

Combining new buildings and deep retrofit at Stadtwerk Lehen

A case study from Salzburg



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SIR – Salzburg Institute of regional planning and housing

- ➔ Non profit organisation in fields of spatial planning, housing, energy
- ➔ Consultancy, pilot projects, research
- ➔ Members of the association: all municipalities of Salzburg, city of Salzburg, federal state of Salzburg, housing associations, ...
- ➔ Consultant for city of Salzburg: Spatial planning issues, energy strategy, innovative housing projects, ...



Starting Situation

City of Salzburg

General development plan with focus on sustainability

Concrete figures for efficiency of buildings and use of renewable energy

District of Lehen

Masterplan for re-development of a district with structural problems

Chance by development of a demolished old commercial site



Objectives

Development of an energy concept

- focussing on supply concept with high share on renewables (>30%)
- considering existing district heating system
- based on high thermal standards for new buildings
- including existing building stock / opportunity for renovation / modernisation



Challenge

Involvement of all owners, tenants and stakeholders in the whole community

Key figures / core area

New Buildings

- 300 dwellings
- students' hostel (97 apartments)
- Commercial buildings / laboratories

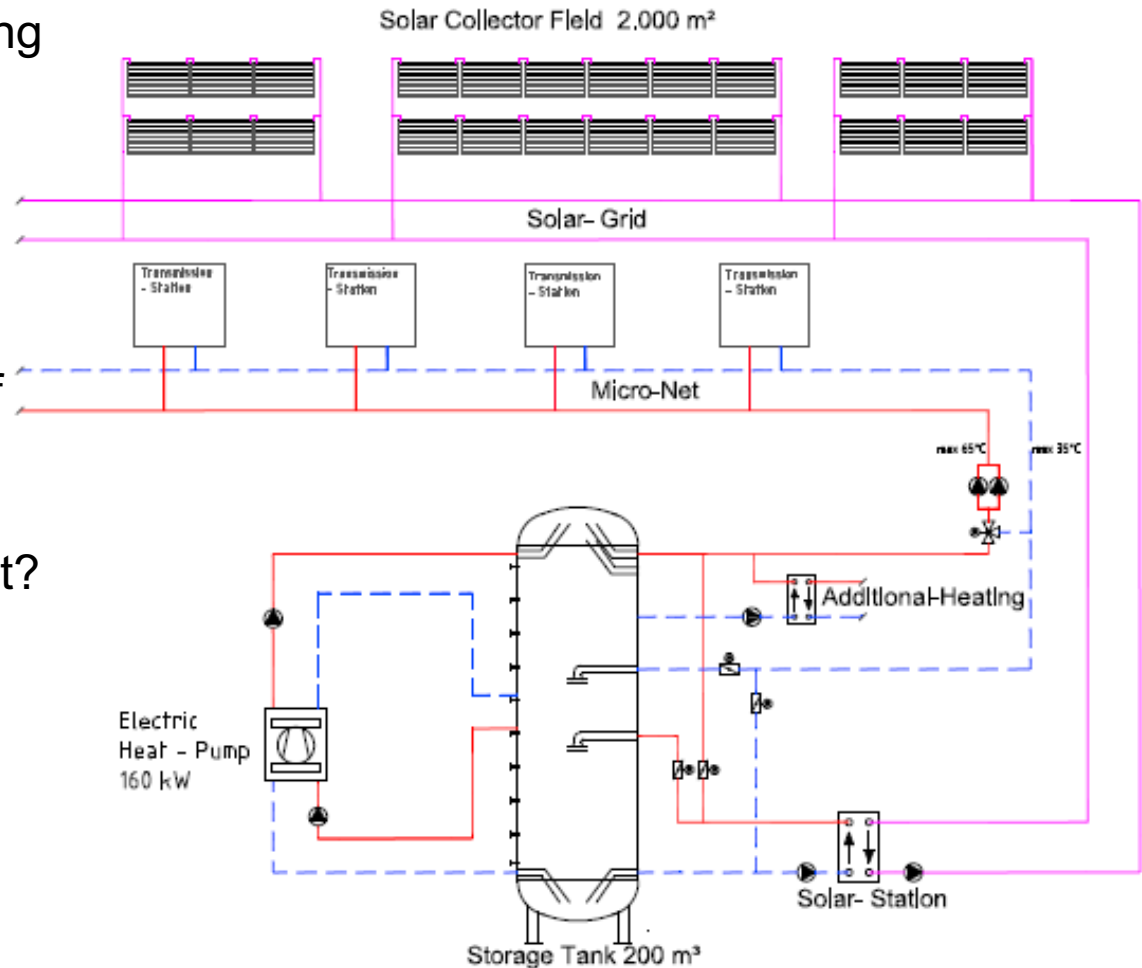
Buildings stock / Renovation

- 26 Buildings, > 500 dwellings
- 1950 - 1965

Preparation phase	2005 – 2007
Planning phase	2007 – 2010
Construction phase	2009 – 2011 (for housing, commercial buildings will be finished later)
Completion	2013 (for housing, commercial buildings, renovation is ongoing)

Energy Concept

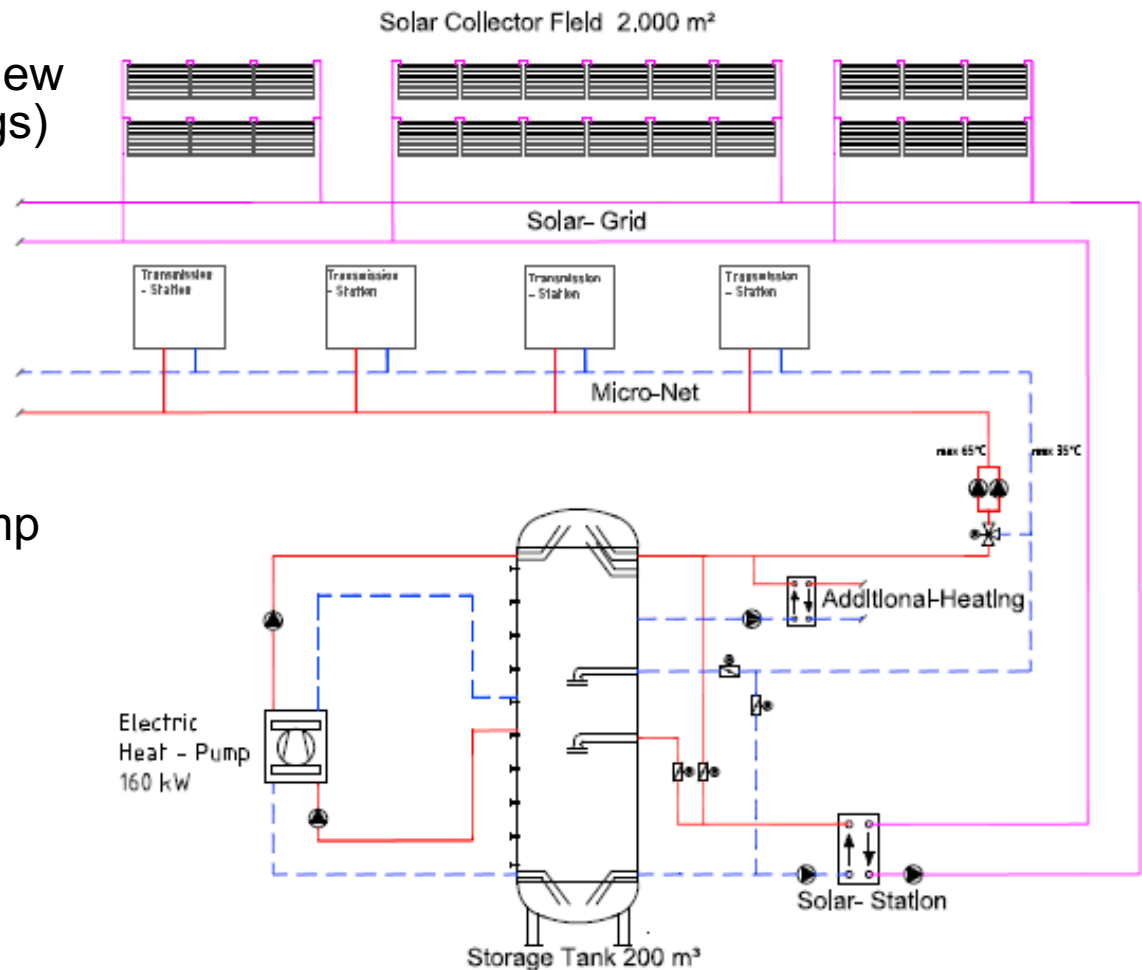
- ➔ Main system: district heating
- ➔ Solar collector fields on several buildings
- ➔ Central storage tank
- ➔ Central heat pump for increasing the efficiency of solar system?
- ➔ Heat distribution with own low-temperature- micro-net?
- ➔ Possibility for including existing buildings in the surroundings
- ➔ Efficient pumps, LED for public areas, PV, ...



Optimization

- ➔ Variation of heat demand (time-table of realization; new buildings / existing buildings)
- ➔ With / without heat pump
- ➔ Collector area and pitch
- ➔ Size of storage tank
- ➔ Temperatures of micro net
- ➔ Different types of heat pump

- ➔ Specific solar yield
- ➔ Solar fraction
- ➔ Investment costs
- ➔ Primary energy demand / CO₂- emissions



Results

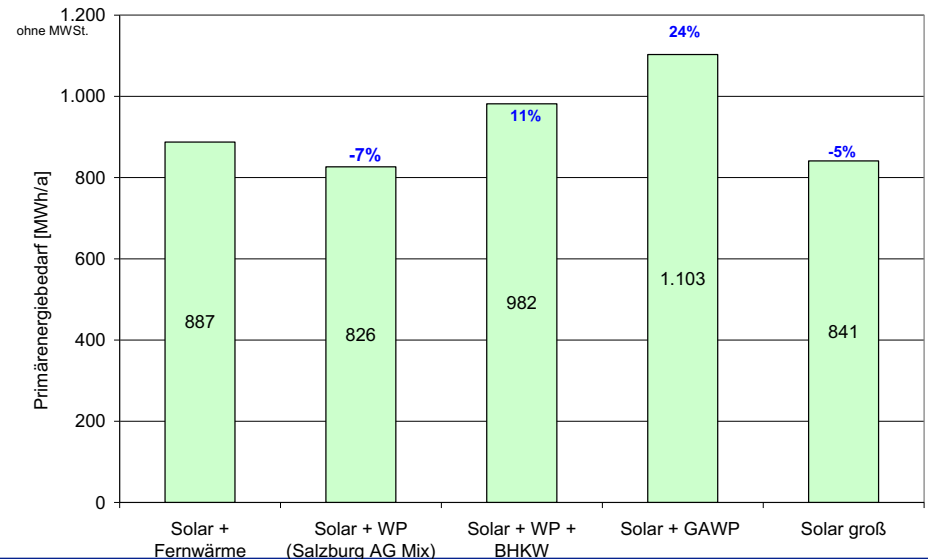
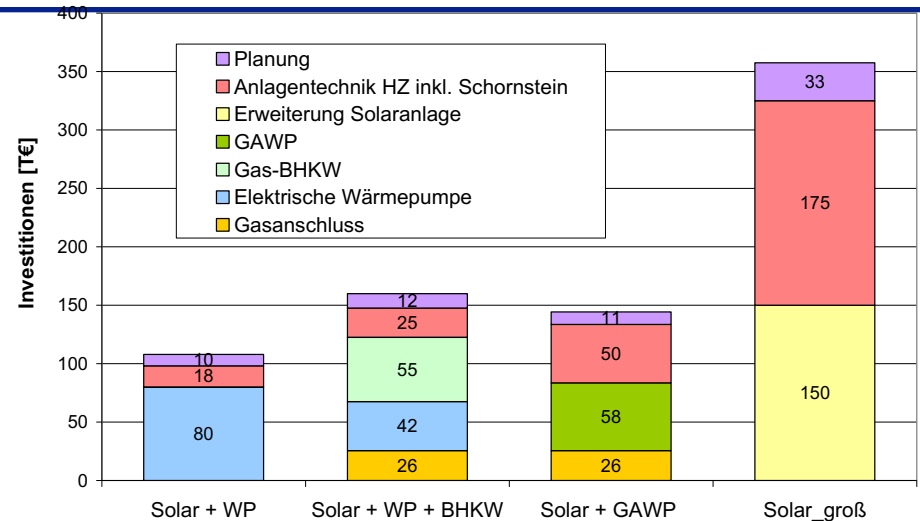
- Specific solar yield: 423 kWh/m².a
- Solar fraction: 35%

Investment Costs

- Solution with electric heat pump means lowest additional investment costs

Primary Energy Demand

- Only electric heat pump and solution with double sized solar system can reduce primary energy demand compared to standard solution (but strongly depends on PEI of electricity)



Realization

- Micro net
- 2000 m² solar collector fields
- 200 m³ storage tank
- Heat pump
- District heating system



Renovation

Focus

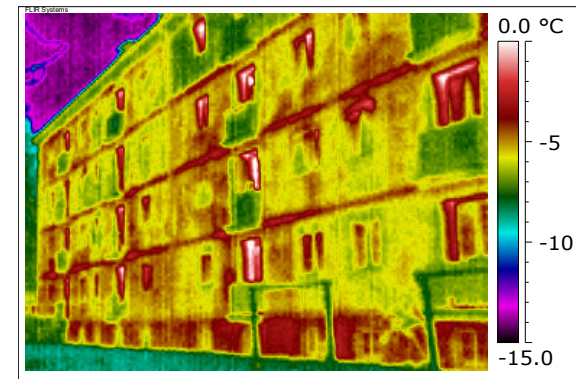
- Strubergassensiedlung

Starting situation

- 26 buildings
- 1950 – 1965
- Individual heating systems (natural gas, wood, coal)
- No ideas about renovation



→ **Modernization Concept as starting point for further discussion**
(Arch. Schulze-Darup)



Modernization Concept

Meeting tenants' needs:

- More green
- Improved situation for car-parking (using underground parking area of new buildings)
- Individual balconies
- Less noise pollution (new orientation of buildings)
- State-of-art standards of the flats

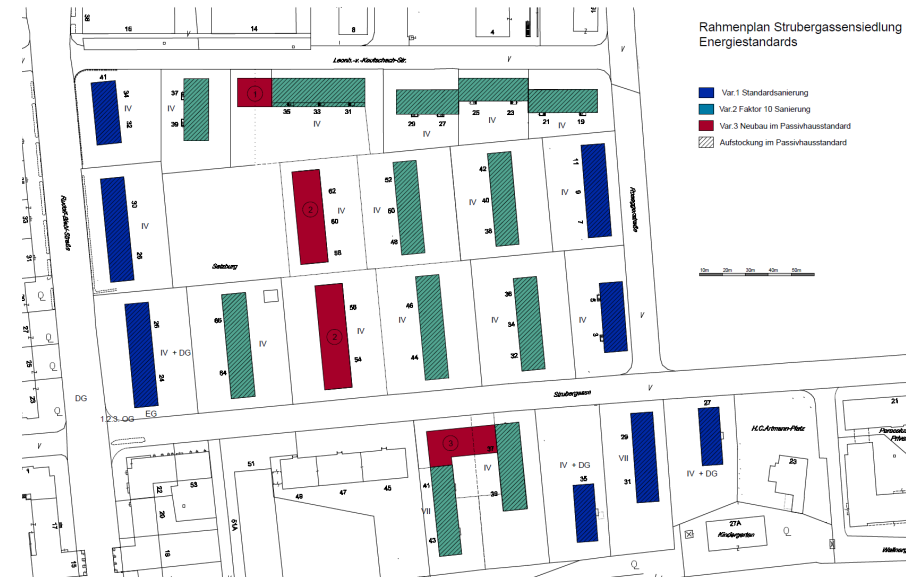


Modernization Concept

Energy: Different renovation standards

- „Faktor 10“ – renovation
- Passivhouse-Standard (for addition of another storeys)
- Demolition and re-build
- Connection to micro-net
- In total: 80% reduction of heat demand

→ Calculation and optimization for each individual building: investment costs, primary energy demand

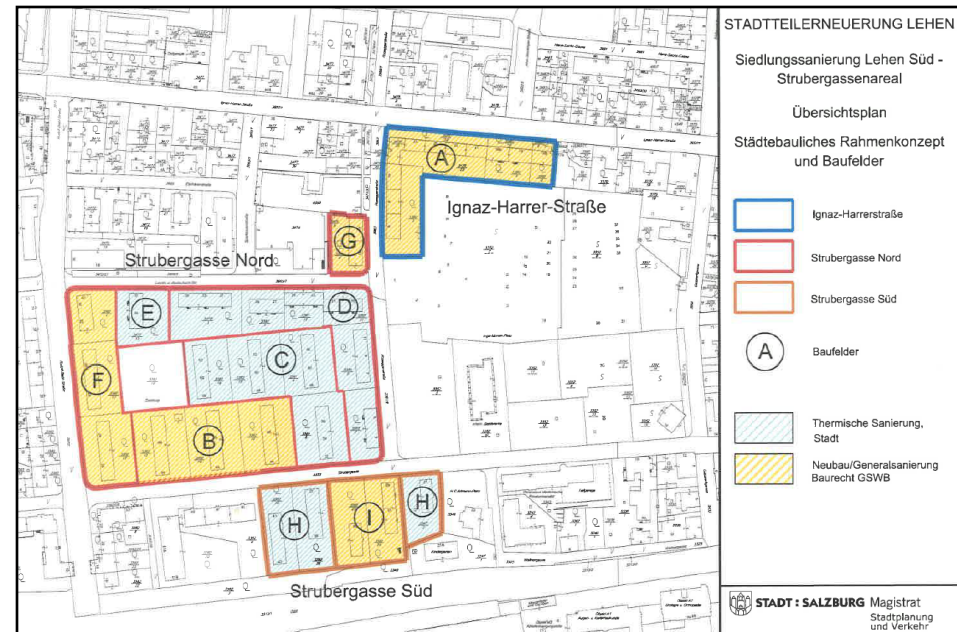


Nr	Faktor	Nutzfläche m²	NUTZENERGIE			ENDENERGIE			PRIMÄRENERGIE		
			Heizung	Warmw.	Strom	Heizung	Warmw.	Strom	Heizung	Warmw.	Strom
23	Rudolf Bietlstrasse 24/26	2.644,8	39.672,0	47.606,4	44.080,0	45.622,8	55.689,5	44.080,0	9.124,6	11.139,9	22.040,0
24	Rudolf Bietlstrasse 28/30	2.644,8	39.672,0	47.606,4	44.080,0	45.622,8	55.689,5	44.080,0	9.124,6	11.139,9	22.040,0
25	Rudolf Bietlstrasse 32/34	2.644,8	39.672,0	47.606,4	44.080,0	45.622,8	55.689,5	44.080,0	9.124,6	11.139,9	22.040,0
26	Strubergasse 27	769,0	39.526,6	13.842,0	12.816,7	45.455,6	16.195,1	12.816,7	9.091,1	3.239,0	6.408,3
27	Strubergasse 29/31	2.109,1	100.978,6	37.963,9	35.151,8	116.125,4	44.417,8	35.151,8	23.225,1	8.883,6	17.575,9
28	Strubergasse 32-36	1.396,5	27.297,9	25.137,0	23.275,0	31.392,6	29.410,3	23.275,0	6.278,5	5.882,1	11.637,5
29	Strubergasse 35	752,0	38.652,8	13.536,0	12.533,3	44.450,7	16.837,1	12.533,3	8.890,1	3.167,4	6.266,7
30	Strubergasse 37/39	2.152,6	39.201,6	38.754,0	35.883,3	45.081,8	45.342,2	35.883,3	9.016,4	9.068,4	17.941,7
31	Strubergasse 38-42	1.394,1	27.251,5	25.094,3	23.235,4	31.339,2	29.360,3	23.235,4	6.267,8	5.872,1	11.617,7
32	Strubergasse 41/43	2.108,0	41.901,6	37.944,0	35.133,3	48.186,8	44.394,5	35.133,3	9.637,4	8.878,9	17.566,7
33	Strubergasse 44/46	1.777,7	34.749,1	31.998,4	29.628,1	39.961,5	37.438,1	29.628,1	7.992,3	7.487,6	14.814,1
34	Strubergasse 48-52	1.392,9	27.228,3	25.072,9	23.215,6	31.312,5	29.335,3	23.215,6	6.262,5	5.867,1	11.607,8
35	Strubergasse 54/56	1.816,3	35.503,9	32.693,1	30.271,4	40.829,0	38.250,9	30.271,4	8.165,8	7.650,2	15.135,7
36	Strubergasse 64/66	1.816,3	35.503,9	32.693,1	30.271,4	40.829,0	38.250,9	30.271,4	8.165,8	7.650,2	15.135,7
37	Strubergasse 58-62*	1.448,8	28.319,3	26.077,5	24.145,8	32.587,1	30.510,7	24.145,8	6.513,4	6.102,1	12.072,9
38	Leonhard von Keutschachstr. 19-25	2.204,0	43.082,4	39.672,0	36.733,3	49.544,8	46.416,2	36.733,3	9.903,0	9.283,2	18.366,7
39	Leonhard von Keutschachstr. 27-35	3.489,7	83.771,9	62.814,6	58.161,7	73.377,7	73.493,1	58.161,7	14.667,5	14.698,8	29.080,8
40	Leonhard von Keutschachstr. 37-39	1.005,8	19.661,0	18.104,6	16.763,5	22.610,1	21.182,4	16.763,5	4.522,0	4.236,5	8.381,8
41	Roseggerstrasse 3.5	1.102,0	50.309,2	19.836,0	18.366,7	57.855,6	23.208,1	18.366,7	11.571,1	4.641,6	9.183,3
42	Roseggerstrasse 7-11	1.400,1	63.916,5	25.201,1	23.334,4	73.504,0	29.485,3	23.334,4	14.700,8	5.897,1	11.667,2
SUMME		36.069	835.871	649.254	601.161	961.252,0	759.626,7	601.160,7	192.250	151.925	300.580
GESAMT SUMME Heizung, WW, Strom			2.086.286		2.322.039						644.756
PV-Ertrag Variante 1 - tradierte Dachform, ausgebautes Dach							869.832		0,5 PE-Faktor		434.916
PV-Ertrag Variante 2 - Satteldach, unausgebaut und voll nutzbar							1.290.318		0,5 PE-Faktor		645.159
PV-Ertrag Variante 3 - Pultdach Süd - Ost - West 20° Dachneigung							1.288.625		0,5 PE-Faktor		644.313

Realization

Result of Modernization Concept and Discussion process:

- 12 buildings are demolished and re-build again (using new buildings for substitution)
- Renovation of 14 buildings / 285 dwellings
 - 30-35 kWh/m².a
 - Connection with micro-net



Process design

Challenge: Process design with

- **obligatory, ambitious targets**
- **a lot of players** (city of Salzburg, local utility, housing associations, architects, planners)

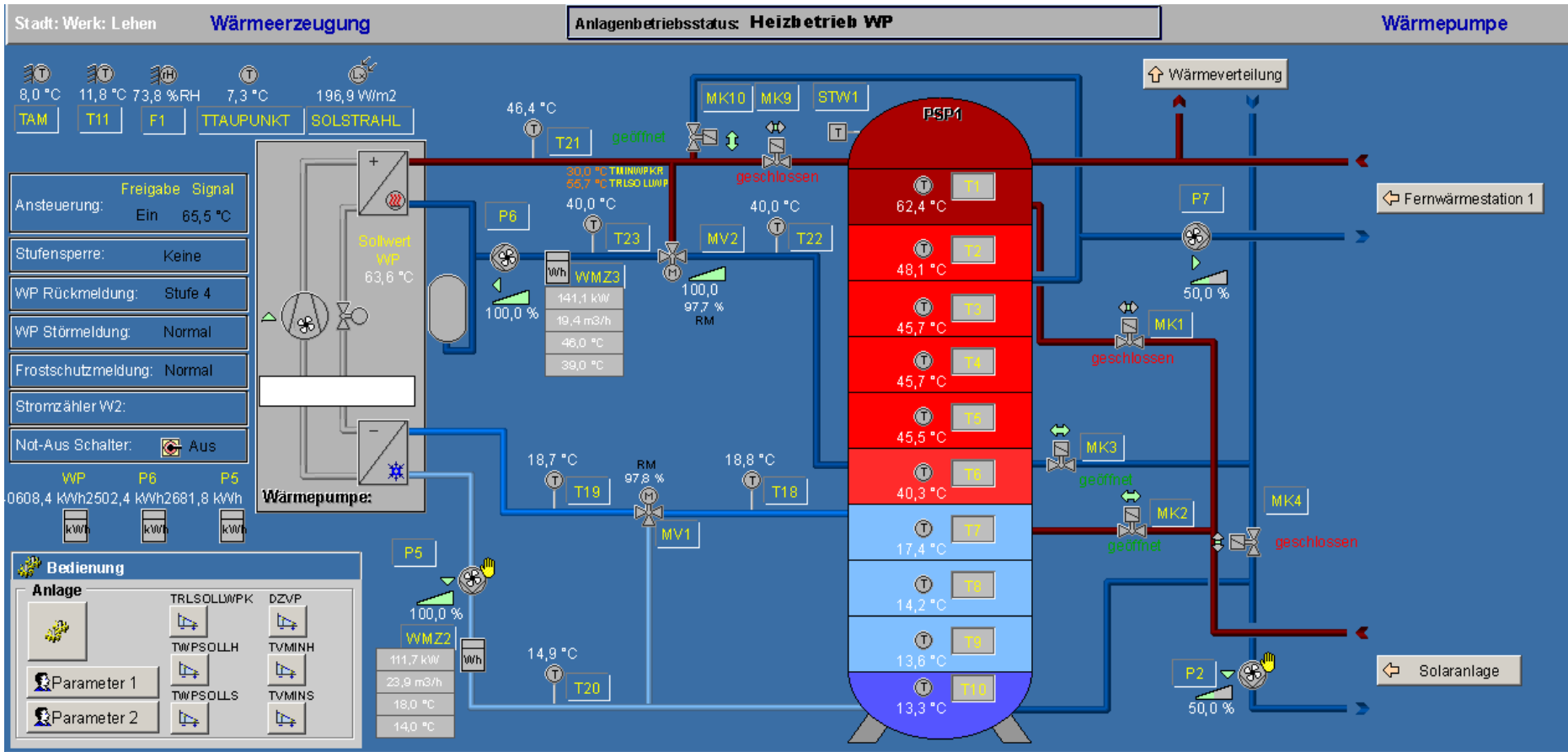
→ Obligation for new buildings:

- Signed quality agreement (performance criteria, minimum requirements)
- Steering group with all signing parties (monthly meetings)
- Working groups (energy supply, renovation)
- Information activities

→ Extended for renovation projects



Monitoring



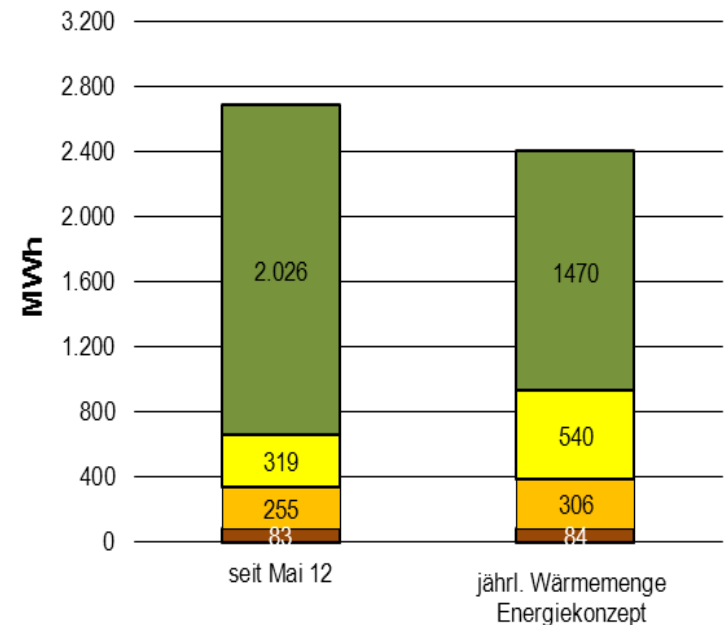
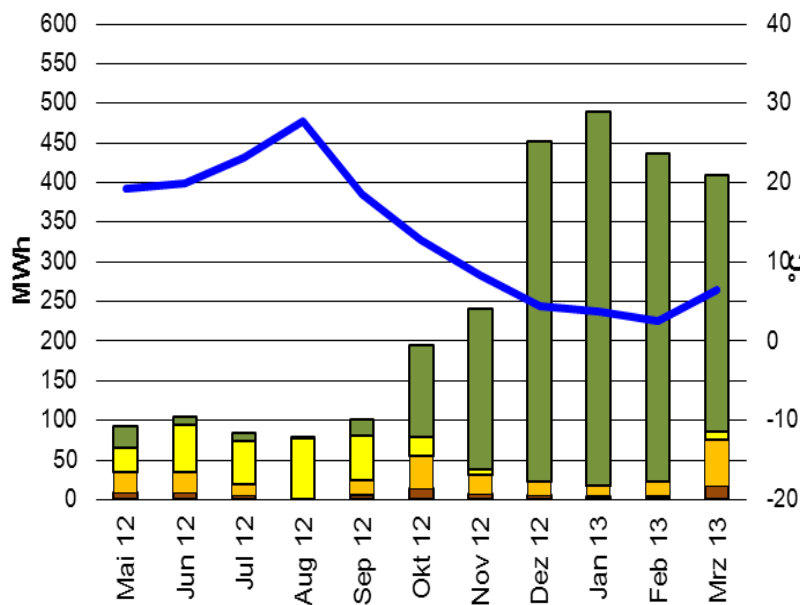
First results

for new residential buildings

11 months

1.550 m² solar collector field

Optimization is ongoing



Conclusions

New building projects might be used as initial starting point for renovation of further buildings around – **ambitious energy concepts**

Renovation of communities allows creation of win:win situations: improvement of energy standards, open space, infrastructure etc. – **instrument for forced renovation activities**

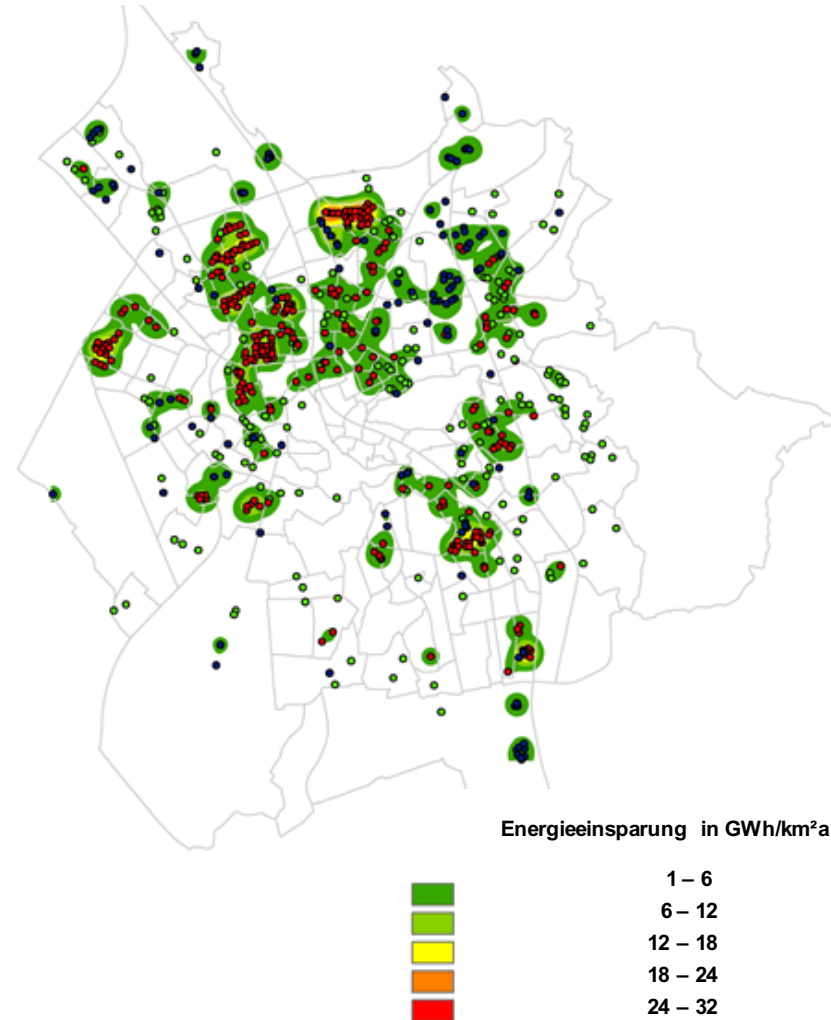
renovation of communities needs effort in process design and process steering – **role of urban planning**

Perspective

- Analyses of building structure in city of Salzburg: renovation potential, ownership
- Working Group „Renovation“: City of Salzburg, Housing associations, utility

Objectives

- Identification of renovation projects at community scale, prioritisation
- Common planning (creating win:win situations)
- Information exchange



Thank you for your attention!

... and thanks to those experts who were contributing to this Full Proposal



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