Small Scale Energy from Waste – Drivers and barriers influencing the development

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Background

Case studies

Drivers and barriers

Conclusions
Why a report?

- **2004 – IEA Task 36** – ‘Review of small scale Waste to energy conversion systems’
  - Focussed on technology and economics of small scale EfW
  - Reported on commercial availability

- However, the report dealt very briefly with the drivers and barriers present. The focus in the new task report is more on those and less on technology.

- What is small scale? In this case <100,000 tonnes/year
They are not uncommon...

... but the presence of small scale EfW plants vary greatly between countries.

- Japan has a tradition of local treatment plants and a large share of small scale plants (even if it’s changing)
- Netherlands on the other hand only have two small scale plants
- In a Cewep study for European plants energy efficiency approx one third were small scale
Average size of WfW plants

(ISWA State of the art report, 2013)
Case Studies

Skövde värmeverk, Sweden
(Photograph: Thomas Harrysson)

Exeter Energy Recovery facility, UK
(Devon city council)

Pontenx-les-Forges, France
<table>
<thead>
<tr>
<th>Location of plant</th>
<th>Exeter, UK</th>
<th>Pontenx-les-Forges, France</th>
<th>Skövde, Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant size (tonnes/annum)</td>
<td>60,000</td>
<td>43,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Start of operation</td>
<td>2014</td>
<td>1997</td>
<td>2005</td>
</tr>
<tr>
<td>Owner</td>
<td>Private company: Viridor, the facility reverts back to Devon County Council upon expiry of the associated contract</td>
<td>Association of municipalities: SIVOM des cantons du Pays de Born Operated by Tiru</td>
<td>Public company: Skövde Värmeverk AB (100% owned by the municipality of Skövde)</td>
</tr>
<tr>
<td>Types of waste received</td>
<td>MSW (99%), C&amp;I (1%)</td>
<td>MSW, C&amp;I</td>
<td>MSW (50%), C&amp;I(47%), Haz. (3%)</td>
</tr>
<tr>
<td>Steam data (bar/°C)</td>
<td>40/390</td>
<td>34/355</td>
<td>16/215</td>
</tr>
<tr>
<td>Exported electricity (GWh)</td>
<td>26.8</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Exported heat (GWh)</td>
<td>0 (investigating possibilities for district heating)</td>
<td>0 (starting delivery in 2015)</td>
<td>168</td>
</tr>
<tr>
<td>Investment cost</td>
<td>€63m</td>
<td>€16m</td>
<td>€33m</td>
</tr>
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</table>
Drivers Exeter

Drivers for Devon County Council:

- To reduce waste being sent to landfill, thus driving the management of this residual waste up the waste hierarchy
- To meet Landfill Allowance Trading Scheme targets
- To recover energy from waste

- The EfW facility was developed as an outcome of a Waste Management strategy:
  - to ensure targets were met
  - to provide certainty of future costs
Drivers Pontenx

Drivers SIVOM des cantons du pays de Born

- Replacement of old plant
- Ensure treatment capacity for the next 30 years
- Policy supporting EfW, landfill tax
- Positive public perception when only treating the regional waste
- Avoiding unnecessary transports in or out of the region

The plant was primarily developed as a replacement facility for an older and smaller plant.
Drivers Skövde

Drivers for Skövde Värmeverk:
- carbon dioxide tax which was introduced in Sweden in 1991
- landfill tax, introduced in 2000
- a landfill ban for combustible wastes came in to force in 2002
- Need for new heat production capacity for district heating

The municipality decided to build a small scale EfW plant, mainly because waste was the most economic fuel alternative for the district heating production.
Policy and legislation

Powerful tool, both as driver and barrier

- Waste Framework Directive
- Landfill Directive, landfill bans and taxes
- Industrial emissions directive
- Energy and CO₂ taxes

All three case studies have referred to policy and legislation as part of the reason for their chosen solutions
Heat and energy demand

In Sweden - a main driver for EfW plants:

- need for an economic fuel for district heating production
- heat source needs to be within reasonably close proximity to the heat network.

- Skövde facility was sized to be able to run on full load (without the need of chillers) during summer, when the heat demand is low.

- Examples of plants delivering process heat to pulp and paper mills, ethanol plants, desalination plants
Economics

Higher capital cost (€/tonne of waste) for small scale solutions

- No economics of scale
- Cost of access roads, weighbridges, development costs, engineering design

Higher operational cost

- Emissions measurements
- Quality assurance, instrumentation, control
- Lower energy efficiency (lower income)
Gate fee vs operational capacity (UK)
Incentives

- Most financial incentives are not directly connected to the size of the plant
- UK- incentives given for advanced thermal technologies (gasification, pyrolysis) but not traditional EfW
  - These technologies often modular and small scale

Of the three case studies, only the French plant has received subsidies
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<td>Exported heat (GWh)</td>
<td>0</td>
<td>0</td>
<td>168</td>
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<tr>
<td>Investment cost (in the year of commissioning)</td>
<td>€63m</td>
<td>€16m</td>
<td>€34m</td>
</tr>
<tr>
<td>Subsidised</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Price electricity (€/MWh)</td>
<td>67.5</td>
<td>40</td>
<td>32.5</td>
</tr>
<tr>
<td>Price heat (€/MWh)</td>
<td>-</td>
<td>31</td>
<td>53*</td>
</tr>
<tr>
<td>Gate fee (range) (€/ tonne)</td>
<td>&gt;141</td>
<td>81-120</td>
<td>45-60</td>
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*price at end consumer (households) including distribution
Geography

- Small scale EfW plants have been developed on Isle of Man, Shetland Islands, The Faroe Island, St. Barth.
- Turning away from landfill, from general environmental reasons, but also from lack of space
- A desire to be self-sufficient in waste management
Public acceptance and planning

- In Scandinavia it is generally not a problem with public acceptance - well established technology and long experience
- In UK it has been hard to get public acceptance for larger EFW plants – in Exeter it was considered advantageous that it was small scale
- In France there seem to be less public acceptance for new projects today than when the Pontenx plant was built, but the small scale plant was an advantage at that point
Conclusions

- **Policy** - decision to develop facilities on a small scale are more relevant to local politics and situation.

- **Costs** Operational and capital costs are higher but there are often other drivers which take precedence over economics alone.

- **Incentives**: Are a driver on specific markets, specifically for technologies more common in small scale plants

- **Geography** can be a driving factor for small scale EfW, but in many cases there are additional drivers.

- **Public Acceptance**: treatment of waste close to the point of generation, the generation of jobs in the local community, and lower transport distances, all serve to increase the public acceptance of such facilities.

- **Technical issues** are not deemed to be a specific barrier.
Acknowledgements

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- Håkan Johansson, Skövde Värmeverk AB
- IEA Bioenergy Task 36
Thank you for your attention!

Want to know more?
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