Non-CO₂ Greenhouse Gases: Methane

Source/Sectors: Wastes/Landfills

Technology: Landfill gas recovery and utilization - direct gas use/upgrade to natural gas (A.5.1.1)

Description of the Technology:
Landfills are the largest anthropogenic source of methane emissions in the United States. Key reduction options for methane emissions from landfills are reduction of the amount of organics deposited into landfills, and energetic use or flaring of landfill gas (Lucas et al., 2006).

In this option landfill gas is recovered and used as a medium BTU fuel for boilers or industrial processes. The gas is directly piped to a near-by user and serves as a replacement fuel. Several methods such as membrane separation can separate carbon oxide and other compounds in landfill gas from methane. The treated gas can be injected to a local natural gas distribution grid. The recovered gas can also be converted to compressed natural gas (CNG), liquefied natural gas (LNG), methanol, or ethanol (US Climate Change, 2005).

Effectiveness: Good

Implementability: Good

Reliability: Good

Maturity: Good

Environmental Benefits: It reduces methane emissions.

Cost Effectiveness:

<table>
<thead>
<tr>
<th>Technology</th>
<th>Lifetime (yrs)</th>
<th>MP (%)</th>
<th>RE (%)</th>
<th>TA (%)</th>
<th>Capital cost</th>
<th>Annual cost</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct gas use (WIP &lt;100,001 tons)</td>
<td>15</td>
<td>0</td>
<td>85</td>
<td>14</td>
<td>$152.91</td>
<td>$4.97</td>
<td>$9.25</td>
</tr>
<tr>
<td>Direct gas use (WIP 100,001 – 200,000 tons)</td>
<td>15</td>
<td>0</td>
<td>85</td>
<td>4</td>
<td>$68.57</td>
<td>$3.70</td>
<td>$9.18</td>
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<tr>
<td>Direct gas use (WIP 200,001 – 300,000 tons)</td>
<td>15</td>
<td>0</td>
<td>85</td>
<td>4</td>
<td>$47.44</td>
<td>$3.41</td>
<td>$9.07</td>
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<tr>
<td>Direct gas use (WIP 300,001 – 400,000 tons)</td>
<td>15</td>
<td>33</td>
<td>85</td>
<td>4</td>
<td>$41.74</td>
<td>$3.51</td>
<td>$9.36</td>
</tr>
<tr>
<td>Direct gas use (WIP 400,001 – 500,000 tons)</td>
<td>15</td>
<td>50</td>
<td>85</td>
<td>8</td>
<td>$37.73</td>
<td>$3.63</td>
<td>$9.34</td>
</tr>
<tr>
<td>Direct gas use (WIP 500,001 – 1,000,000 tons)</td>
<td>15</td>
<td>29</td>
<td>85</td>
<td>23</td>
<td>$23.09</td>
<td>$3.29</td>
<td>$9.34</td>
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<tr>
<td>Direct gas use (WIP 1,000,000+ tons)</td>
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<td>31</td>
<td>85</td>
<td>43</td>
<td>$15.00</td>
<td>$3.13</td>
<td>$9.16</td>
</tr>
</tbody>
</table>

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US$/MT CO₂-Eq.

1: CEC (2005); 2: WIP = waste-in-place
Industry Acceptance Level: Good

Limitations: Unit capital cost is higher for smaller landfills.

Sources of Information: