

Energy in buildings

Energy renovation of technical installations in Egedal municipality



Purchasing body:	Egedal Municipality
Contract:	4 year contract without possibility of extension Awarded: March 2017
Savings:	<ul style="list-style-type: none"> • 4,876.6 tons of CO₂/year (15 %) • 23 GWh/year (16 %) • Expected savings of up to €560,000 when the project is fully implemented

SUMMARY

- Energy upgrades of technical installations in municipal buildings.
- 71 buildings will be renovated with a focus on reduced energy consumption and improved indoor climate.
- Won by the consulting engineers Danish Energy Management and Esbensen with a maximum financial framework of up to €16 million.

Procurement Approach

Egedal municipality has decided to reduce energy consumption in municipal buildings, thereby creating more energy efficient buildings with better indoor climate. The renovation will focus on the technical facilities.

Prior to this tender the consulting engineers Danish Energy Management and Esbensen completed energy screenings for all 80 relevant municipal buildings within the following categories:

- Kindergartens
- Recreational clubs
- Schools
- Daycare
- Nurseries
- Sports facilities
- Club houses.

Out of the 80 screened buildings, 71 buildings have been selected for energy renovation. These 71 buildings represent 163,500 heated m².

With this tender, Egedal Municipality has chosen to designate a consultant to schedule and manage the work on the 71 energy renovations; including design of sub-projects, implementation of main contract and consultancy in the execution phase.

The overall advisory task is divided into parallel sub-projects to ensure that the project team, in collaboration with the overall advisor, will be able to evaluate processes and paradigms continuously so that experience and learning can be included in the following subproject.

PROCUREMENT INNOVATION

The tender ensures a close link between reduced energy consumption and an improved indoor climate.

- Sub project 1: Energy renovation of 3 buildings. Was started in 2017. The first results of these energy renovations should be evident in the second half of 2018.
- Sub project 2: Energy renovation of 7 buildings. Start-up and completion in 2018.
- Sub project 3: Energy renovation of 6 buildings. Start-up and completion in 2019.
- Sub projects 4-6: Energy renovation of 55 building. Time schedule not yet decided upon.

Total contract costs are expected to amount to approx. €16 million. The budget for each year depends on the political budgeting process that allocates funds to the project.

The contract was won by the consulting engineers Danish Energy Management and Esbensen.

The tender was completed with pre-qualification. Deadline for prequalification was on December 8, 2016. Notice of prequalification was given on December 22, 2016, after which the tender deadline was on February 10, 2017. The contract was concluded on 27 March 2017.

Needs analysis

The above mentioned screenings showed that the energy consumption and operating costs of the buildings were far higher than necessary, both due to the age of the individual technical components, but also because of the area's development since the buildings were constructed.

The purpose of the tender and the subsequent renovations is to bring the buildings to modern standards, reduce maintenance and energy consumption while improving the indoor climate.

Life cycle costing

Any changes made to the building are subject to a holistic economic value calculation that i.a. includes the lifetime of the individual components and decisions. The calculations illustrate the most reasonable choice seen in a longer time perspective. The final decision about which measures should apply for each building is made by the municipality. However, the municipality have been advised by the consultants and decisions are de facto made in accordance with the entire project group.

The calculations are based on following assumptions:

- Interest rate: 1.35%
- Discount factor: 1.5%
- Electricity price increase: 1.00% per year
- Calculation period: 25 years
- Life span: See Appendix 1

Tender specifications

This tender focuses on the overall project organisation and logistics, meaning that the more technical specifications will be part of the sub-projects that specifically target the energy renovation of the individual buildings.

The municipality of Egedal has initiated an internal energy management project in order to ensure, that the calculated energy savings are translated to reality.

In the present tender the following specifications were set fourth:

FINANCIAL SPECIFICATIONS

- Applicants should be able to present a total turnover of minimum €1.6 mill. for the three previous years
- Have a solvency ratio of minimum 10 % for the latest year
- Have a liquidity of at least 100 % for the latest year
- If a consortium bids all parts of the consortium must fulfil the above mentioned minimal demands

TECHNICAL SPECIFICATIONS

- Bidders need to present 5 references describing similar tasks that they have put into practice.

AWARD CRITERIA

Best relation between price and quality. Sub criteria (weight):

- A. Price (40%)
 - A1: Price per hour
 - A2: Fee after construction costs
 - B. Approach to the task (25%)
 - B1: Process
 - B2: Evaluation
 - C. Organisation and staffing (35%)
 - C1: Presented organisation
 - C2: Presented staffing
-

Results

Environmental impacts

The estimates of CO₂ and energy savings express the total savings for both electricity and heat when the project is fully implemented across the 71 buildings, according to the energy audit.

Table 1: Environmental savings

Tender	Consumption (kWh/m ³)	CO ₂ emissions (tonnes/year)	Primary Energy consumption (GWh)
Baseline	Electricity (conventional) 4,966,363 kWh district heating: 12,480,289 kWh Natural gas: 7,513,926 m ³	31,872.9	146
Green tender	Electricity (conventional) 3,895,819 kWh District heating: 6,389,668 kWh Natural gas: 9,584,503 m ³	26,996.3	124
Savings		4,876.6 (15%)	23 (16%)

CALCULATION BASIS

- The calculation is based on a 40/60 distribution of district heating/natural gas.
- CO₂ emissions for conventional electricity set at 0.329 kg CO₂/kWh
- For primary energy consumption a PEF (Primary Energy Factor) of 2.5 was assumed for electricity produced from fossil fuels, and 1.1 for RES¹
- Calculation made using the tool developed within the GPP 2020 project (www.gpp2020.eu), and refined within the SPP Regions project. Available on the SPP Regions website. (More detailed calculation tables are included in the Annex below).

¹ Source: Ecofys, Development of the Primary Energy Factor of Electricity generation in the EU-28 from 2010-2013, 2015

Furthermore, it is worth mentioning that the buildings will be assessed in relation to their content of environmentally hazardous substances such as PCB, asbestos, heavy metals, PAHs and chlorinated paraffin. The buildings will be cleaned for the presence of environmentally hazardous substances before the energy renovation begins.

Financial impacts

The energy renovation generates expected savings of approx. €490,000² for the 71 properties when the project is fully implemented. In addition, the municipality expects another yearly saving of up to €70,000 per year due to the implementation of energy management.

Contract management

The project is divided into sub-projects, which are initiated one after the other so that there is an opportunity to follow up, evaluate and adjust.

Lessons learned and future challenges

In parallel with the energy renovation project, Egedal Municipality has carried out a project on the municipality's land use. This project was launched to shed light on the use of the municipality's building stock; which buildings are still useful and which could/should be torn down or rebuild for other purposes. Such a co-ordination of cross cutting strategies has been a major strength for the project.

However, the project around the municipality's land use has been delayed, which has also postponed the original schedule for energy renovation. The former project should ideally have been started earlier, so it would not collide with the energy renovation project. For the same reasons, the energy renovation project has been pushed from originally to have been completed by 2020 until now to be completed by 2023.

CONTACT

Signe SONNE-HOLM
Technical administrator
The Danish Environmental Protection Agency
sison@mst.dk
Tel +45 20 38 38 40



**Ministry of Environment
and Food of Denmark**
Environmental
Protection Agency

² Every completed energy screening has included a calculation of expected savings. This figure represents the sum of the 71 calculations. The calculations were based on expected savings DKK/year compared to the investments needed (in DKK)

Annex 1 - Applied life span in calculations.

The functional life of the solution proposals for calculating the total economy is generally determined by the following table:

District heating - pipes	40 years
Wires for geothermal heating (heat pump)	40 years
Hot water tank (including components such as meter, exchanger, etc.)	30 years
Circulating pump	20 years
Valves	15 years
Distribution plant for cooling	30 years
Cooling units, -machines, heat pumps, cooling surface and automation.	20 years
Distribution plant for heating	60 years
Kettle, heat exchangers, meters, etc.	30 years
Heating surfaces and local regulation	30 years
Technical isolation (pipes and canals)	30 years
Heat pump	20 years
Ventilation luminaire, dampers, extractor hoods, roof caps, etc.	25 years
Ventilation centrals, -aggregates, ventilations, etc.	25 years
Ventilation channel and pipes	50 years
Technical isolation (pipes- and channel isolation)	30 years
Lighting systems	25 years
Lighting systems, LED light sources and LED luminaire	25 years
Electronic, low current and communication	15 years

Annex 2 – Calculation of environmental savings.

Location of energy contracting	Denmark	
CO ₂ -emissions per kWh electricity (kg/kWh)	0,329	<i>If you know your own rate, enter it on the sheet "General Assumptions".</i>
Lifetime of the measures implemented in the course of the contract	25	years

INPUT DATA				TOTAL EMISSIONS AND CONSUMPTION									
Energy source	Baseline		Green tender		Baseline				Green tender				
	Current annual energy consumption		Expected annual energy consumption		Per year		Per lifetime		Per year		Per lifetime		
					Primary energy consumption (GWh/year)	CO ₂ -emissions (t CO ₂ / year)	Primary energy consumption (GWh)	CO ₂ -emissions (t CO ₂)	Primary energy consumption (GWh/year)	CO ₂ -emissions (t CO ₂ / year)	Primary energy consumption (GWh)	CO ₂ -emissions (t CO ₂)	
Electricity, conventional	4.966.363	kWh	3.895.819	kWh	12,4	1.633,1	310,4	40.828,6	9,7	1.281,1	243,5	32.027,6	
Electricity, green		kWh		kWh	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Heating oil		l		l	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Natural Gas	11.270.890	m ³	9.584.503	m ³	125,7	28.211,0	3.142,9	705.275,9	106,9	23.990,0	2.672,6	599.750,3	
Wood pellets		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Wood		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
District heating	7.513.926	kWh	6.389.668	kWh	8,3	2.028,8	206,6	50.719,0	7,0	1.725,2	175,7	43.130,3	
Coal Briquette		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Lignite high quality		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Lignite low quality		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Coke/Anthracite		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
					TOTAL	146,4	31.872,9	3.659,9	796.823,5	123,7	26.996,3	3.091,8	674.908,1

SAVINGS			
Expected results	Savings (Baseline / Green tender)		
	Per year	Per lifetime	Percentage
	Primary energy savings, (GWh)	22,7	568,1
Reduction of CO ₂ emissions, (t CO ₂)	4.876,6	121.915,4	15,30%

About SPP Regions

SPP Regions is promoting the creation and expansion of 7 European regional networks of municipalities working together on sustainable public procurement (SPP) and public procurement of innovation (PPI).

The regional networks are collaborating directly on tendering for eco-innovative solutions, whilst building capacities and transferring skills and knowledge through their SPP and PPI activities. The 42 tenders within the project will achieve 54.3 GWh/year primary energy savings and trigger 45 GWh/year renewable energy.

SPP REGIONS PARTNERS



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649718. The sole responsibility for any error or omissions lies with the editor. The content does not necessarily reflect the opinion of the European Commission. The European Commission is also not responsible for any use that may be made of the information contained herein.