EnviroDish and EuroDish System And Status

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The EuroDish Project

- Main objectives:
  - Preparation of market introduction
  - Erection of country reference systems

- Partners:
  - SBP: Project leader and system design
  - SOLO: Stirling engine
  - K+S: Control system
  - MERG: Concentrator, turntable, erection
  - DLR/PSA: testing and evaluation

- Sponsor:
  - EC under Joule III
Dish Stirling Principle

![Diagram showing the Dish Stirling Principle, including components such as Solar radiation, Generator, Stirling Receiver, Concentrator, and Tracking.](image)
Dish Stirling Status:
10 kW dish Stirling System at PSA
EuroDish Design

1  Concentrator shell
2  Stirling support structure
3  Stirling unit
4  Elevation drive rail
5  Azimuth drive rail
6  Foundation
7  Azimuth motor
8  Switch case
9  Turntable
10  Ring truss
11  Elevation bearing
FEM Analysis of new Segmented (12) Concentrator Design
EuroDish Facet fabrication:
12 segments of glass fibre reinforced resign

Master Pattern

Heating elements

Stiffening ribs on mould rear side

Attaching glass mirrors
EuroDish Concentrator Erection

Mounting of segments to ring truss
EuroDish Motion Controller
SOLO Stirling 161
Two Euro Dish units in Operation at PSA/Spain
EuroDish Test Results
EuroDish Test Results

Solar Insolation DNI (W/m²) vs. Net Power (kW)
EuroDish Test Results

- Solar 100%: 44.8 kW
- Reflectivity: 42.1 kW
- Intercept: 39.6 kW
- Receiver: 33.6 kW
- Stirling: 10.8 kW (24% efficiency)
- Generator: 9.8 kW (22% efficiency)
- Parasitics: 9.5 kW (21% efficiency)
Technology Expectations / Learning Curve

<table>
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<tr>
<th>DISTAL 2</th>
<th>EuroDish</th>
<th>100/year</th>
<th>1'000/year</th>
<th>3'000/year</th>
<th>10'000/year</th>
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<tr>
<td>25.3 MWh/a</td>
<td>25.3 MWh/a</td>
<td>26.5 MWh/a</td>
<td>28.2 MWh/a</td>
<td>29.6 MWh/a</td>
<td>31.1 MWh/a</td>
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<tr>
<td>10 kW</td>
<td>10 kW</td>
<td>10 kW</td>
<td>10.4 kW</td>
<td>10.8 kW</td>
<td>11 kW</td>
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<tr>
<td>19.9%</td>
<td>15.9%</td>
<td>25.2%</td>
<td>19.6%</td>
<td>25.2%</td>
<td>19.6%</td>
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</tbody>
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Yearly energy production at 2800 W/m²/a
- Max. power
- Average system efficiency
- Peak system efficiency
Levelized Electricity Cost: Dish-Stirling vs. Diesel generators

**Levelised Electricity Cost in €/kWh**

- **Dish - Stirling (low production rate)**
- **Dish - Stirling (medium production rate)**
- **Dish - Stirling (high production rate)**
- **Diesel generator sets @ selected fuel costs**

**Yearly solar insolation**:
- 2000 kWh/m²/a DNI
- 2800 kWh/m²/a DNI

**Fuel costs**:
- 0.25 €/litre
- 0.50 €/litre
- 0.75 €/litre

**Cost components**:
- LEV of Dish-Stirling with increasing production rate
- Fuel
- Maintenance
- Replacement/Overhaul
- Initial Equipment
Outlook: BMU Project

Objectives: Further cost reduction and preparatory steps for market introduction.

Project Partner:

SBP: System development
SOLO: Stirling
K+S: Remote control
MERO: Fabrication and erection
DLR: Testing and operation
BMU Project: Working packages

WP 1: Preparing series production
WP 2: Operation of the two units in Spain
WP 3: Erection of Country Reference Systems