



**SmartReFlex – Smart and flexible 100% renewable district heating and cooling systems for European cities**

**Smart Reflex – Intelligente und flexible Lösungen für 100 % erneuerbare Wärmenetze in europäischen Kommunen**

Vorhaben L7514012

## Forschungsberichtsblatt

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*Koordinator:*

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## 1. BETEILIGTE INSTITUTIONEN

Koordinator: Ambiente Italia (IT)

AMBIENTEITALIA

- DE
- Steinbeis Forschungsinstitut Solites (StT)
  - Hamburg Institut (HIC)
  - Energieeffizienzverband für Wärme, Kälte und KWK e.V. (AGFW)
  - Ministerium für Energiewende, Landwirtschaft, Umwelt und ländliche Räume des Landes Schleswig-Holstein (MELUR)

solites

HAMBURG  
INSTITUT

AGFW

SH  
Schleswig-Holstein  
Ministry of Energy,  
Agriculture, the  
Environment and  
Rural Areas

- IT
- ANCI Emilia-Romagna
  - Italienischer Fernwärmeverband (AIRU)

EMILIA  
ROMAGNA  
anci

AIRU  
associazione italiana  
riscaldamento  
urbano

- IE
- Kerry County Council (KCC)
  - Tipperary Energy Agency (TEA)
  - XD Sustainable Energy Consulting



TIPPERARY  
energy  
AGENCY

Consulting  
Creative  
Energy  
Services

- ES
- Catalan Land Institute (INCASÒL)
  - Catalonia Institute for Energy Research (IREC)

INCASÒL  
Institut Català  
del Sol

IREC  
Institut de Recerca en Energia de Catalunya  
Catalonia Institute for Energy Research

- DK
- Dänischer Fernwärmeverband (DFJ)
  - PlanEnergi

DANSK  
FJERNVARME

GRØNENERGI

PlanEnergi

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## 2. KURZBESCHREIBUNG DER FORSCHUNGSERGEBNISSE

The SmartReFlex project aimed at increasing the diffusion of smart and flexible district heating and cooling (DHC) grids and systems, basing on high shares of renewable energy sources (RES), in European cities.

In order to reach this goal, 6 regions in 4 countries (Germany, Ireland, Italy and Spain) implemented legislative and organizational measures for promoting high-RES DHC, as reported in the next paragraph, also benefitting from the know-how transfer by the two Danish partners, bringing in the consortium the success story from Denmark.

The project activities allowed the SmartReFlex consortium to meet the foreseen objectives. The main project results could be summarised as follows:

- **6 Regional strategies:** Action plans for 100% RES DHC were developed in the participating regions.
- **Capacity building:** more than 500 people were trained through national workshops on three different topics (design & planning, technical issues, organization and financing) and training material have been made available on the project website for further replication activities.
- **Practical case studies:** 20 cases of real plants at local level and / or policies on RES DHC have been developed.
- **SmartReFlex towards replication:** Several guidelines have been prepared for Local and Regional Authorities willing to 'copy, adapt and paste' the 'SmartReFlex recipe' among which:
  - Recommendations for setting up a task force on RES DHC: How to effectively involve all local stakeholders for carrying out a fruitful process towards 100% RES DHC.
  - Guide for regional authorities: Knowledge and inspiring examples on RES DHC for local authorities and communities – residents, commercial and industrial enterprises.

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### **3. WELCHE FORTSCHRITTE ERGEBEN SICH FÜR DIE WISSENSCHAFT UND/ODER TECHNIK DURCH DIE FORSCHUNGSERGEBNISSE?**

Thanks to a continuous and fruitful interaction with the main stakeholder categories, it was possible also to gather several 'dos and don'ts'. The key lessons learned can be listed as follows:

- The role of the 'know-how' partners is crucial: Thanks to the expert partners from DK and DE, the draft versions of the regional strategies have been reviewed to make them as practical as possible. Especially the availability of partners from DK not directly involved in a country team allows a very helpful view from 'outside' to improve the strategy and implementation process for the regional partners.
- Capacity building workshops have shown to be a very good framework for discussion between the local stakeholders, especially with a balance between speakers for abroad and local representatives, and the right place to find the potential case studies on the territory. A careful preparation of the programme and selection of the potential participants are key issues to determine the success of training initiatives.
- Local energy planning, and heat planning in particular, is at an early stage of development in participating regions. Further capacity building and piloting in the framework of the SRF project will help establishing a methodological framework and demonstrate best practice in this area.

Finally, as publishable final report, a combination of the main project results have been chosen, namely the project leaflet (in its revised result-oriented version), the brochure highlighting the local actions, the guide on RES DHC for local and regional authorities and the detailed EU report in English on performed case studies.

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#### 4. NUTZEN, INSBESONDERE PRAKTISCHE VERWERTBARKEIT DER ERGEBNISSE UND ERFAHRUNGEN

SmartReFlex success stories cover the four project countries and the whole project flow, from the task forces, through the policy and technical case studies, to the dissemination and replication impact.

##### **Baden-Württemberg, DE**

The energy transition in Germany poses special challenges to Baden-Württemberg. As a strong industrial region, there is a particularly high demand for energy. Nevertheless, Baden-Württemberg has set ambitious goals for CO<sub>2</sub> reduction in its climate protection law. The law contains aims for the reduction of CO<sub>2</sub> and is complemented with the integrated energy and climate protection concept (IEKK) in which concrete spheres of activity are established. These goals can only be achieved with increased energy efficiency and perceptible savings of energy. Baden-Württemberg has put its energy policy goals for the year 2050 in a 50-80-90 formula:

- 50 % less energy consumption
- 80 % renewable energy
- 90 % less greenhouse gas emissions (compared to 1990)

In order to achieve these goals, Baden-Württemberg is politically active in many fields. One focus is on energy-efficient DH systems, which complements perfectly the goals of the SmartReFlex project.

##### New subsidy program 'Energieeffiziente Wärmenetze' (energy-efficient DH systems)

- The Ministry of the Environment Baden-Württemberg drew a subsidy program funding (1) municipal climate protection concepts, (2) regional initiatives in 12 regions of Baden-Württemberg promoting RES DH and giving advice e.g. to municipalities and (3) investments in energy-efficient DH systems linked to advanced quality criteria. The subsidy program came into effect in February 2016.
- Furthermore, the competence centre 'district heating' was created at the Climate Protection and Energy Agency Baden-Württemberg (KEA) to coordinate the different activities, e.g. initiatives, within the state.
- The input by Solites and SmartReFlex was the support to quality criteria of the subsidy program (Workshop in July 2015 as part of the WP2 task force meeting). Furthermore, there is a close cooperation of Solites with the competence centre.

One issue going along with RES DH systems in urban areas is to find places/areas to install the RES heat production units.

##### 'Areas for RES heat production' (e.g. to feed in DH systems)

- An initial workshop took place at the Ministry of the Environment Baden-Württemberg in Stuttgart on 11.04.2016 to exchange ideas on availability and ecological quality of the required areas for RES heat production.
- The workshop was mainly referring to areas for solar thermal collectors (Solar District Heating) regarding legal, ecological and further aspects. The Ministry of the Environment and the Ministry of Agriculture participated at the workshop as well as collector manufactures, conservationist, legal experts and a utility/municipality reporting about their problems of finding appropriate areas for 'heat production'.
- The input by Solites and SmartReFlex was the initiation of the workshop and bringing the topic on the agenda to be discussed with different relevant stakeholders. The aim is to start a process in improving, amongst others the planning and approval procedure, for solar thermal and other RES installations in urban areas.

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**ES: Catalonia stakeholder group (Task force): Effective, committed and alive beyond the project period**

Though working in SmartReFlex as a 'newcomer' region on RES DHC, Catalonia succeeded in creating a very effective regional task force on this topic that could act as a best practice for other Regions and Cities willing to use such a policy tool. The following are the main features and results of this task force:

- **Comprehensive:** Led by INCASÒL (a public company that belongs to the Ministry of Territory and Sustainability of 'Generalitat de Catalunya'), the task force was able to collect 18 relevant stakeholders from many different target groups of the project: Energy agencies, industrial districts, Municipalities, consumer associations, legal firms, research institutes, professionals, etc.
- **Committed:** because of the interest shown by stakeholders, 12 meetings (8 plenary + 4 thematic) were held during the project period, much more than the 6 foreseen when the project started.
- **Effective:** Task force discussions have always been held to solve practical issues and overcome technical or legal barriers in real cases; For instance, an environmental solution was found for the new residential area 'l'Estrella' in the city of Badalona, where a strict protection against air emissions is in place. One of the task force stakeholders, the Catalan Biomass Cluster, provided a detailed regulation for biomass boilers which was then included in the urban plan to show to the environmental office that the boiler emissions will be much lower than they expected.
- **Sustainable in the long term:** on February 28th, 2017 (the very last day of SmartReFlex), the final meeting of the task force was held and there the members have expressed their interest in continuing the activities, committing to meet at least once a year, because of the mutual enrichment and the practical results obtained.

**IT: Policy – How RES DHC was included in the Regional Energy Plan of Emilia-Romagna**

In November 2015, Emilia-Romagna Region started the update of its regional energy plan that led to two different documents: the Regional Energy Plan 2030 and the Regional Energy Action Plan 2017-2019. ANCI Emilia-Romagna, also using the concept developed in its SmartReFlex regional strategy for RES DHC, opened a consultation with its Municipalities, teaming up with ARPAE (regional agency for environment and energy), to try to include RES DHC in the regional energy plan.

After the publication of the drafts of the two documents mentioned above, a public consultation was opened and ANCI Emilia-Romagna sent its contribution, of course stressing the relevance of RES DHC. Thanks to this action, the final version of the energy plan foresees a more relevant role for RES DHC, planning the creation of a regional energy observatory to implement a study on DH potential at a regional level, with a focus on areas not reached by the natural gas network.

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**IE: Policy – Local heat planning in Kerry**

The case study undertaken by Kerry County Council together with XD Consulting on Local Heat Planning for the town of Tralee and County Kerry was particularly exemplary. The objective of this case study was to support the integration of heat and district heating into the local energy-planning framework.

The first step was to create a heat density map of Tralee (100 x 100 m grid) and the whole county (250 x 250 m grid), based on a GIS dataset which includes the annual heating requirement of all dwellings and nonresidential buildings. We used this heat density dataset to derive the total cost of heat supply and distribution via district heating per unit of heat sold, for each land plot within Tralee. Our analysis shows that district heating could possibly attract a 90% share of the heat market in Tralee, moving from individual heating if cheap renewable heat is available as a by-product of biomass CHP.

This case study will inform the local authority's spatial planning and development plans for Tralee and Kerry respectively. Additional support is given by the Sustainable Energy Authority of Ireland to leverage the associated knowledge to provide a template for other local authorities to develop their heat plans and renewable energy strategies.

**Schleswig-Holstein, DE: Implementation – Toward solar district heating in Trappenkamp**

SmartReFlex partner Hamburg Institut has supported the municipality of Trappenkamp (5,000 inhabitants, 80 km north of Hamburg) by carrying out an economic analysis of their current district heating system and conducting a feasibility study on the integration of a large-scale solar thermal plant into the existing heat supply provided by a natural gas CHP system.

The key findings of their analysis are that with the end of the CHP premium payment in approximately two years, the profit for the municipal district heating utility will deteriorate significantly. The proposed 2.5 million investment in a large-scale solar thermal plant (5,000 m<sup>2</sup>) to cover the summer load would increase the gross profit in the district heating. The attractive regional and federal funding schemes in place that could cover parts of the investment in the solar thermal plant would increase the return on investment even further. The solar heat is already competitive with fossil fuels today and could stabilize the heat production cost of the district heating system for the next 25 years. The projected cost of solar heat is 3-4 cents/kWh. F

ollowing the support provided by the SRF partners as part of this case study, the municipality of Trappenkamp has decided to go ahead with the project and has initiated its implementation. Their key issue now is to provide the land required to install the solar thermal collector field.

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## 5. KONZEPT ZUM ERGEBNIS- UND FORSCHUNGSTRANSFER AUCH IN PROJEKTFREMDE ANWENDUNGEN UND BRANCHEN

The foreseen target groups were:

- Primary (first priority): regions/provinces
- Secondary (second priority): local authorities (Municipalities), DHC utilities and DHC industry, consumers

The involvement of such target groups in the project activities, namely the task forces, the capacity building and the development of case studies, was quite straightforward in all the participating regions given the presence of a relevant regional (or similar) actor in the project consortium. Such actors were able to convey all relevant stakeholders, mainly through the task forces.

In addition, the composition of the audience in the capacity building workshops shows a remarkable active participation of the two main target groups.

To complete the project flow, also practical case studies at local level were carried out with the active participation and involvement from the target groups, namely Local and Regional Authorities and DHC utilities.

Finally, the involvement of the target groups went beyond the project boundaries thanks to the relevant dissemination effort, in particular looking at the cooperation with similar EU-supported project or other international activities. From this point of view, the common activities with 'CELSIUS' and 'progRESsHEAT' should be highlighted.

Further information about the project impact among the target groups, focusing on replication and on increased knowledge and acceptance on RES DHC thanks to the SmartReFlex activities.

One aspect that could be improved is to foresee, from the very beginning of the project, quite short capacity building activities due to the type of target groups to be involved. In fact, it is very hard for Public Bodies to be able to attend 2-days events and, therefore, shorter and more condensed training packages should be prepared.