IEA Bioenergy Task 37

Anaerobic Digestion Report

Turkey’s Situation in Biogas
Biogas Plant Inventory

Summary of AD Plants:

- Agriculture: None in Turkey
- Industrial: 13 plants
- Sewage sludge: None in Turkey
- Municipal (biowaste): 1 plant
- Landfill: 6 plants
Biogas Plant Inventory

Summary of Up-grading Plants:

Unfortunately, there is no biogas upgrading plant in Turkey. The produced biogas is only separated from condensate and hydrogen sulphide to be utilised in gas engines.
Biogas Plant Inventory

Trends in numbers of AD Plants:

Continuously running 20 plants and there are almost five more at the construction phase.

Turkey has 2,000 plant potential only with animal manure.

It is obvious that market players are waiting for the new legislation.
Biogas Plant Inventory

Summary of Gas Production Data:

- Raw biogas production
  180 million m³ annually

- Electricity production
  60 MW installed capacity annually

- Amount of heat recovered
  60 MW installed capacity annually
Biogas Plant Inventory

Performance Data:

- electrical efficiency
  The electricity efficiency ratio is between %30-38

- total energy efficiency
  Overall efficiency 80-85%

- emissions
  Not in the agenda yet
Biogas Plant Inventory

Economic Data:

- Investment costs
  - AD plant

Landfill plants cost are around €33 million/17 off 1.4 MW plant

Waste water treatment+organic waste plant investment cost €2.7 million 600 kW engine and operating cost €40.000 annually.
Biogas Plant Inventory

Economic Support Data:

- Potential Feed-in tariff in Turkey (in progress)

<table>
<thead>
<tr>
<th>RES Plant type</th>
<th>First 10 years in operation (Euro cent/kWh)</th>
<th>Second 10 years in operation (Euro cent/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Hydroelectric power plant</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>b. On land wind turbine plant</td>
<td>8</td>
<td>-</td>
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<td>c. Offshore wind power plant</td>
<td>12</td>
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<tr>
<td>d. Geothermal power plant</td>
<td>9</td>
<td>-</td>
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<tr>
<td>e. Photovoltaic solar panel plant</td>
<td>25</td>
<td>20</td>
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<tr>
<td>f. Solar power plant</td>
<td>20</td>
<td>18</td>
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<tr>
<td>g. Plant running on biomass (including landfill gas)</td>
<td>14</td>
<td>8</td>
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<tr>
<td>h. Tide and wave energy power plant</td>
<td>16</td>
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</tbody>
</table>
Biogas Plant Inventory

National Strategy/Support for Exploitation of Biogas:

- e.g. renewable energy programmes – specific support for biogas

The new potential RES legislation also includes biogas production
Biogas Plant Inventory

Challenges:

- AD plant permitting
There is no direct permission for plant
  - Environmental licenses
Not really big issue as the market still under development phase
  - Grid connections (electricity, heat, gas pipeline)
Some applications exist but still not clear
  - Digestate utilisation
No legislation on digestate characteristics and utilisation
Biogas Plant Inventory

Research Activities:

- Main national and international projects

- Ongoing national biogas plant project capacity of 350 kWel.
- Ege University will establish 1-5 m³ 60 plants around Izmir.
- Akdeniz University has also its own laboratory 5 m³ plant.
- Suleyman Demirel has started lab. scale trials as well.
- Some other universities also study on lab. scale