SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Task 66: Solar Energy Buildings, *October 10th 2023*

Integrated solar energy supply concepts for climate-neutral buildings and communities for the “City of the Future”

Solar energy communities in Aarhus, Denmark

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Resource **E**fficient cities implementing **AD**vanced smart cit**Y** solutions, **READY**

- Demonstrate a **“whole city approach”**
- **Affordable retrofitting** of residential buildings and offices towards the zero-energy consumption
- Development and demonstration of new **low-temperature district heating** solutions
- Smart energy flexible solutions in buildings and introduction of **renewable energy** and **heat recovery** technologies

Project period: December 2014 – November 2020
Project coordinator: Reto M. Hummelshøj, COWI
Support: European Community, FP7-SMARTCITIES-2013, Demonstration of optimized energy systems for high performance energy districts.

Resource **E**fficient cities implementing **AD**vanced smart cit**Y** solutions, **READY**

Priorities for the **"whole city approach"**

- Reduce the energy demand
- Efficient energy supply and renewable energy sources
- Coherence of all decisions and solutions within all parts of the community concerning energy, environment, economy and life quality of the citizens
- Continuous dissemination and training to support the optimization of the above-mentioned priorities

Continuous monitoring to ensure efficient operation of the Solar Energy Buildings

Resource **E**fficient cities implementing **AD**vanced smart cit**Y** solutions, **READY**

Location information

Geographic Coordinates: 55.68° N 12.57° E

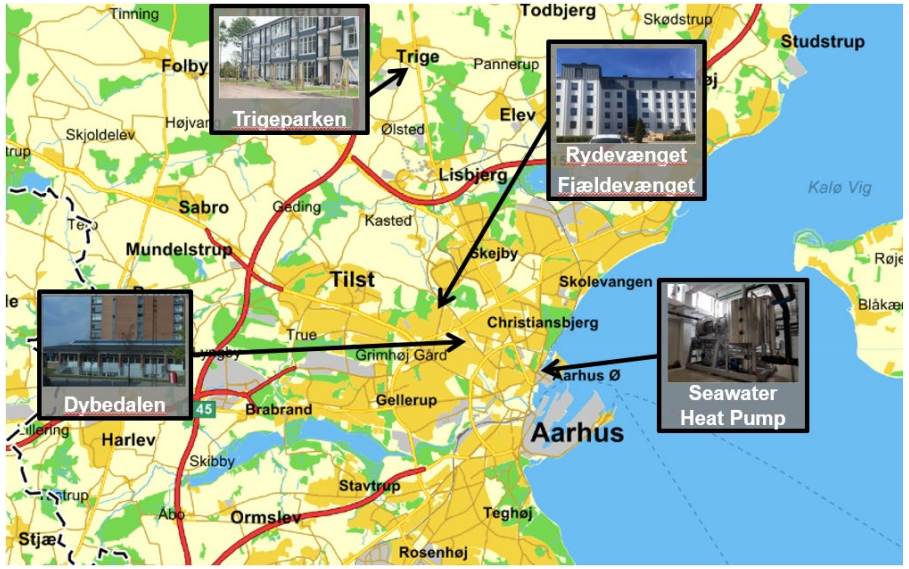
Climate Zone: Temperate climate

Building typology: Commercial/Residential

Overview of demonstration sites

BEI+VENT: 187 kWh/m² ⇓ 59 kWh/m²
≈ 69% energy reduction

BEI: Building Envelope Improvement
VENT: Balanced ventilation with efficient heat recovery
PV: Photo Voltaic
PVT: Photo Voltaic Thermal
WW-HR: Wastewater Heat Recovery
BESS: Battery Energy Storage System



BUILDING BLOCKS	Measures	Gross floor area [m²]	PV [kWp]	Heat pump [kW]	Solar thermal PVT [m²]	Battery Storage, BESS [kWh]
Fjældevænget	**BEI, VENT, PV**	14,151	153			
Rydevænget	**BEI, VENT, PV**, WW-HR	14,151	157	2		
Trigeparken	**BEI, VENT, PV**, WW-HR, PVT, BESS	19,140	140	44	743	114
OFFICE BUILDING						
Dybedalen	**BEI, VENT, PV**	1,446	29			
DISTRICT HEATING						
Seawater heat pump				1,000		
Total		48,888	479	1,046	743	114

Video

https://www.cowi.com/solutions/energy/ready-gears-Aarhus-for-green-energy-friendly-future

Performance data

Degree of self-sufficiency
Renewable energy consumption / Total energy consumption

Renewable energy fraction
District heating: 80%
Electricity grid: 66%

Rydevænget

Gross floor area: 14,151 m^2

Technologies
BEI, VENT, PV, WW-HR

Energy consumption
Heating: 60.9 kWh/m^2/a
Electricity: 19.7 kWh /m^2/a

Renewable energy production
District heating: 681,478 kWh/a
WW-HR: 9,494 kWh/a
Electricity, grid: 153,629 kWh/a
Electricity, PV: 46,004 kWh/a

Degree of self-sufficiency
Heating: 80.2%
Electricity: 71.6%

Trigeparken

Gross floor area: 19,140 m^2

Technologies
BEI, VENT, PV, PVT, BESS, WW-HR

Energy consumption
Heating: 47.4 kWh /m^2/a
Electricity: 18.6 kWh /m^2/a

Renewable energy production
District heating: 641,734 kWh/a
PVT and WW-HR: 105,068 kWh/a
Electricity, grid: 212,952 kWh/a
Electricity, PV: 33,349 kWh/a

Degree of self-sufficiency
Heating: 82.3%
Electricity: 69.2%

Dybedalen

Gross floor area: 1,446 m^2

Technologies
BEI, VENT, PV

Energy consumption
Heating: 43.1 kWh /m^2/a
Electricity: 40.5 kWh /m^2/a
Electricity, cooling: 5.6 kWh /m^2/a

Renewable energy production
District heating: 46,858 kWh/a
Cooling: 5,344 kWh/a
Electricity, grid: 30,112 kWh/a
Electricity, PV: 21,037 kWh/a

Degree of self-sufficiency
Heating: 80%
Electricity: 76.7%

Thanks for listening!
Questions?

www.iea-shc.org

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