




Factsheet

IKB Smart District



SINFONIA stands for "Smart INitiative of cities Fully cOMmitted to iNvest In Advanced large-scaled energy". This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 609019

PROFILE

Name and address	<p><i>IKB Smart District</i> <i>Langer Weg 32</i> <i>6020 Innsbruck</i> <i>Austria</i></p>
Map	 <p><i>Source: Google Maps</i></p>
Type of installation	<p>The IKB-Smart-District includes several buildings. In the center is the Showroom where most of the units are located. On nearly all roofs PV plants are installed. Between the location “heating room” and the Showroom the heat pipes were built, and a micro heating grid installed. The heat storage tanks are located in the Showroom and the heating room. The other departments like the Recycling Center and the electricity grid department are connected by a micro grid for electricity. Charging stations for the electrical cars are also located close by the showroom and on the other side of the street at the electricity grid department.</p>
Ownership	<p>Innsbrucker Kommunalbetriebe AG</p>

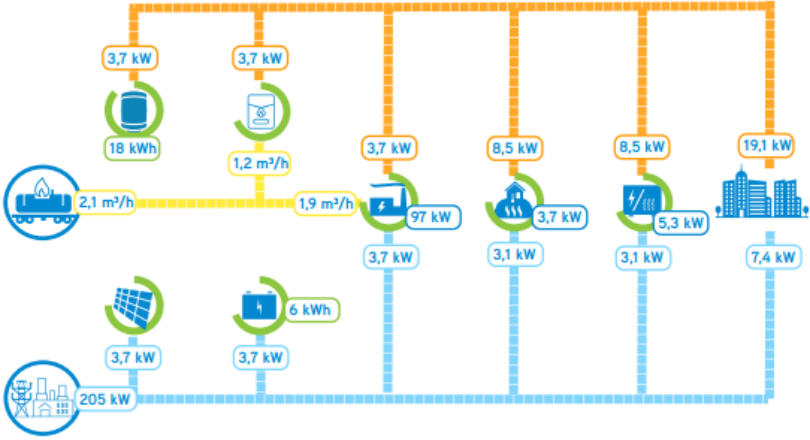


Capacity	<p>Biogas CHP 262 kW_{el} / 375 kW_{th}</p> <p>Heat Pumps 2 x 95.7 kW_{th}</p> <p>Heat storage Tanks 1 x 10,000 litre 6 x 1,500 litre</p> <p>Electric heating element 200 kW_{el}</p> <p>Heat exchanger sewage water 150 kW_{th}</p> <p>PV-plant – LW32 14.82 kWp</p> <p>PV-plant – RCH 122.58 kWp</p> <p>PV-plant – Triendlgasse 50.76 kWp</p> <p>Battery storage 27.60 kWh</p>
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THE CONCEPT

Detailed characteristics of the device / infrastructure / service	<p>The project “IKB Smart District” includes the following major components:</p> <ul style="list-style-type: none"> • Biogas CHP • Heat Pumps • Heat storage Tanks • Electric heating element • Heat exchanger sewage water • PV-plants • Sensors- & monitoring equipment • Battery storage
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<p>Concept</p>	<p>The figure shows a simplified schematic representation of the project:</p>  <p>The diagram illustrates a complex energy network. At the top, a dashed orange line represents a main distribution network. Below it, several components are connected: a CHP unit (205 kW), two heat pumps (97 kW and 97.7 kW), two heat storage tanks (18 kWh and 6 kWh), and several buildings. Energy flows are indicated by arrows with values: 2.1 m³/h, 1.2 m³/h, 1.9 m³/h, 3.7 kW, 8.5 kW, 8.5 kW, 19.1 kW, 3.7 kW, 3.1 kW, 3.1 kW, 7.4 kW, 3.7 kW, 3.7 kW, 3.7 kW, 3.7 kW, 5.3 kW, and 97 kW. The CHP unit is connected to a 205 kW power source. The heat pumps are connected to a 97 kW power source. The heat storage tanks are connected to a 18 kWh and 6 kWh storage capacity. The buildings are connected to various power sources and energy flows.</p>
<p>Energy solutions</p>	<p>The aim of the project was the implementation of an innovative hybrid grid to connect the different sectors of electricity, heat and gas. For this purpose, several technical facilities, such as: heat pumps, CHP, heat storage tanks, battery storages, PV systems and a sewage water heat exchanger were built.</p>
<p>Technologies considered in the design</p>	<p><u>Biogas-CHP:</u> As part of IKB Smart District project, a new biogas CHP were installed within showroom to convert biogas (biogas use proven through certificates) into electricity and heat. The electric power is 262 kW and the thermal power 375 kW.</p> <p><u>Heat pumps:</u> Heat pumps are considered a key technology to integrate the heating sector into the electricity-based energy system. These devices use electricity to circulate hot/cold liquids, using the heat from outside air, geothermal heat, ground or sewage water. As part of IKB Smart District project, two heat pumps with a thermal power of 95.7 kW for each were installed. As an energy source, the wastewater from the nearby sewer is used.</p> <p><u>Heat storage tanks:</u> To store the generated heat, several heat storage tanks with a total capacity of 19 m³ were built. The large storage tank with 10 m³ is situated in the showroom of Langer Weg 32 and the storage cascade with 9 m³ (6 x 1.5 m³) were situated in the technical room of Rossaugasse 2.</p> <p><u>Electric heating element:</u> The installed Power-to-heat system is operated according to the flow heater principle and has an electrical power of 200 kW. Due to the almost lossless conversion, the thermal performance of 200 kW is</p>



	<p>also obtained. All components of the power-to-heat system (continuous flow heater, heat exchangers, main pumps, control technology) are located in the showroom of the project.</p> <p><u>Inline heat exchanger for sewage water:</u> The installed inline heat exchanger is a module sewer heat exchange system for subsequent installation in existing sewers. The modules are introduced into the sewer using the available shaft infrastructure and are securely mounted. The heat exchange surface is completely supplied by warm wastewater (between 8°C and 22°C). The heat exchanger itself is perfused with heating water. Energy is thus extracted from the warm wastewater.</p> <p><u>PV systems:</u> In addition to the existing PV plants, several new PV plants with a total capacity of 188.16 kWp were built. The new plants were integrated into the overall system.</p> <p><u>Battery storage:</u> To match electricity supply and demand a battery storage with a capacity of 27.60 kWh has been installed in the showroom. As technology, a lithium-iron-phosphate battery was used.</p>
Performance targets	<p>expected amount of produced heat: 1,855 MWh/a</p> <p>expected amount of produced electricity: 1,020 MWh/a</p> <p>expected amount of reduced CO₂: 863 t/a</p>
Financing model	Direct investment of IKB 85%, national grant: 10 % and EC grant: 5%

IMPLEMENTATION

Contracting authority	IKB Innsbrucker Kommunalbetriebe AG
Project manager	Sophia Neuner (IKB)
Manufacturer / supplier	Ortner (pipeline construction and main components) Doma (measuring and control technology) Uhrig (sewage water heat exchanger)
Other involved companies	
Cost breakdown	The total investment costs are in order of 3.2 Mio. €, Estimated payback time is: 10a



Implementation planning	
1 - Design	05/2017
2 – Public procurement	01/2018
3 – Completion	04/2019



Work progress	
Milestones	 <p><i>figure 1: CHP plant in the IKB Smart District fired with biogas</i></p>  <p><i>figure 2: One of two heatpumps in the IKB Smart District</i></p>





figure 3: Heat storage tank cascade – 6 x 1,500 litres



figure 4: Power-to-heat system in the IKB-Smart-District





figure 5: Inline heat exchanger for sewage water



figure 6: PV plant Showroom - Langer Weg 32





figure 7: PV plant -Recycling Center - Rossaugasse 4



figure 8: PV plant - Trientlgasse





figure 9: Battery storage – Langer Weg 32

MONITORING

<p>Monitoring System</p>	<p>The entire system has a modern process control system, which connects all components with each other. All measured values required for operation are recorded in the system. In order to assess the performance of the individual components, KPIs are calculated.</p>
<p>Monitored variables and figures</p>	<p>The following data is recorded for the Sinfonia project:</p> <ul style="list-style-type: none"> • energy input and output [kWh_{el}, kWh_{th}] • reduction of CO₂ [t/a]



LIFE CYCLE ANALYSIS

Estimated lifetime	Heat pumps: 20 yrs Biogas CHP: 20 yrs Measuring and control system: 15 yrs Sewage water heat exchanger: 20 yrs PV plants: 20 yrs Buildings: 50 yrs Pipe systems: 20 yrs Battery storage: 8 yrs Heat storage tanks: 20 yrs
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