CdTe system analysis after 11 years exposure to a hot-humid climate in Huichila-Mexico

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Background

In Huichila region in the state of Morelos, are installed PV pumping systems with Thin film technology. The predominant climate in the state of Morelos is hot and humid as defined by INEGI[1]. The temperature range is about 22-33 °C.

The array is composed by 6 CdTe modules of First Solar manufacturer , the system was installed in 2005.

![Image](https://via.placeholder.com/150)

Figure 1. Geographical coordinates of Amate system

![Image](https://via.placeholder.com/150)

Figure 2. EL “Amate” PV system array (2S x 3P). Array title angles: 22°

![Image](https://via.placeholder.com/150)

Figure 3. Electrical performance outdoor method

Results

Visual inspection:

CdTe modules are in good condition, after 11 years, there are no defects as delamination, corrosion or other degradation problems. It was found lightly soiled near frame.

![Image](https://via.placeholder.com/150)

Figure 4. CdTe module dirty near frame

IR image:

The temperature of the module is relatively uniform. The average temperature of the array is 47°C with a difference of 7°C between the higher temperature and the lower temperature.

![Image](https://via.placeholder.com/150)

Figure 5. IR imagen of the PV array

Electrical performance:

![Image](https://via.placeholder.com/150)

Figure 6. I-V curve normalized @ STC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>First Solar Normalized Array Ratings (G = 1000 W/m², Tcell= 25°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ψn (W)</td>
<td>1359</td>
</tr>
<tr>
<td>Vmp (V)</td>
<td>16.5</td>
</tr>
<tr>
<td>Isc (A)</td>
<td>3.11</td>
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<tr>
<td>FF (%)</td>
<td>75</td>
</tr>
<tr>
<td>Rs (ohm)</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Table 2. Degradation analysis results of CdTe modules

Conclusions

- CdTe modules have a good performance in hot and humid climate, in the visual inspection corrosion problems, delamination or other visual defects weren't found. CdTe modules have soiled in the glass near to frame but this don’t affect the electrical performance.
- IR image shows a uniform temperature distribution in all PV array, the ΔT is 6.8°C so it is considered that there aren’t hot-spot problem.
- Degradation analysis was made comparing the IV normalized data with nameplate data, and results indicate that the power degradation in the PV array is about of 27.45 W and that the annual power degradation is about 0.76% (11 years old module exposed). This value is similar to that reported by manufacturer of 0.70%/year [5].
- The Rs increase about a 72% of initial value . Fill Factor decreases in around of 6.7% with respect to its initial value.

References

[6] PVSYST V5.05 Databases.

Acknowledgment

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