

Pangalactic Gargleblaster

- 1 Tablespoon Gin**
- 1 Tablespoon Light Rum**
- 1 Tablespoon Vodka**
- 1 Tablespoon Tequila**
- 2 Tablespoons Creme de Menthe Liqueur**
- 2 Tablespoons Galliano**
- 1 Cup Ice Cubes**
- 1 Slice Lemon**

Combine the gin, rum, vodka, tequila, creme de menthe, Galliano and ice in the container of a blender. Cover, and blend until slushy. Pour into a glass and garnish with a slice of lemon.

How combined spatial energy planning, simulation and stakeholder integration lead to sustainable district heating systems

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Keith O'Donovan, Basak Falay

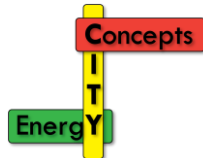
AEE - Institute for Sustainable Technologies (AEE INTEC)
8200 Gleisdorf, Feldgasse 19, AUSTRIA

The example of Gleisdorf

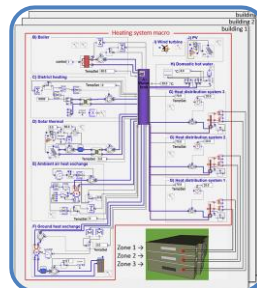
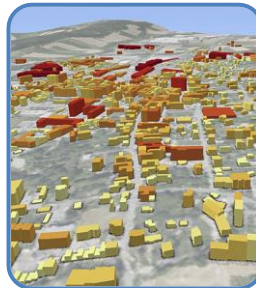
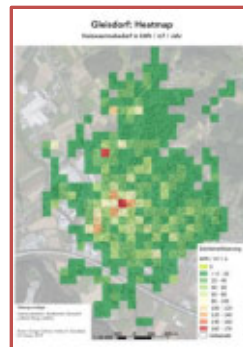
- 6.073 inhabitants
- Urban area: 475.4 ha
- ~35% built environment (buildings + traffic areas)



Spatial and energy analysis



Spatial energy and infrastructure analysis and modeling GIS, statistics, energy balancing, roadmapping



Data acquisition, geodatabase management

Pre-processing (check, verify, extend database)

Spatial analysis / spatial modeling

- Characterization of existing infrastructures, energy demands and local resources

Renovation and modernization roadmap

- Building renovation roadmap based on hourly HWB* calculation (acc. to EN ISO 13790)
- Scenarios for increased share of renewables in heating sector and DH extension

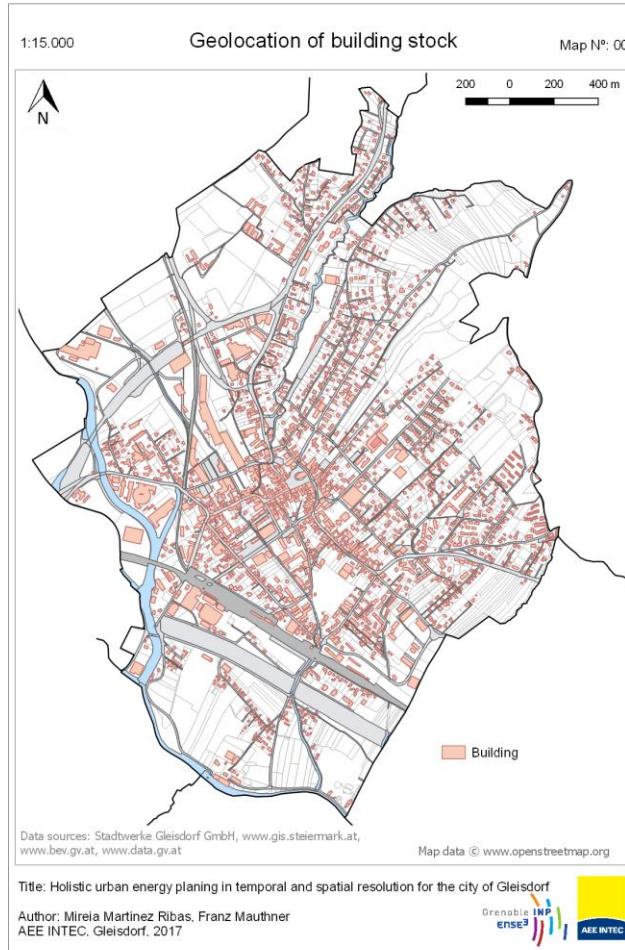
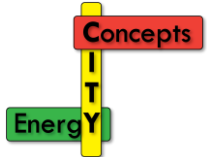
Dynamic component & DH network simulation

- Automated workflow coupling geodatabase with simulation framework

In-depth analysis / simulations in high temporal resolution
physical models, (dynamic) simulation

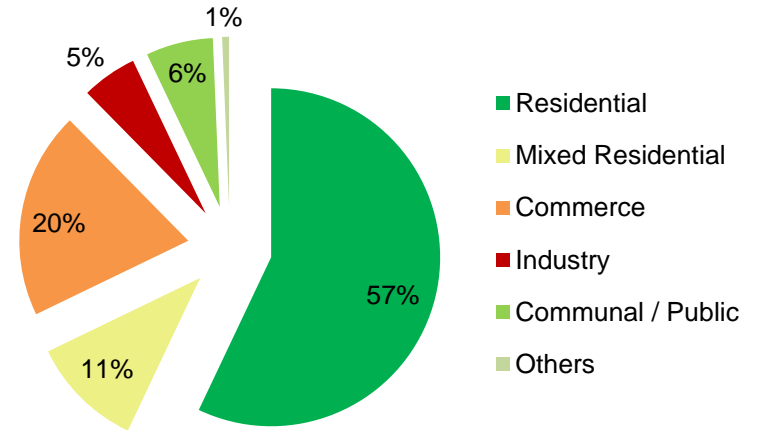
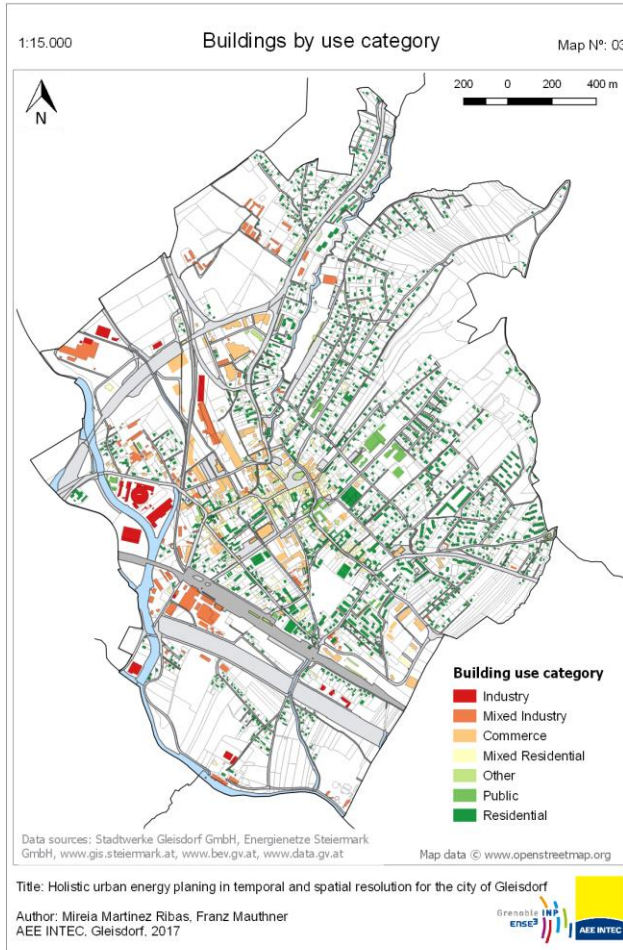
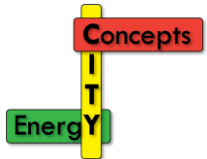
*HWB = German abbr. for space heating demand

Building stock and energy networks



- 6.073 inhabitants
- Urban area: 475.4 ha
 - ~35% built environment (buildings + traffic areas)
- Building infrastructure
 - 1.731 addresses
 - 1.902 buildings
 - 734.000 m² GFA
- Energy networks
 - 50.3 km natural gas network
 - 6.7 km district heating trench

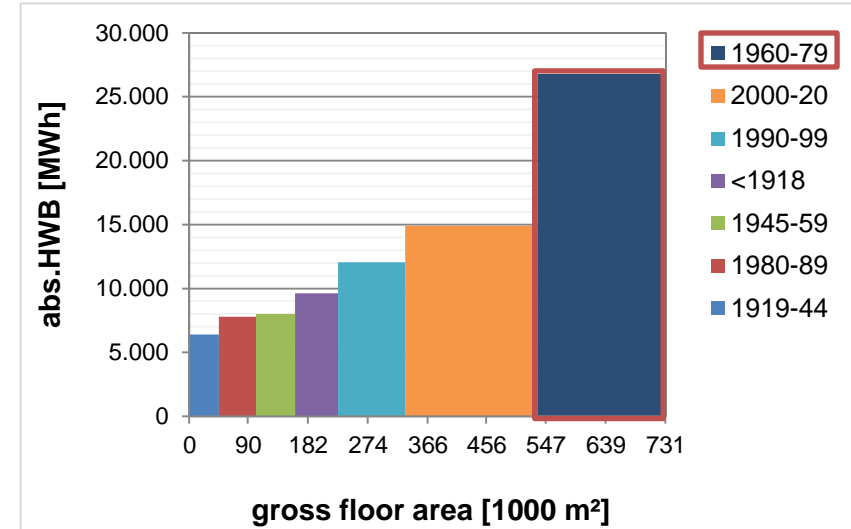
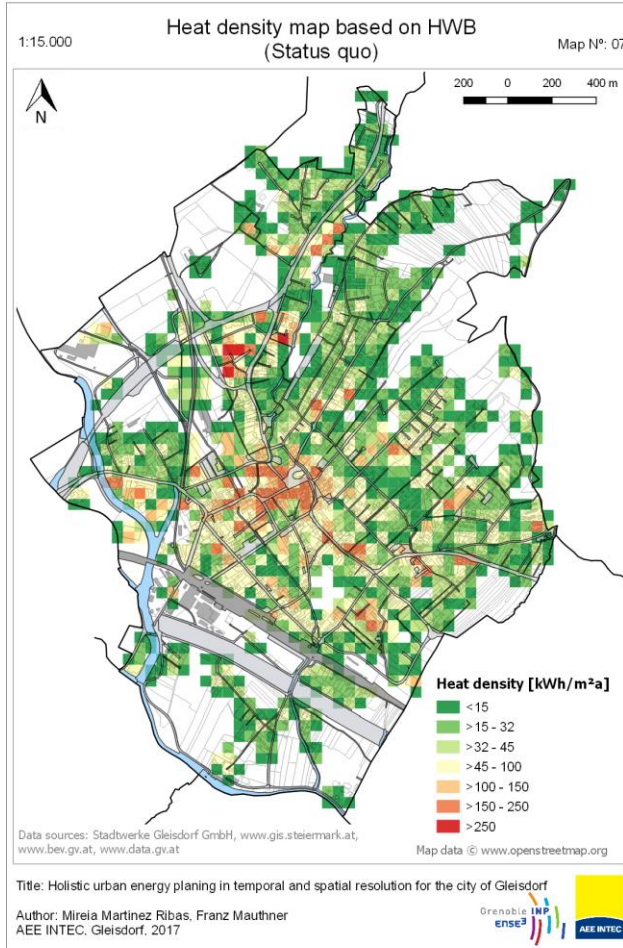
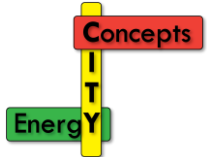
Analysis of building stock: Building use category



- Distribution by building use category*
 - ~75% residential and public buildings as well as mixed use in city center
 - ~25% industry and commerce

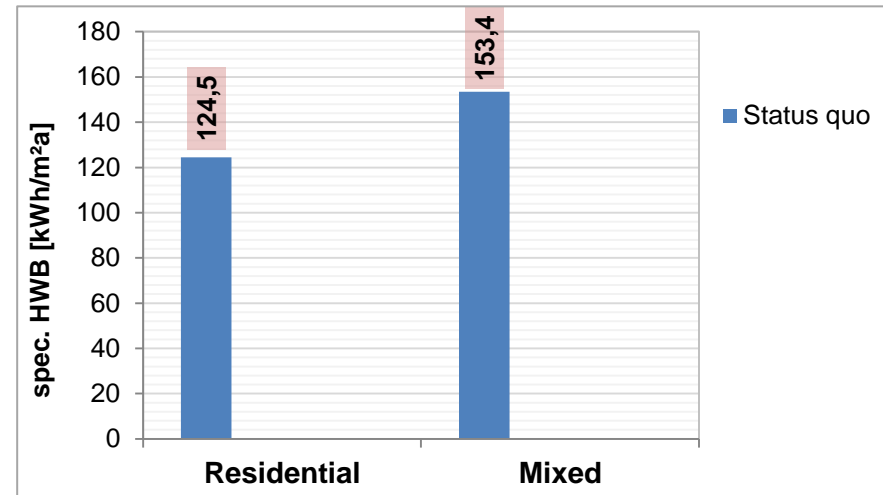
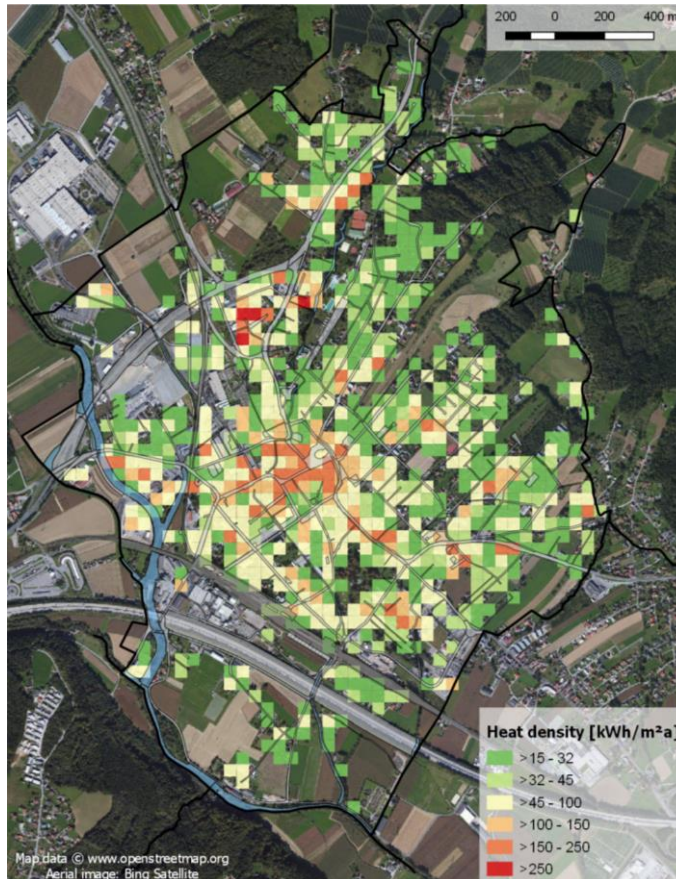
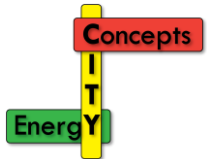
*weighted by heated gross floor area (GFA)

Analysis of building stock: Heat density map → kWh per raster area



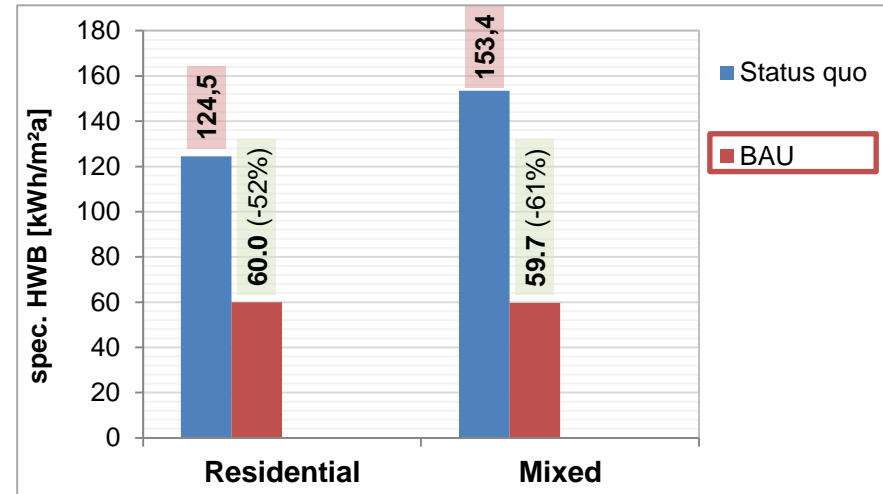
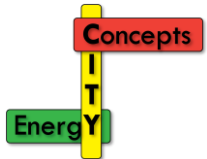
- Buildings built between 1960 and 1979 will account for the highest energy savings
- → starting point for building renovation roadmap

Heat density map – Status quo



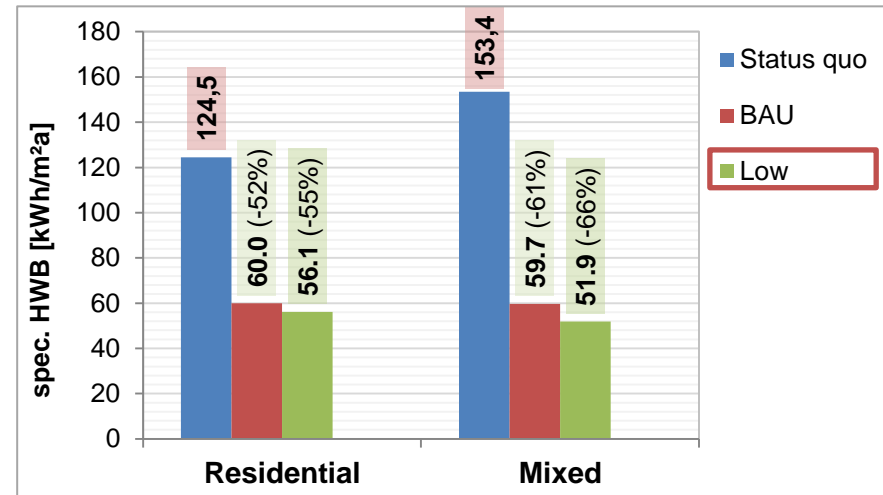
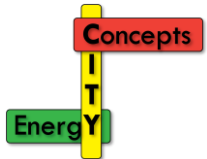
- Status quo
 - Total No. of buildings: 1,902
 - Residential / Mixed residential: 1,599 (447 already refurbished)
 - Other: 303 (industry, commerce)

Heat density map – BAU scenario 2050



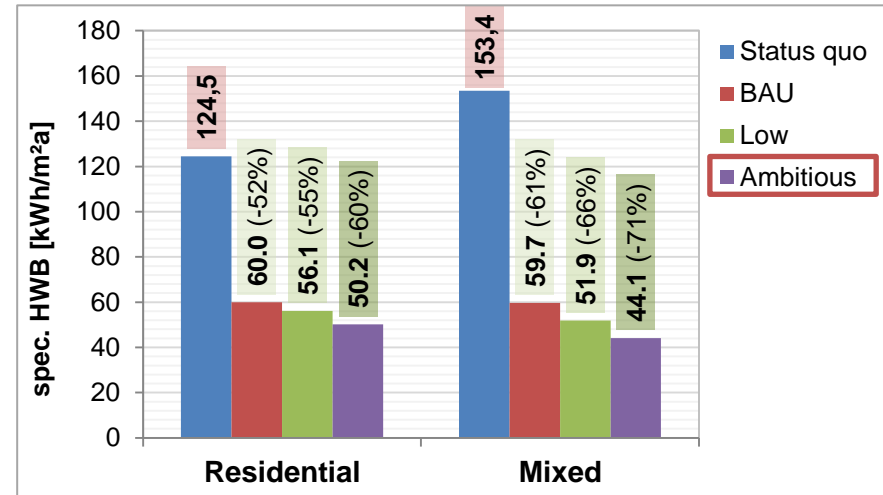
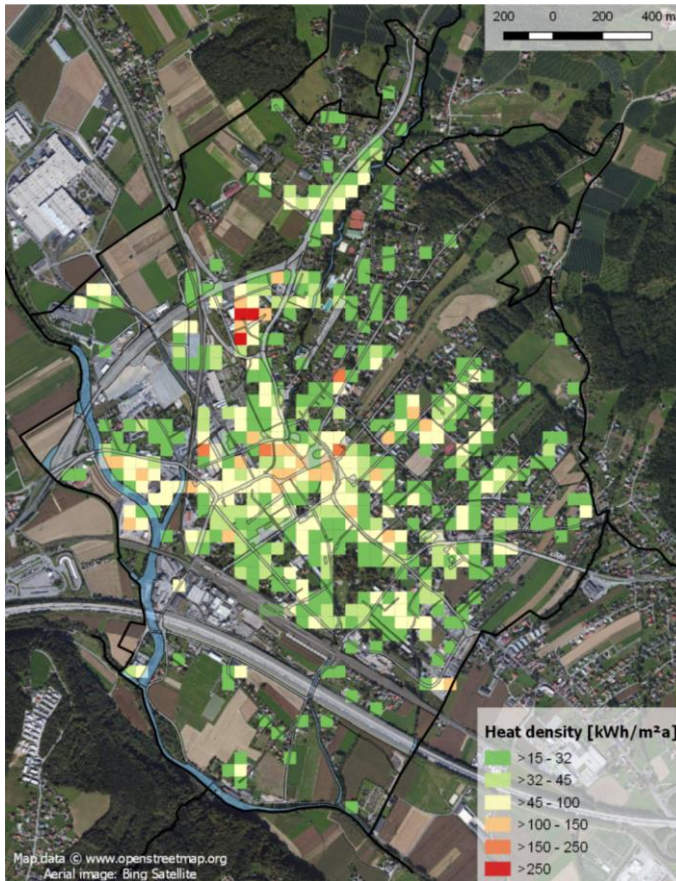
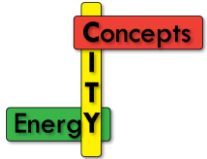
- BAU scenario
 - Renovation rate: 1.21%
 - 761 buildings
 - Space heating reduction: 52-60%

Heat density map – Low scenario 2050



- Low scenario
 - Renovation rate: 1.65%
 - 1,037 buildings
 - Space heating reduction: 55-66%

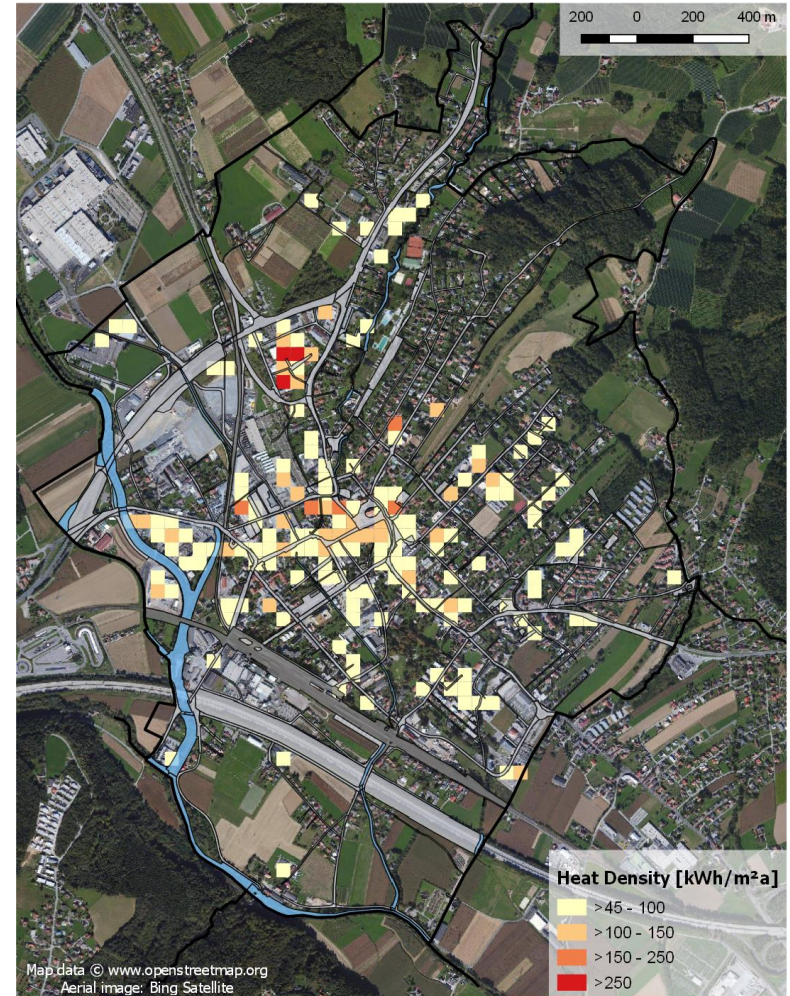
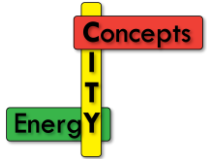
Heat density map – Ambitious scenario 2050



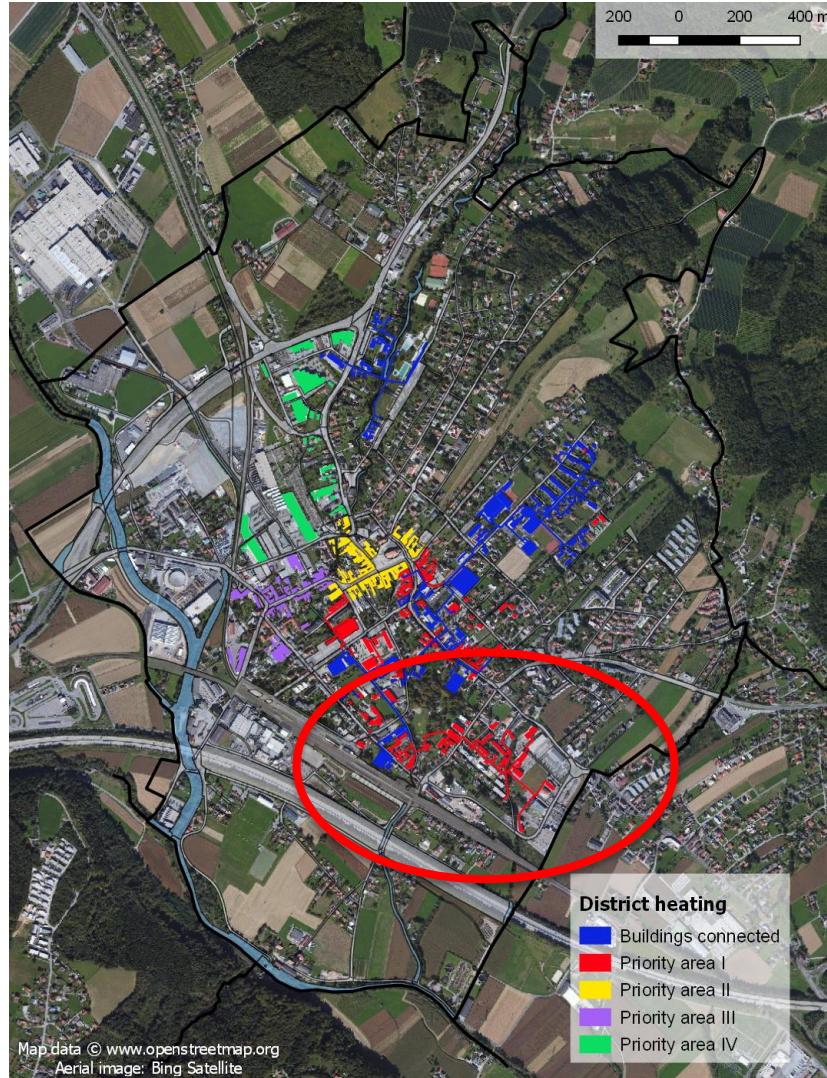
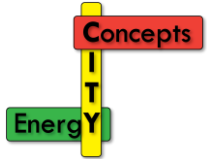
- Ambitious scenario
 - Renovation rate: 2.16%
 - 1,358 buildings
 - Space heating reduction: 60-71%

District heating potential areas

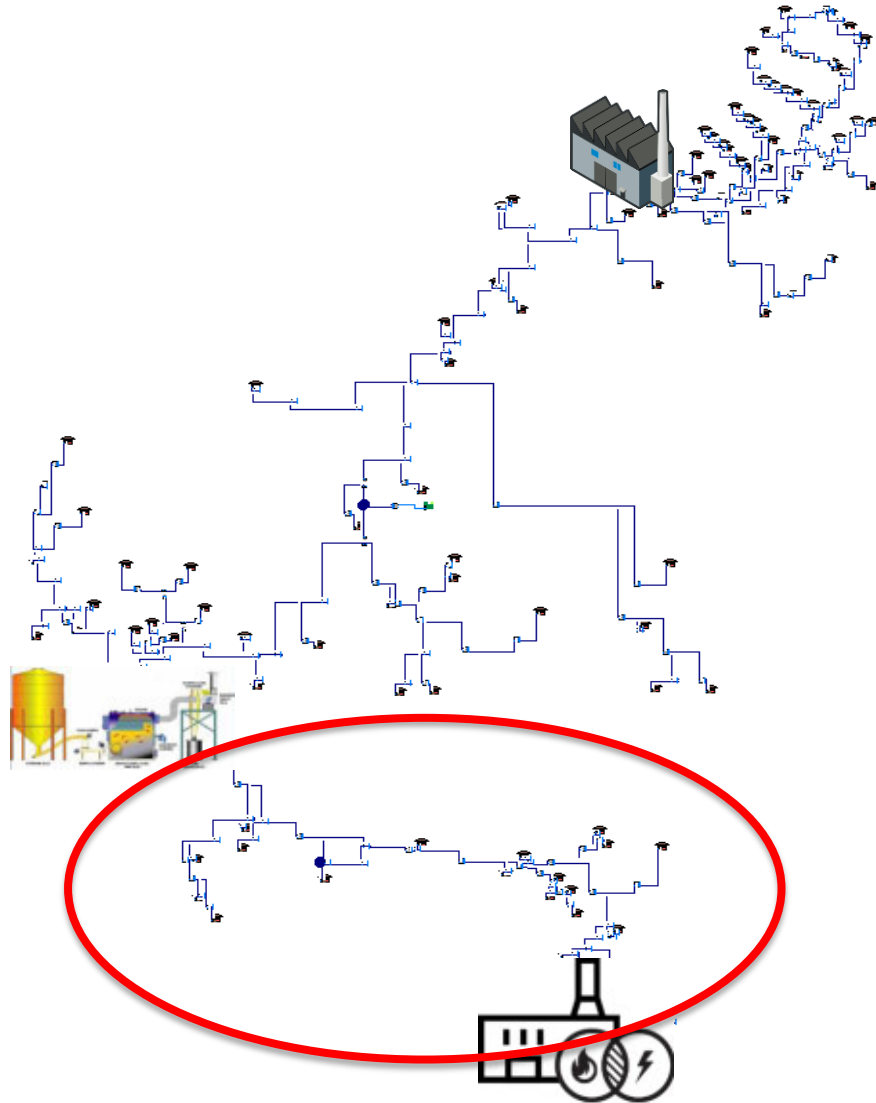
- Status quo
- Technical potential > 32 kWh/m²/a
- Techno-economic potential > 45 kWh/m²/a



Priority areas for district heating

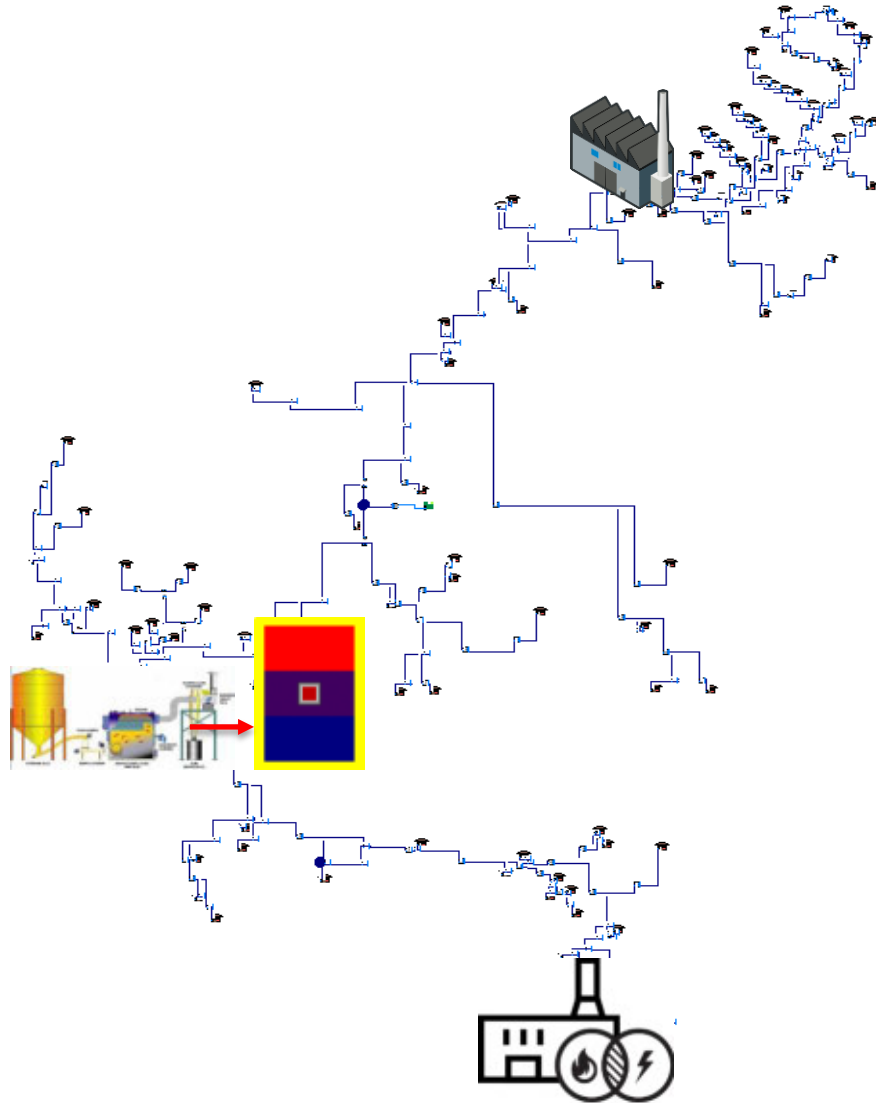


Case Study I: Reference Scenario



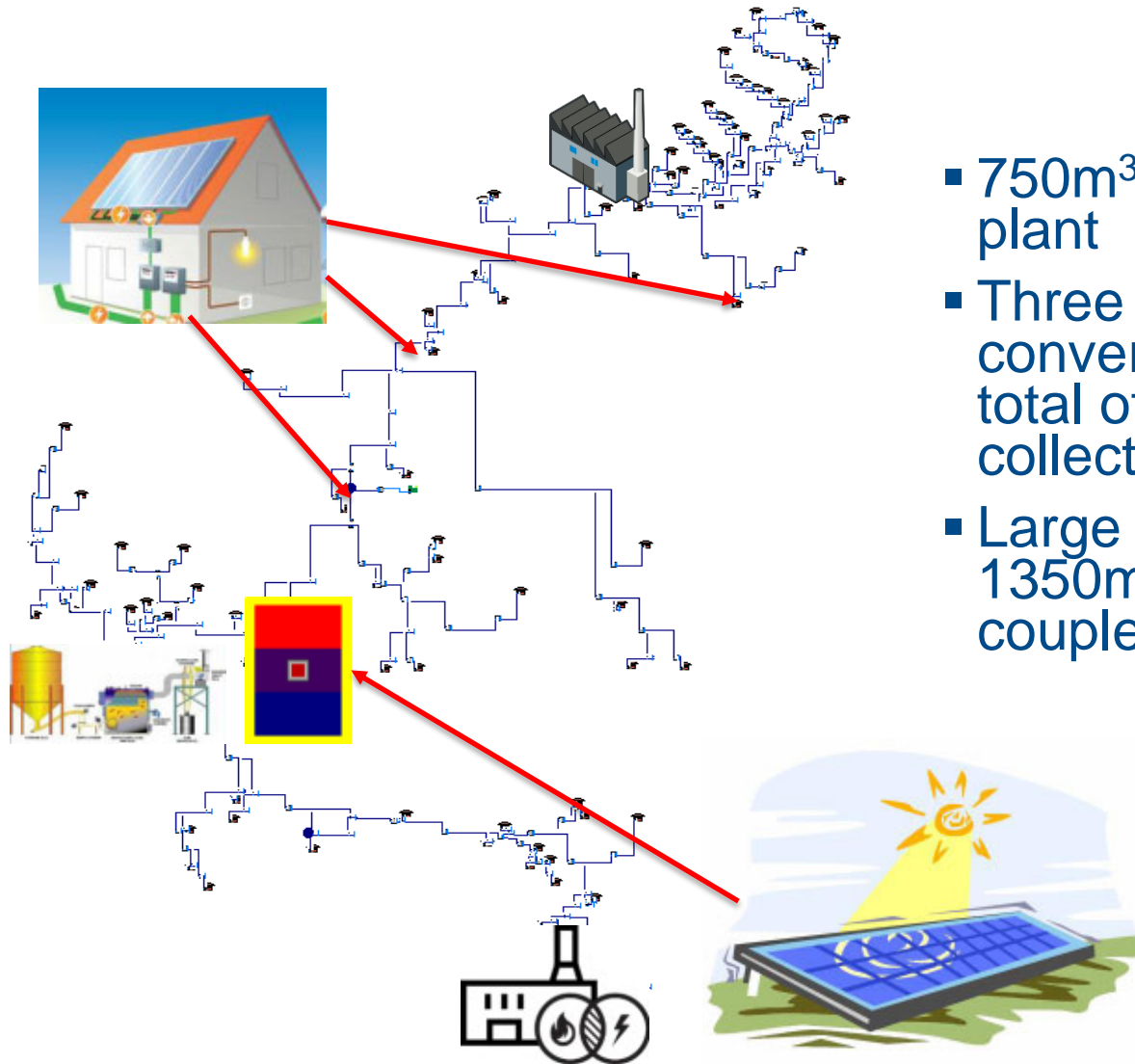
- Three Production Sites:
 - Base Load: 3MW Biomass Plant
 - Peak Load: 2MW Gas Plant
 - Constant 300kW from CHP
- Expected 115 consumers in extended network
- Peak loads up to 6.5MW
- Total length ~ 7.7km

Case Study II: Network with buffer storage



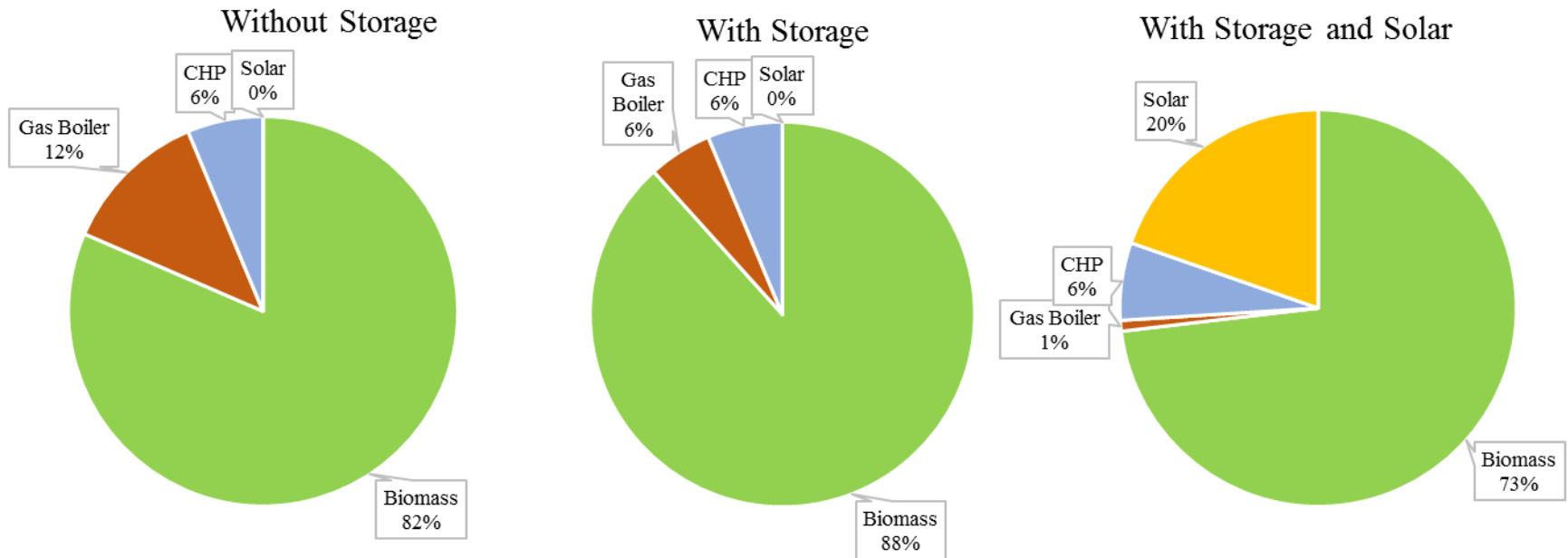
- 750m³ Storage at Biomass plant
- Storage charged from biomass during times of low heat demand
- Tank discharges stored heat during times of high demand
- Peak boiler only used when insufficient energy from storage/biomass available

Case Study III: Upgraded Future Network



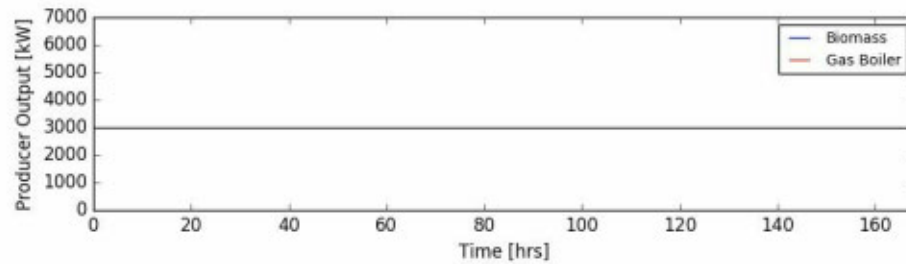
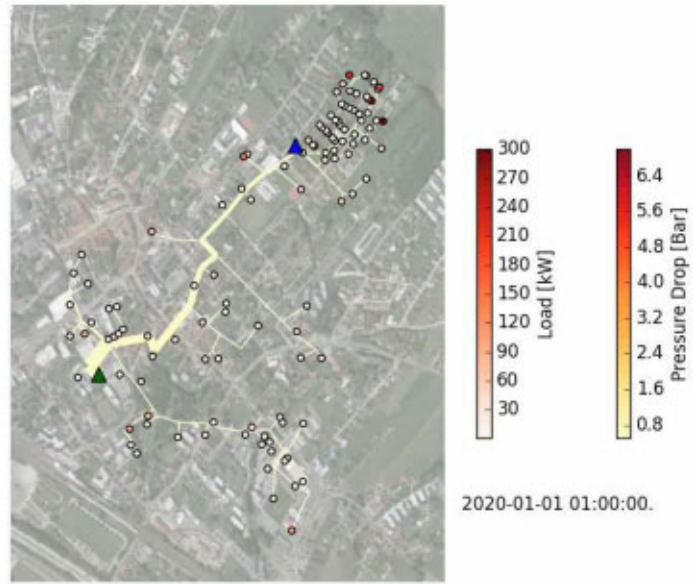
- 750m³ Storage at Biomass plant
- Three large consumers converted to prosumers with a total of 150m² Solar thermal collectors
- Large solar thermal collector 1350m² field added and coupled to storage.

Energy mix comparison over 4 month period (January – April)

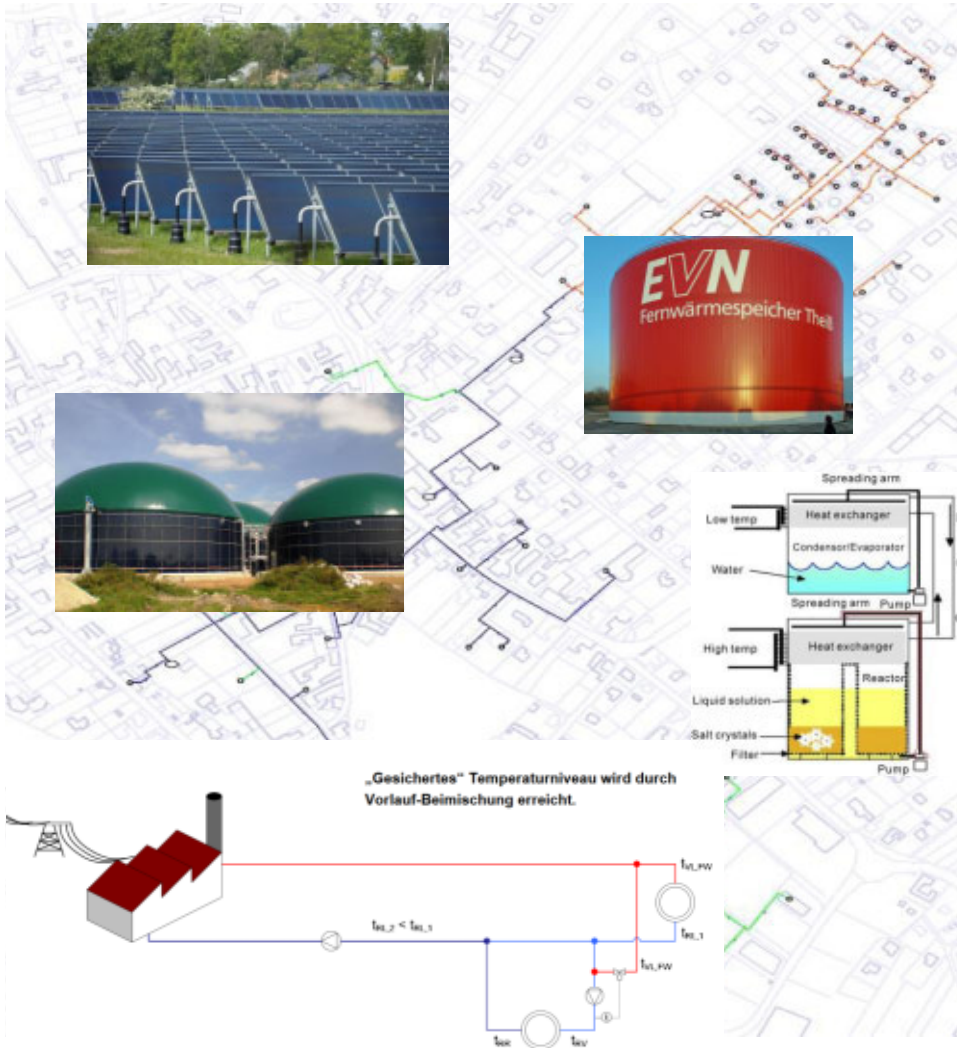


- Buffer storage + solar collectors increase share of total renewables (Biomass + Solar) from 82% to 93%

System dynamics visualisation



Future Options for Gleisdorf's Energy Network



- Large Scale storage
- Increased Solar Thermal energy fraction
- Supply from the return pipe
- Biogas from Waste Water Treatment plant
- Compact sorption heat storage
- Improvement in unit commitment



AEE INTEC

IDEA TO ACTION

**Thank you
for your Attention**

Acknowledgements

AEE INTEC

Concepts

Energy



■ EnergyCityConcepts

- Methoden- und Konzeptentwicklung zur Implementierung nachhaltiger Energiesysteme in Städten am Beispiel von Gleisdorf und Salzburg
- Stadt der Zukunft 2. Ausschreibung, FFG-Projekt Nr. 850129

STADTWERKE GLEISDORF

TU Graz STADT: SALZBURG

SALZBURG AG

SIR rtsa iSPACE

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Bundesministerium
für Verkehr,
Innovation und Technologie



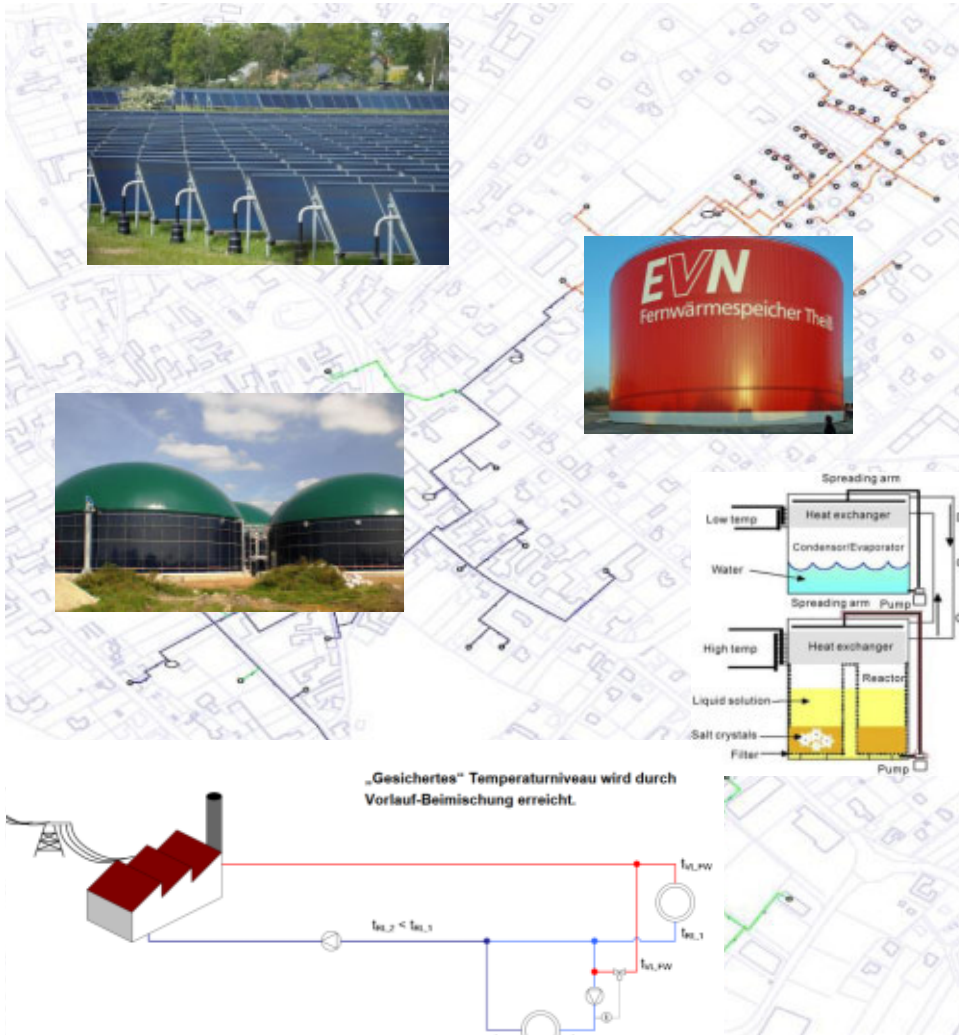
STADT
der Zukunft

■ ResearchStudioAustria „EnergySimCity“

- Ganzheitliche Analyse und Simulation von Energiesystemen und Ressourcenverbänden in Städten und Stadtquartieren
- Research Studios Austria 4. Ausschreibung, FFG-Projekt Nr. 884732



Future Options for Gleisdorf's Energy Network



- Large Scale storage
- Increased Solar Thermal energy fraction
- Supply from the return pipe
- Biogas from Waste Water Treatment plant
- Compact sorption heat storage
- Improvement in unit commitment