologies for energy efficiency at district level

**Technical content / scope:** The construction sector can provide a significant contribution to the reduction of resources consumption and to a wider use of renewable resources. The main objective of the topic is to develop new technologies and methods to help reduce the energy consumption and environmental impact of buildings during their entire life-cycle (80% of energy consumption occurs during service-life) at district level, since this cannot be achieved only at building level.

The main focus is on new concepts, technologies, design tools and business models at district level for "intelligent buildings", able to significantly reduce or even completely meet their own energy consumption; improvement of the building energy performance (through cladding and ventilation technologies, sensors, actuators and pervasive computing systems, utilisation of embedded renewable energy sources, etc.). Developments are also required at district level addressing new and improved materials and structures to improve the indoor environment as well as resource and climate, energy consumption conversion, storage capacities and energy carriers. Deliverables include the development, integration and demonstration, if possible at district level, of decision support systems and assessment tools of the above concepts e.g. for social housing, residential buildings, offices, and public buildings such as hospitals, schools and universities, railway- and underground-stations and airports.

In order to ensure industrial relevance and impact of the research efforts, the active participation of industrial partners, including SMEs, represents an added value to the activities and this will be reflected in the evaluation.

The projects are expected to cover demonstration activities, including pilot implementations in industrial settings, and this will be reflected in the evaluation.

**Funding scheme:** Collaborative projects.

**Expected impact:** The new technologies should contribute to a reduction of 50% in energy consumption compared to the 2005 values. The benefits for applying the new technologies at district level are expected to represent a significant reduction (around 20%) of the total costs compared to existing solutions. The return on investment for these additional costs should be preferably not more than 7 years, both in the case of new construction and retrofitting.
Evaluation Summary Report

- Scientific and/or technological excellence  4,5/5
- Quality and efficiency of the implementation and the management  4,5/5
- Potential impact through the development, dissemination and use of project results  4/5
- Total score 13/15
The consortium
Origins of FC-DISTRICT technologies

FP6 Flame SOFC

IEE ReWISe

FP6 I-SSB FP7 MESSIB
## RTD topics

<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>micro CHP based on high temperature SOFC</td>
</tr>
<tr>
<td>biogas production in waste disposers</td>
</tr>
<tr>
<td>new solutions for thermal storage</td>
</tr>
<tr>
<td>district wide distribution networks</td>
</tr>
<tr>
<td>communication needed for control of the networks</td>
</tr>
</tbody>
</table>
## Technical WPs

<table>
<thead>
<tr>
<th>WP2 System requirements</th>
<th>WP3 Building and district tailoring of SOFC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WP4 Biogas production in district waste disposers</td>
</tr>
<tr>
<td></td>
<td>WP5 Thermal storage systems for building and district</td>
</tr>
<tr>
<td></td>
<td>WP6 Efficient heat distribution network and micro-grid</td>
</tr>
<tr>
<td>WP7 Dynamic control and wireless communication solutions</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WP8 System Integration</th>
<th>WP9 Demonstration in industrial settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proof of Concept</td>
<td></td>
</tr>
</tbody>
</table>

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Non technical WPs

**WP1** Project Management

**WP10** Decision Support – Certification procedures – Business Models – Exploitation Road Map

**WP11** Awareness, dissemination and training
FC-DISTRICT optimizes and implements an innovative energy production and distribution concept for sustainable and energy efficient districts exploiting decentralized co-generation coupled with optimized building and district heat storage and distribution network targeting reduction in annual primary energy consumption at district level up to 60%.

It introduces a new paradigm in energy efficiency by developing systems, materials, technologies and methodologies specifically intended for integration at district level.
Main objectives

• Development of a high temperature Solid Oxide Fuel Cell with versatile fuel processor for natural gas and biogas reforming.
• Advanced, durable and cost effective insulation materials for improved building and district piping thermal response.
• Integrate Food Waste Disposers with anaerobic digesters to produce biogas.
• Implement an “Intelligent Heat Network” equipped with smart control and hybrid wireless network systems.
• Optimize and tailor the characteristics of the energy and power distribution systems to meet the energy and power demand of various building and district typologies.
μ-CHP based on high temperature SOFC

Micro-co-generation systems, producing both heat and electricity in a certain ratio to each other, provide potential reductions in carbon emissions and costs by generating both heat and electricity locally with efficient fuel use and by offsetting the use of centrally-generated electricity from the grid.
SOFC unit prototype

- FC-District SOFC system model was presented at HANNOVER MESSE, April 4-8 2011.
Biogas production of domestic food waste

Through the introduction of the upgraded wastes into centralized anaerobic digesters it is possible to integrate the production of biogas. After purification, removal of inerts and sulphur, and deodorization of the biogas derived from such renewable resource, it is possible to be upgraded via injection into the gas grid.
New solutions for thermal storage

The FC-DISTRICT project aim is exploitation of active storage (heat and cooling) at floor, wall and ceiling dry wall systems. The building will act as an active “heat hub” exchanging heat with neighbouring buildings.

The “integrated energy system” will enable circulation of the thermal energy within the building through space and time responding to load variations and taking advantage of this energy that otherwise would be wasted.
District wide distribution networks

Electrical integration at district level can be met using the Virtual Power Plant (VPP), a collection of smaller electricity generating units able to replace a conventional power plant in terms of power output. The concept of thermal integration at district level with a dynamic load exchange between neighbouring buildings and/or with a central hub is an extension of the VPP concept.
Communication needed for control

The conventional approach to sensory networks assumes a homogeneous network infrastructure whereas most real-life scenarios are based upon the use of hybrid networks. This creates a number of issues related to the reliability of the received data, localization and remote calibration of the sensors and provision of the same quality of service to wireless and wired sensor nodes. A prototype hybrid network will be developed and implemented.
Up-to-date FC-DISTRICT information

visit project website

fc-district.eu