IEA Bioenergy Task 37

Anaerobic Digestion Report

Turkey’s Situation in Biogas
Summary of AD Plants: 37 plants

- Agriculture: None in Turkey
- Industrial: 23 plants
- Sewage sludge: None in Turkey
- Municipal (biowaste): 1 plant
- Landfill: 13 plants
Biogas Plant Inventory

Summary of Up-grading Plants:

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 37 plants (ten at the construction phase)

Turkey has 2,000 plant potential only with animal manure.
Summary of Gas Production Data:

- Raw biogas production
  201 million m$^3$ annually

- Electricity production
  91 MW installed capacity annually

- Amount of heat recovered
  91 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 (2 MW plant for €3 mil.)

Waste water treatment + organic waste plant investment cost €2.7 million 600 kW engine and operating cost €40.000 annually.
Biogas Feed-in-tariff Legislation

Economic Support Data:

- Potential Feed-in tariff in Turkey


<table>
<thead>
<tr>
<th>RES Plant type</th>
<th>For a decade ($ cent/kWh)</th>
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<tbody>
<tr>
<td>Hydroelectric</td>
<td>7.3</td>
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<tr>
<td>Wind</td>
<td>7.3</td>
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<tr>
<td>Geothermal</td>
<td>10.5</td>
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<tr>
<td>Solar</td>
<td>13.3</td>
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<tr>
<td>Plant running on biomass (including landfill gas)</td>
<td>13.3</td>
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In case of using locally made mechanic and electro-mechanic components, an additional $0.4-2.4 cent for 5 years will be added to the guaranteed price.
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

According to the law: Tariffs are applied for plants established between 18th May 2005 & 31st December 2015. From 31st December 2015 on, the prices will be revised (not exceeding figures)
Biogas Plant Inventory

Challenges:

- **AD plant permitting**
  Licensing steps including [www.epdk.org.tr](http://www.epdk.org.tr)
  Application, examination and Evaluation, Approval, Granted a license (150-180 days)
  - **Environmental licenses**
    Environmental impact assessment is required
  - **Grid connections (electricity, heat, gas pipeline)**
    Some applications exist but still not clear
  - **Digestate utilisation**
    No legislation on degistate 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.
- Some additive nutrients are being tried