Solar cooling installation UWC & Desert Mountain Highschool, AZ

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Solar Cooling & Hot Water for School Campus

- Solar Panels: 3900 m² / 2.73 MW
- LiBr absorption chiller: 1470 kW
- Operation started: 2011
- ESCo- System
Contents

- Performance of the solar cooling plant in 2013
- Singapore weather 2013
- TRNSYS simulation vs. reality in 2013
- System improvements based on simulation
  - Variable speed drives cooling water circuit
  - Additional collector area – various orientations

UWC Tampines, Singapore
PERFORMANCE OF THE SOLAR COOLING PLANT IN 2013

Solar heat input to the cooling and domestic hot water system
Electricity consumption

- Cooling tower, 31.7 MWh/a, 21%
- DHW, 4.1 MWh/a, 3%
- P1, 7.8 MWh/a, 5%
- P2, 4.4 MWh/a, 3%
- P3, 6.3 MWh/a, 4%
- P4, 83.9 MWh/a, 56%
- Chiller, 11.7 MWh/a, 8%
- Other, 0.6 MWh/a, 0%

Deviation from reality

<table>
<thead>
<tr>
<th></th>
<th>Q_solar</th>
<th>Q_hw</th>
<th>Q_chw</th>
<th>Q_DHW</th>
<th>P_el</th>
<th>SPF_el</th>
<th>Operation hours</th>
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<tbody>
<tr>
<td>2013</td>
<td>1566</td>
<td>1406</td>
<td>949</td>
<td>143</td>
<td>151</td>
<td>6.3</td>
<td>2046 h/a</td>
</tr>
<tr>
<td>real</td>
<td>-7.3%</td>
<td>-4.8%</td>
<td>-2.8%</td>
<td>1.4%</td>
<td>-3.8%</td>
<td>6.5</td>
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<tr>
<td>Base</td>
<td>-7.3%</td>
<td>-4.8%</td>
<td>-2.8%</td>
<td>1.4%</td>
<td>-3.8%</td>
<td>6.5</td>
<td>2020 h/a</td>
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</table>
SYSTEM IMPROVEMENTS BASED ON SIMULATION

Electricity savings due to cooling water circuit improvements

9/29/2014
Increase of cooling generation due to additional collector area

![Graph showing chilled water generation vs. m2 of collector area](image)

<table>
<thead>
<tr>
<th>SPF</th>
<th>East</th>
<th>South</th>
<th>South-East</th>
<th>North</th>
<th>Base</th>
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<tbody>
<tr>
<td>SPF_E</td>
<td><img src="image" alt="Graph showing SPF vs. m2 of collector area" /></td>
<td>East</td>
<td>South</td>
<td>South-East</td>
<td>North</td>
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</tbody>
</table>

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Desert Mountain High School, USA

Solar Panels: 5,000 m² → 3.5 MW
Cooling load: 500 tons /1750 kW
In operation since 2014
Live feed: dmhs.heizwerk.at
Username: gast
Password: gast