

**Market Access for Smaller Size Intelligent Electricity Generation (MASSIG)**

**Biogas store is winning over Thermal store**

**Version:** V 1.1 (2008-06-01)

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**Belongs to:** EIE/07/164/SI2.467618 - MASSIG

**Reviewer:**

## Biogas store is winning over Thermal store

A sustainable energy system based on fluctuating renewable energy productions needs a lot of energy stores. Until now storing the energy as thermal heat has been the cheapest way to store energy – but also a rather inflexible way of storing energy, since stored heat may only be used afterwards for covering heat demands, whereas energy stored as e.g. biogas is flexible, since it is cheap and efficient to convert biogas to e.g. electricity and heat.

Hashoej Biogas CHP-plant in Denmark has right now finished the installation of a new 12.000 m<sup>3</sup> biogas with an investment cost of 28 €/m<sup>3</sup>.

In the table below is shown, that this low investment cost implies that the investment cost for storing 1 MWh of energy has become the same for a biogas store and a thermal store.

The picture to the right shows the new 12.000 m<sup>3</sup> biogas store at Hashoej Biogas CHP-plant in Denmark. The investment costs of 28 €/m<sup>3</sup>.

<b>Biogas store</b>	
Lower calorific value	6,5 kWh/m <sup>3</sup>
Investment costs	28 €/m <sup>3</sup>
<b>Investment costs</b>	<b>4308 €/MWh</b>

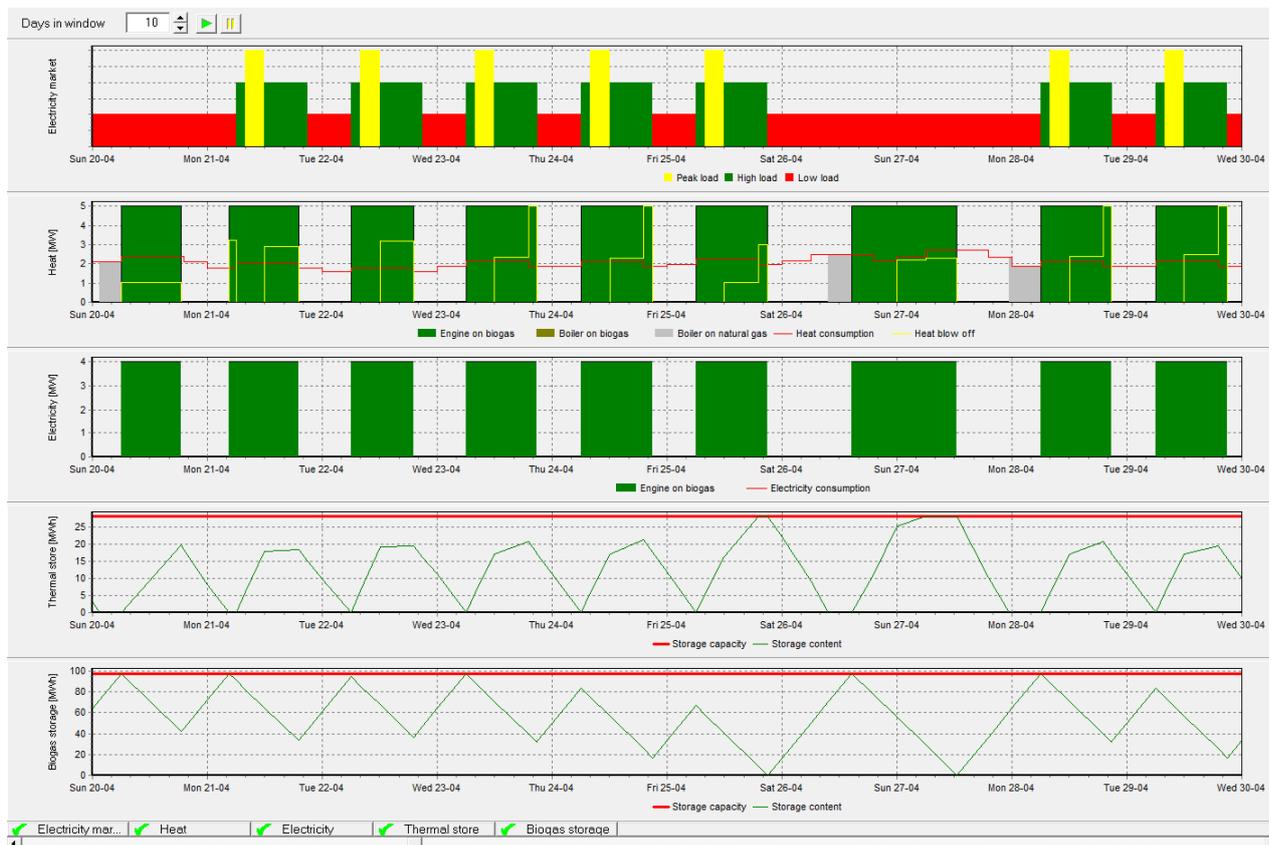


The picture to the right shows a 600 m<sup>3</sup> thermal store at Vaarst-Fjellerad CHP-plant.

<b>Thermal store</b>	
Utilization	90%
Temperature difference	45 °C
Specific heat of water	4.18 kJ/kg/K
Thermal energy	47 kWh/m <sup>3</sup>
Investment costs	200 €/m <sup>3</sup>
<b>Investment costs</b>	<b>4253 €/MWh</b>



The simulated operation of Hashoej Biogas CHP-plant 10 days in April is shown below. It is a simplified energyPRO model of Hashoej Biogas CHP-plant, where a 4 MW engine on biogas is optimized against the Danish triple tariff. Actually this 4 MW engine is split into three engines of different age.



**Figure 0-1: Simulated operation of Hashoej Biogas CHP-plant**