Case study to support SDH development

Subject:	Case study to support Solar District Heating (SDH) development
Description:	The realization of a case study for the integration of solar district heating in the region of Varna by involving local stakeholders will attract attention on SDH technology and its commercial and environmental aspects and benefits.
Date:	10.06.2017
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Document download:	www.solar-district-heating.eu/

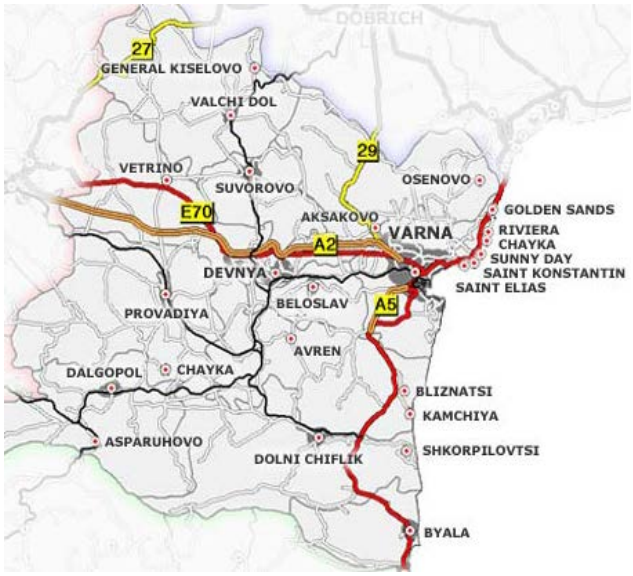
Summary description of the instrument

Region: Varna, Bulgaria

Partners involved: Institute for Zero Energy Buildings

Short description of the measure: The realization of a case study for the integration of solar district heating in the region of Varna by involving local stakeholders will attract attention on SDH technology and its commercial and environmental aspects and benefits.

Initial situation



Varna region comprises 12 provinces with a population of 495 000 inhabitants. The region has 49 municipalities, the smallest with 2 100 inhabitants and the largest with 395 000 inhabitants (City of Varna). The only DH in the region, own by Veolia Energy International is operating in 4 districts in the city of Varna. Like all the DH plants in Bulgaria, the DH plant in Varna is from CHP type where the waste thermal energy is used for district heating. The plant uses natural gas as a fuel. The heat transmission network of Veolia Energy Varna provides heat energy for heating and for hot water to nearly 10 000 household and 40 municipal and corporative customers. Its length is 33 km, 2 km of which are laid in pre-insulated pipes not set into canals. However the company covers only 4 of the 12 districts in the city which is 12% of the population.

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Objectives

The main objective is to identify suitable city disctricts where no DH is available and where new generations of solar district heating (SDH) could be developed, integrated in the urban environment.

Recognized suitable district will be analized and a feasibility study will be developed and disseminated to relevant stakeholders and public in order to attract attention on SDH technology and its commercial and environmental aspects and benefits.

Measures and actions

- The region was analysed and it was recognized that the most appropriate urban area for SDH installation is inside of city of Varna.
- A city district called 'Kaisieva gradina' was recognized as the most suitable area for the study: it is a dense, urban, residence area with blocks of flats, located next to the local DH plant, close to the existing DH net.
- The case study was coordinated with the stakeholders Varna Municipality and DH Veolia Varna and was developed in partnership with them.
- The results of the case study are going to be disseminated to the public during the capacity building seminar on June 21, 2017 in Varna.

Barriers and opportunities

Opportunities:

- Large national program for energy efficient residential buildings is operating at the moment, funded with 2 billion BGN from the national budget and 100% grant. The goverment expectation is to cover big part of the existing concrete blocks of flats from the 70-s and 80-s.
- Next to Varna, along the Black Sea seaside, a concetration of wind farms is situated and exists the possibility to buffer their excess energy into the seasonal buffers as part of SDH. This sinergy of different RE sources will make the seasonal storage more comercial viable.
- On contrary of its predecessors from Denmark where SDH is located next to low density urban areas, there is no space for solar fields available inside of high density city districts other then the roofs and facades. Fortunately the chosen district and its building typology provides plenty of such areas.
- Several price jumps of gas stroked the market in the last years, causing instability, social tension and a lot of public and political attention. Huge investments are needed for developing of additional gas supply network and alternative distribution, in order to ensure stability of the gas price in the near future. In such investment environment SDH is a new alternative that can diversify the energy market.

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- Only small part of the city population is covered from DH. Being most efficient heating technology with most low cost heat prices future new DH networks and investment initiatives are expected.

Barriers:

- RE is not included in the National program for energy efficiency residence buildings and only heat insulation and window refurbishment is granted.
- No national grant scheme for pilot project with RE is available.
- Being an innovative and unknown technology, SDH is not recognised from the authorities and DH suppliers as commercially viable alternative
- Bulgaria already has reached 19% RE goal manly because of large hydro and PV plans, and the solar heat is not recognised from the strategic documents as goal for acheving 20% RE in the national energy production, and it is not supported from the national RE programs.
- Bad public image of DH in general has rised over the years because of public scands caused of low quality services.
- There is no such type of DH operators having large solar heat fields. The solar heat is used manly for DHW (domestic hot water) and the biggest solar thermal installations are placed on seaside hotel roofs.

Results

The survey include 69 blocks of flats with total build up area 285 000 m^2. It was estimated that the effective heated area is only 180 000 m^2. There is no DH available in Kaisieva Gradina District. Main power source is based on electricity and heat pumps.

Several key studies show, that after refurbishment of each residential building the consumption of the end users will be 85 kWh/(m^2 y)*.

The survey explore the urban potential of the available spaces, where solar panels can be installed. Flat roofs are nominated as being most suitable for large scale installation. Being integrated part of the refurbishment – vertical south facades are also suitable for heat production. However the vertical walls will achieve 2 times less production / per unit investment comparing to the roofs. The heat production from the roof panels can cover 38 kWh/(m^2 y) of the heating demands while the wall panels can cover 2 kWh/(m^2 y) with total 60 kWh/(m^2 y). Finally 70% of total yearly heat consumption of the end users after refurbishment of the buildings will be covered from the solar panels.

It was calculated, that 50% of the heating demands will be DHW which demands can be covered completely from the solar fraction. In addition it was evaluated, that for the district heating network at least 6.0 GWh energy is needed to be stored or buffered for seasonal usage in the winter. Due to lack of sufficient space for large

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water-based seasonal storage in the district, it is suggested to explore the possibilities to buffer the surplus energy in larger city DH, as being the most cheapest solution. Further calculations and evaluations with the local DH company are planned.

It prepared preliminary concept design of the solar roof and walls installations with custom sizes that can suit to the geometry of the buildings (modular panel systems, produced in 80-s). Custom sizes of 1.40x5.50 and special substructure are needed to be produced for the perfect much.

**Note: The total average consumption of this generation concrete block of flats before refurbishment is 120* kWh/(m^2 y) *for heating and DHW with ratio 60/40. After refurbishment the consumption of the heating is going to be diminished at least 30% and the final consumption of the end users is evaluated to be 85* kWh/(m^2 y) *with ratio 50/50 between heating and DHW.*

Lessons learned

We have found a friendly attitude both from the local heating company and the municipality, although SDH still remains an exotic topic for non-granted investment due to above mentioned barriers. However personal interest from stakeholders was expressed and future partnership for overcoming the barriers was agreed.

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