




Factsheet

Powerhouse Rossau



SINFONIA stands for "Smart INitiative of cities Fully cOmitted 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>Wastewater treatment plant Innsbruck Josef-Mayer-Nusser Weg 30 6020 Innsbruck Austria</i></p>
Map	 <p><i>Source: Google Maps</i></p>
Type of installation	<p>The RES-based energy potential at the site of Innsbruck wastewater treatment plant (WWTP) is used to generate heat, electricity, activated carbon and dried sewage sludge, which can be used as a substitute fuel. For this purpose, a smart combination of several components is necessary. The produced biogas, the accruing sludge of the WWTP, solid biomass wood chips and different types of waste heat are used as a primary energy source. The biogas is used in the CHP and in the hot water boiler of the sewage dryer, while the heat recovery is carried out by an air-to-water heat exchanger. The biomass gasification plant produces electricity, heat and activated carbon from wood chips. The energy derived from renewable sources is used for internal (WWTP) and external (public indoor swimming pool, restaurant at the public swimming lake, DH grid Innsbruck) consumers.</p>



Ownership	Innsbrucker Kommunalbetriebe AG
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Capacity	<p>Biomass gasification plant 261 kW_{el} / 393 kW_{th}</p> <p>Biogas CHP 1,702 kW_{el} / 1,866 kW_{th}</p> <p>Biogas hot water boiler 1,800 kW_{th}</p> <p>Heat recovery – sewage sludge dryer 385 kW_{th}</p> <p>Façade integrated PV plant – biomass gasification plant 15,12 kWp</p> <p>Conventional PV plant – biomass gasification plant 34,29 kWp</p> <p>Conventional PV plant – public indoor swimming pool 18,72 kWp</p>
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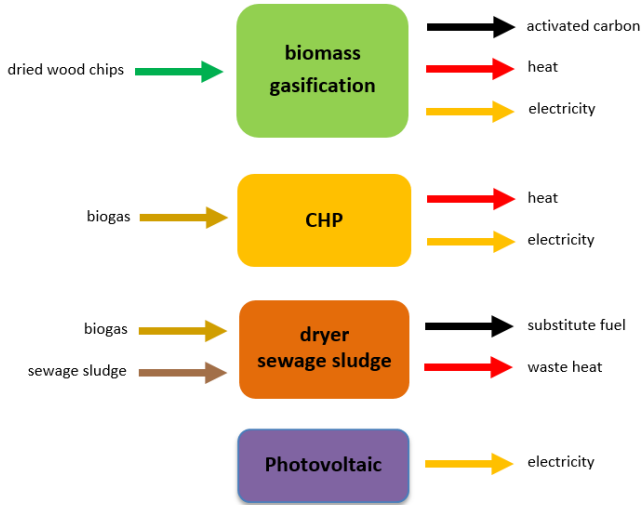
THE CONCEPT

Detailed characteristics of the device / infrastructure / service	<p>The project “Powerhouse Rossau” includes the following major components:</p> <ul style="list-style-type: none"> • biogas-CHP, • dryer for sewage sludge, <ul style="list-style-type: none"> ▪ biogas hot water boiler ▪ heat recovery - sewage sludge dryer • biomass gasification plant, <ul style="list-style-type: none"> ▪ façade integrated photovoltaic plant ▪ conventional photovoltaic plant
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| | <ul style="list-style-type: none">• photovoltaic plant at public indoor swimming pool. |
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<p>Concept</p>	<p>The figure shows a simplified schematic representation of the project:</p>  <p>The diagram illustrates the energy production processes. It features four main components: biomass gasification (green box), CHP (yellow box), dryer sewage sludge (orange box), and Photovoltaic (purple box). Biomass gasification takes dried wood chips as input and produces activated carbon, heat, and electricity. CHP takes biogas as input and produces heat and electricity. The dryer sewage sludge process takes biogas and sewage sludge as input and produces substitute fuel and waste heat. Photovoltaic technology produces electricity.</p>
<p>Energy solutions</p>	<p>The aim of the project was to transform the treatment plant Innsbruck from an energy consumer to an energy supplier. Both established technologies and technologies with a high degree of innovation were used. The energy generated is available to both internal and external customers. For this purpose, a district heating pipe was built, which was connected to the district heating network of Innsbruck. As a result, a bidirectional heat exchange is possible.</p>
<p>Technologies considered in the design</p>	<p><u>Biogas-CHP:</u> As part of Sinfonia, two new biogas CHP were installed at the wastewater treatment plant Innsbruck to convert biogas into electricity and heat. The plant has an electrical efficiency of 41 percent and a thermal efficiency of 45 percent, resulting in an overall efficiency of 86 percent. The electric power is 1,702 kW and the thermal power 1,866 kW.</p> <p><u>Dryer for sewage sludge:</u> The implemented drying system reduces the sewage sludge mass by up to 75 percent, which in turn reduces the number of transport journeys and leads to</p>



	<p>considerable savings in CO₂ emissions. The dryer is supplied by a biogas hot water boiler and the CHP's. Furthermore, the dryer is equipped with a highly efficient waste heat recovery system. The drying process produces around 4,000 tonnes of sludge granules per year with an energy potential of 13,000 MWh. The sludge granules can be used as a substitute fuel.</p> <p><u>Biomass gasification plant:</u> In order to expand the supply of generating plants, an innovative demonstration plant for electricity and heat generation from renewable energies was realized. Local wood residues from forests and public parks are converted into wood gas, which is efficiently converted into electricity and heat in a combined heat and power plant. The heat is used as process heat for the wastewater treatment plant or transported to the nearby public indoor pool and the new restaurant on the public bathing lake. The by-product is activated carbon, which can be used in agriculture.</p> <p><u>Conventional photovoltaic plant - public indoor swimming pool:</u> A photovoltaic system was built on the roof of the nearby public indoor swimming pool to cover a part of the own electricity consumption.</p> <p><u>Façade integrated photovoltaic plant - biomass gasification plant:</u> A photovoltaic system was built on the building facade of the biomass gasification plant to cover a part of the own electricity consumption.</p> <p><u>Conventional photovoltaic plant - biomass gasification plant:</u> A photovoltaic system was built on the roof of the of the biomass gasification plant to cover a part of the own electricity consumption.</p>
Performance targets	



	<p>expected amount of produced heat: 21,662 MWh/a</p> <p>expected amount of produced electricity: 6,995 MWh/a</p> <p>expected amount of heat supply to DHG: 2,681 MWh/a</p> <p>expected amount of produced sludge granulate: 4.000 t/a</p> <p>expected amount of produced activated carbon: 1,348 t/a</p> <p>expected amount of reduced CO₂: 11,440 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	Syncraft (biomass gasification plant) Huber SE (sewage dryer) GE Jenbacher (biogas engine)
Cost breakdown	The total investment costs are in order of 9.2 M€, Estimated payback time is: 10a



Implementation planning	
1 - Design	10/2014
Description of step:	Planning and preparation of engineering
2 – Public procurement	02/2016
Description of step:	Procurement divided into 3 main parts
3 – Completion	09/2017
Description of step:	3 phases of completion, test operation of 3 months


Work progress	
Milestones	 <p><i>Figure 1: biomass gasification plant with façade integrated PV plant</i></p>





Figure 2: district heating pipes from WWTP to public indoor swimming pool



Figure 3: PV plant at public indoor swimming pool



Figure 4: biogas CHP at the side of WWTP





Figure 5: sewage sludge dryer at the side of WWTP

MONITORING

Monitoring System	<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>
Monitored variables and figures	<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}] • production of biogas [m³/h] • reduction of CO₂ [t/a]

LIFE CYCLE ANALYSIS

Estimated lifetime	<p>Biomass gasification plant: 20 yrs</p> <p>Biogas CHP: 20 yrs</p> <p>Biogas hot water boiler: 20 yrs</p> <p>Sewage sludge dryer: 20 yrs</p>
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	PV plants: 20 yrs Buildings: 50 yrs Pipe systems: 20 yrs
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