1. Cover sheet

Name of the system: HEAT SUPPLY TREBIC
Location: Town Trebic, Southern Moravia, Czech Republic
Name of the owner: TTS energo s.r.o. (ltd.)
Type of the ownership: private (ltd.)
Contact person (for the application’s purposes Mrs. Hana Luptovska, ADH CR, + 420 466 414 447; + 420 602 165 178; tscr@tscr.cz)

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http://www.tts.cz

2. List of photographs (see enclosed files):

Photo no. 1: 1Map_situation.jpg
Photo no. 2: 2Trebic_view.jpg
Photo no. 3: 3North_view1.JPG
Photo no. 4: 4woodbiomass.JPG
Photo no. 5: 5Stock_DHNorth.jpg
Photo no. 6: 6Stock_DHNorth.jpg
Photo no. 7: 7 Straw_crane.JPG
Photo no. 8: 8Straw_bioler.jpg

3. System description:

HEAT SUPPLY OF THE TOWN TREBIC

Already since the year 1995 the TTS company has operated heat supply of the town Trebic from a centralised heat supply system. From that time it has been managed from original decentralized heat management constituted of block boiler houses, house boilers and heat exchang stations to build stepwise a centralised district heating supply network in the largest city areas of Trebic (District Heating plants North, South and West). In total there have been laid more than 25 km of new pre-insulated 2-pipes distribution networks and about 20 block boiler houses and 40 boiler rooms on natural gas have been closed down.
Map – situation: Trebic (population 38,882; density 675/ km²)

Supplied areas from TTS Energo DH plants in Trebic (North/dark green, South/light green, West/dark and light blue).

**DISTRICT HEATING PLANT NORTH**

History of the plant has started in the year 1987, when the plant has been taken into operation as a heat source burning fossil fuels for a training centre (CEZ NP Dukovany). For the needs of the centre the boiler house had several times overdimensioned load (similarly as other boiler houses stepwise closing down in the town). Due to those reasons the operation of the training centre boiler house was stopped and natural gas supply network for the centre was constructed in 1991.

The company TTS Energo has bought this areal (the boiler house, a chimney and a place for fuel stores) with dismantled technology in December 2000 and integrated it into their project of heat and hot water supply concept of the North part of Trebic (localities Hajek, Nove Dvory, Brnenska). Already from the beginning the project has been conceived as a multifuel ecological district heating plant.

Biomass utilisation for energy purposes has started in Trebic in 2002, when the ever first boiler (VESKO-B, with the load 3,0 MW) for wooden biomass combustion (saw dust, wood shavings, bark, chops, wood chips) has been taken into operation. An essential step to biomass utilisation for power production has been realised in the beginning of the year 2005, at first a thermo-oil boiler on biomass burning has been introduced of a heat load 7 MW<sub>Q</sub> and consequently an ORC unite (Organic Rankin Cycle) with electric output 1,0 MW<sub>e</sub>. A construction and connection of the thermo-oil boiler enables
combined heat and power production (hereafter CHP) or only heat production, when all the heat from
the thermo-oil circle is lead through a heat exchanger and an involved circle into the centralised district
heating system. In that time it was ever the first installation of such a technology in the Czech Republic.
For covering of daily fluctuations in heat and hot water demand an accumulation tank serves of a
volume 1800 m$^3$, that enables also a continuous operation of the CHP unite in a stabile mode.

A project of the District Heating plant North has been completed at the beginning of the year
2007, when ever the first boiler on straw combustion in Trebic has been introduced, with 5 MW$_Q$ load.
The fuel for the new boiler is corn straw, rape straw, feeding sorrel, these are delivered in a pack form.
The main advantage of straw as an energy source is its good availability. A decision about the straw
burning boiler was convenient, because there is a useful potential of corn straw roughly 18 000 t/a in
Trebic surroundings. By the boiler there have been afterwards built two storages for straw, each of
capacity 800 tunes, what ensures a sufficient stock of the fuel.

As additional sources two boilers on natural gas there are installed in the District Heating plant
North, with the loads 5 MW and 6 MW and two boilers with combined burners on light fuel oil
(LFO)/natural gas with the loads 5 and 6 MW. For an own consumption of the plant there have been
installed two CHP units on natural gas of the load 0,4 MW$_Q$ and 0,31 MWe. Heat from the cogeneration
units is delivered into district heating network.

Together with the plants construction a large construction of new distribution heat networks took
place gradually. In total 16 km warm water distribution networks were put under the ground in localities
Hajek and Nove Dvory, as 2-pipe system of pre-insulated pipes. The total load of the DH plant North
means 37.4 MW$_Q$ and 1,31 MWe.

DH plant North provides heat for roughly 4500 households, 3 basic and 4 nursery schools, other
buildings of services including an indoor swimming pool. In Trebic there is the really first boiler house
in the Czech Republic under operation, which can from wood and straw in the same time produce heat
and electricity, respectively can provide warm water, heating and lightening.

In the DH plant North (37.4 MW$_Q$ and 1.6 MWe) there are at present time the installations as follows:

- Wood biomass boiler with the load 3.0 MW$_Q$
- Thermo-oil boiler on wood biomass burning with the heat load 7 MW$_Q$
- ORC unite with electric output 1 MW$_e$
- Boiler on straw packs combustion with 5 MW$_Q$ load
- Accumulation tank of the capacity 1800 m$^3$ and load 10.5 MW$_Q$
- Peak and reserve boilers (NG boilers of 5 a 6 MW$_Q$ and boilers with multifuel
  - burners LFO/NG 5 and 6 MW$_Q$)
- Cogeneration units MT 132 a MT 140, each with 0.4 MW$_Q$ and 0.31 MWe
- Distribution network 15.8 km (warm water)

The heat sold in the year 2008 from DH plant North: 175 000 GJ
From biomass was produced: 91%
Customers: 4751 households, 4 schools, 6 nursery schools, a hotel and swimming pool

**District Heating plant South**

DH plant South was by origin a steam plant for an industrial company UNIPLET built at the turn
of 60th and 70th decades. TTS energo s.r.o. has bought this plant in the
middle of the year 2005. An old technology including boilers and one of
mazut stock tank were cleared away. The whole reconstruction of the
plant was divided into several stages.

Already in the first stage in the summer of 2007 a boiler on
straw burning (VESKO-S, with 5 MW heat load) became a basic
source. The second stage main feature was an installation of natural gas boiler with the load 11.2 MWₚ, which was equipped with combined LFO/NG burner. Further a 5 MWₚ natural gas boiler was installed and 3 CHP units serving to cover an own electricity consumption of the plant.

In the third stage (February 2008) the intentions of biomass use continued, a straw boiler with the 5 MWₚ load was installed. Additionally a construction of 2 straw storages and a chimney (90 m high) insertion took place. The chimney with a new stainless insertion presently serves to lead exhaust gases of both straw boilers. The original mazut stock tank was rebuilt on an warm water accumulator with the water capacity 2500 m³ and heat load up to 10 MWₚ, that role is to cover peak consumptions during a day.

Both straw boilers operates in an automatic mode, their supply provides an automatic bridge crane. The already mentioned 2 straw storages are integrated parts of the area, each has dimensions 70 x 18 m and the height 9 m. By their full filling there is possible to store 3000 t straw.

Beside a housing estate also a complex of industrial areas and a shop centre form the south side of the town. The reconstruction of the boiler house took place together with a complete replacement of the distribution network. Smaller natural gas boiler houses were gradually closed down in the residential zone (1900 flats connected) and industrial companies were connected, which previously ensured heat production in their own plants. To the centralised system of district heating was connected also a hospital.

In the DH plant South (27 MWₚ) there are at present following installations:
- 2 x boiler on straw combustion, each of the load 5.0 MWₚ
- Accumulation tank of the capacity 2800 m³ and the heat load 10 MW
- Boiler with combined burner LFO/NG 12 MWₚ
- NG boiler 5 MWₚ
- CHP units 132 kW, 2 x 140 kW, 1 x 75 kW, 6 x 22 kW
- distribution network 7.8 km (warm water)

The heat sold in the year 2008 from DH plant South: 105 000 GJ
From biomass was produced: 90%
Customers: housing estate (1886 households), a hospital and business buildings (60 buildings).

SUMMARY - DISTRICT HEATING TREBIC

Company TTS Energo s.r.o. in Trebic today supplies with heat from renewable energy sources (biomass) more than 9700 households, also schools, buildings of shops and services, business companies. In 2009 there is expected from 375,000 GJ heat production 85 % from biomass, what means that Trebic is among the first places within the Czech republic in heat production from pure biomass (aside mixed combustion with fossil fuels).

The year consumption in 2008 in Trebic represented 20,000 tunes wood biomass and 10,000 tunes straw. The use of biomass is annually increased. Already now there is paid attention to another project in Trebic – the DH plant West. Until the end of this year there will be put in operation another boiler on wood biomass combustion with the load 3 MWₚ, what will create already the third multifuel heat plant in Trebic. Thanks to biomass utilisation for heat energy production in district heating there is in Trebic the heat energy price the lowest among the towns of the region.
Accumulation tanks help very efficiently to avoid short time operation of peak boilers during morning peak demand hours and especially after weekends, when some business and service customers have lower the heat demand.

Straw is delivered should have moisture about 16%, in high pressed packs (120 x 70 x 240; 120 x 90 x 240 or 120 x 120 x 240 cm). This technology saves energy of transport, handling and storage. The boiler of 5 MW load consumes roughly 5 packs per hour. Parts of packs are cut from the bottom (3 – 4 x) and pushed into the boiler without other treatment.

The company operates their own technology for green wood biomass processing. Boilers can accept wood pieces from 4 cm till 50 cm and even by smaller stones can pass the feeding ways without any damages on the technology and boilers.

Cogeneration units lower the costs producing electricity for own consumption of the plants, heat is delivered into the DH networks.

Thanks to the efficient technologies the DH price is one of the lowest within the district and customers have not been recently exposed to impacts of sharp increases of NG prices and supply problems.

4. Data about production and energy savings supporting the system’s success

In 2009 TTS Energo s.r.o. supplies district heat to 9700 flats, what means nearly 70%, by the statistics roughly 26700 inhabitants.

Rest of the market – mostly family houses and buildings in places where it is not technically possible to connect them to district heating, use more decentralised or individual NG heat sources and in old settlements sources on fossil fuels (wood, coal).
### Biomass Fuels Shares in DH Trebic in 2008

<table>
<thead>
<tr>
<th>Biomass fuel</th>
<th>m3</th>
<th>tons</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw dust + brown chips</td>
<td>19 363</td>
<td>5 909</td>
<td>18.9</td>
</tr>
<tr>
<td>Bark</td>
<td>1 400</td>
<td>425</td>
<td>1.4</td>
</tr>
<tr>
<td>Green chips</td>
<td>46 890</td>
<td>14 412</td>
<td>46.1</td>
</tr>
<tr>
<td>Straw</td>
<td>x</td>
<td>10 515</td>
<td>33.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>67 653</td>
<td>31 261</td>
<td>100</td>
</tr>
</tbody>
</table>

#### Weighted shares of biomass fuels in consumption

- **1.4 %** bark
- **18.9 %** saw dust + brown chips
- **33.6 %** straw
- **46.1 %** green chips

### Heat production in ORC DH plant North (GJ/a)

<table>
<thead>
<tr>
<th>Year</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>NG</td>
<td>17 787</td>
<td>32 099</td>
<td>54 581</td>
<td>76 970</td>
<td>51 439</td>
<td>61 300</td>
<td>33 350</td>
<td>16 901</td>
</tr>
<tr>
<td>Biomass</td>
<td>0</td>
<td>33 044</td>
<td>40 264</td>
<td>67 800</td>
<td>112 511</td>
<td>140 350</td>
<td>162 858</td>
<td>178 265</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>17 787</td>
<td>65 143</td>
<td>94 845</td>
<td>144 770</td>
<td>162 948</td>
<td>201 650</td>
<td>196 208</td>
<td>195 166</td>
</tr>
</tbody>
</table>

### Heat production in ORC DH plant North (GJ/a)

![Bar chart showing heat production in ORC DH plant North from 2001 to 2008, with NG, biomass, and total categories.]
The use of biomass fuels decrease primary energy and CO₂ emissions in comparison to other available energy options.

### Tab. 1 DH plant North

<table>
<thead>
<tr>
<th>Year</th>
<th>by replacement (biomass instead NG) /t/</th>
<th>as avoided “methan” emissions from biomass decomposing /t/</th>
<th>by electricity production /t/</th>
<th>In total /t/</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
<td>1 850</td>
<td>324</td>
<td>0</td>
<td>2 174</td>
</tr>
<tr>
<td>2003</td>
<td>2 255</td>
<td>395</td>
<td>0</td>
<td>2 650</td>
</tr>
<tr>
<td>2004</td>
<td>3 421</td>
<td>598</td>
<td>0</td>
<td>4 019</td>
</tr>
<tr>
<td>2005</td>
<td>7 217</td>
<td>1 264</td>
<td>2 579</td>
<td>11 060</td>
</tr>
<tr>
<td>2006</td>
<td>10 427</td>
<td>1 825</td>
<td>3 726</td>
<td>15 978</td>
</tr>
</tbody>
</table>

## 5. TTS energo s.r.o. activities in PR and customers relations

TTS energo s.r.o. in cooperatin with civil association EKOBIOENERGO operate the INFORMATION CENTRE of RENEWABLE ENERGIES at the DH plant North. Additionally to meetings with customers and potential business partners there are hold various seminares and training courses. Since the year 2008 there are nearly every day educational excursions of students and pupils of basic and grammar schools. Excursions are targeted especially to the field of renewable energy sources and they complement education in physics, biology and elological culture. Visitors there have a unique possibility to see in practice utilisation of wood and straw for combined heat and power production. More than 2500 pupils and students passed through the gates of the DH plant North during the year.

## 6. General documentation of the positive impact the system and its employees have on the community or area served.

**TTS energo s.r.o. is a member of the following organisations:**
- COGEN Czech
- CZ BIOM
- Association for District Heating of the Czech Republic
- EKOBIOENERGO

**A short choice of articles in regional and professional magazines, company´s websites:**
Estate housing in Trebic can get along without the Russian gas (regional newspapers)

DH plant in Trebic again more ecological (www.tts.cz)
Deset let, které v Třebíči

OTRÁSLY ZÁSOBOVÁNÍM TEPELM

Tepelné hospodářství Třebíč

10 years that Shook Heat Supplies in Třebíč

(professional magazine “3T” issued by the ADH CR)
How Costly Will Be Heating in This Year?

Heat from Biomass Is Cheaper Than from Coal
(regional newspapers)
EU Green Plan already in Force
(regional magazine)

DH Trebic fulfills given targets in RES already now and with the lowest prices for customers within the region.

<table>
<thead>
<tr>
<th>Členské země EU</th>
<th>Podíl energie z obnovitelných zdrojů v roce 2005 *</th>
<th>Cílová hodnota podílu energie z obnovitelných zdrojů v roce 2020 *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Německo</td>
<td>5.8 %</td>
<td>18 %</td>
</tr>
<tr>
<td>Česká republika</td>
<td>6.1 %</td>
<td>13 %</td>
</tr>
<tr>
<td>Slovenská republika</td>
<td>6.7 %</td>
<td>14 %</td>
</tr>
<tr>
<td>Polsko</td>
<td>7.2 %</td>
<td>15 %</td>
</tr>
<tr>
<td>Rakousko</td>
<td>23.3 %</td>
<td>34 %</td>
</tr>
</tbody>
</table>

* podíl na hlušově koněčné spotřebě veškeré energie

Na rozdíl od předchozích změn EU, které se orientovaly pouze na výrobu elektrické energie, zelený plán zahrnuje veškerou energii (včetně tepelné) a navíc kladne důraz na zvyšování energetické účinnosti. Poza odkaz na vysokou účinnost splňuje moderní technologie vyvinutou na výrobě tepelné energie z biomasy (česov, škána) v teplárnách firmy TTS Trebic. Při výrobě tepla je zde dosažována účinnost vybíhající na 85 %. V roce 2009 bylo v Trebicí vyrobeno z biomasy 84 % tepla pro centrální zásobování. Využívání místních zdrojů energie - biomasy podporuje regionální energetickou nezávislost a cenovou stabilitu.

Cena tepelné energie v Trebicí patří do díky vyvíjení biomassy dlouhodobě k nejnižším v regionu, což dokazuje následující tabulka.

<table>
<thead>
<tr>
<th>Město</th>
<th>Cena tepla v Kč/GJ vč. 9% DPH</th>
<th>Majitel společnosti</th>
<th>Podíl jednotlivých paliv v %</th>
<th>Průměrné roční náklady na teplou v Kč (byly o velikosti 70 m² - revitalizovaný dům)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jindřichův Hradec</td>
<td>692.2</td>
<td>město</td>
<td>87.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Náměšť nad Oslavou</td>
<td>626.4</td>
<td>město</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Dolní Rohozinka</td>
<td>608.2</td>
<td>město</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Brno</td>
<td>603.0</td>
<td>město</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>Jihlava</td>
<td>590.9</td>
<td>město/privát</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Znojmo</td>
<td>569.0</td>
<td>město</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Velké Meziříčí</td>
<td>558.1</td>
<td>město</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Přelíkovice</td>
<td>535.0</td>
<td>privát</td>
<td>22</td>
<td>78</td>
</tr>
<tr>
<td>Trebic</td>
<td>440.4</td>
<td>privát</td>
<td>16</td>
<td>84</td>
</tr>
<tr>
<td>Žďár nad Sázavou *</td>
<td>433.8</td>
<td>město</td>
<td>100%</td>
<td>12.2</td>
</tr>
<tr>
<td>Bystřice n. Pernštejn</td>
<td>405.5</td>
<td>město</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

* Teplá dodává uhelná elektrárna ŽDAS

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