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## **Solar Tracking with the Power of MLD**

### **DELERIA UPGRADE PROJECT – CENTRAL GREECE**

DEGER is the leading manufacturer with the world's largest product portfolio for single and dual axis solar tracking systems. Its market position is based on the unique, patented "Maximum Light Detection" or **MLD** technology.

When compared to astronomically-guided dual-axis tracking systems, the DEGERtrackers enjoy a clear advantage. The Zentrum für Sonnenenergie und Wasserstoff-Forschung (ZSW) [=Center for Solar Energy and Hydrogen Research] calculated an increase of around 27 percent for astronomically-guided systems over fixed systems in European latitudes. MLD technology also offers 7% – 8% more energy for solar collectors in comparison with astronomically-guided trackers. Therefore, the energy production is going to increase at this rate from the next day of the upgrade.

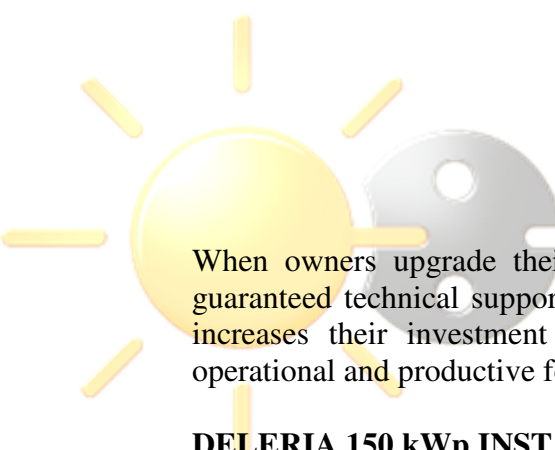
Nowadays, over 50 solar installations throughout Europe have already been upgraded followed by a significant number of solar parks owners, who are interested in repowering their energy installations with DEGER MLD technology. Not only their energy production will increase significantly in the most efficient way on terms of energy use, but there will also be many more benefits for them.

A lot of solar parks that are going to be upgraded, happen to be outdated installations of solar trackers based on GPS and Astronomical Equations. The installed systems with astronomical guidance, don't receive technical support anymore, which is a crucial matter of performance and durability through time. Most of the previous installation companies either have shut down or been inactive for the last years.

These complex astronomical control systems can be bypassed and connected with our custom control board on multiple points, could be in the manual operation sub-system or fully bypass the PLC controller that in most cases exist. After the technical intervention, control boards of astronomical type- trackers should be connected with MLD adaptor board and therefore obey the commands of DEGER MAXIMUM LIGHT DETECTION - DEGER-MLD technology. In any case the astronomical algorithm is bypassed and MLD active tracking technology will drive the upgraded tracker to optimum yield.

For a 2axis tracker MLD upgrade we also provide you two DEGER MLD sensors, connected with a special DEGER circuit board energy converter towards an adaptor board. The DegerMLD sensors are placed on specific points of the to-be-upgraded-tracker at Azimuth and Elevation orientations so the tracker performs correct "solar tracking" movement.

DEGER MLD equipment, described as above, is connected with MLD signal adaptor board. It has 8 control relays and manages to integrate DEGER MLD light detection technology to astronomical control systems.

A graphic in the top left corner showing a bright yellow sun with rays and a grey gear partially overlapping it.

When owners upgrade their solar trackers to MLD technology, they get to receive the guaranteed technical support DEGER, (technical advice, spare parts etc). This significantly increases their investment lifetime, also meaning that their solar installations will be operational and productive for years to come.

### **DELERIA 150 kWp INSTALLATION - CENTRAL GREECE**

On following pages of this document you can see stats and photos from an upgraded solar installation in Central Greece, Larissa region. (Deleria). The solar park of 150 kWp was operating with 16 Feina trackers and AC motors that had been obeying an astronomical algorithm system combined with GPS. In fact it was not an effective control system.

Since day 1 2012 and in just 2 years after, the energy production had been reduced significantly due to many malfunctions of the electronics. The lack of spare parts and official technical support was also crucial for the low annual yields.



Then, in late 2015, the installation was upgraded by **PVMAINT ENERGY SERVICES** company. with MLD sensor sets , along with DEGER control units and CCBs and windmeters, operating in AC and following our basic upgrade strategy points:

1. Solar Tracking with the Power of MLD
2. Does not “touch” or alter any power actuating motor part of the tracker
3. Bypassing the PLC control
4. Wind loads safety device provided by Deger
5. Every night all trackers head towards east (homing)

Luckily, thanks to DEGER, the solar installation is now highly productive, having the best energy yields possible in the region.



Deleria Installation with 16XFEINA tables (39.792743°, 22.349943°)

### Basic installation data:

**Solar plant identification:** Makka  
**Location:** Deleria, Larissa  
**Country/Region:** Greece  
**Longitude:** 39°48'11" North  
**Latitude:** 22°20'28" East

### System configuration:

**Rated installation output:** 150 kWp  
**Number of trackers:** 16 x FEINA  
**Inverters:** SMA  
**Installer:** PV MAINT

Connected to Grid since 2011

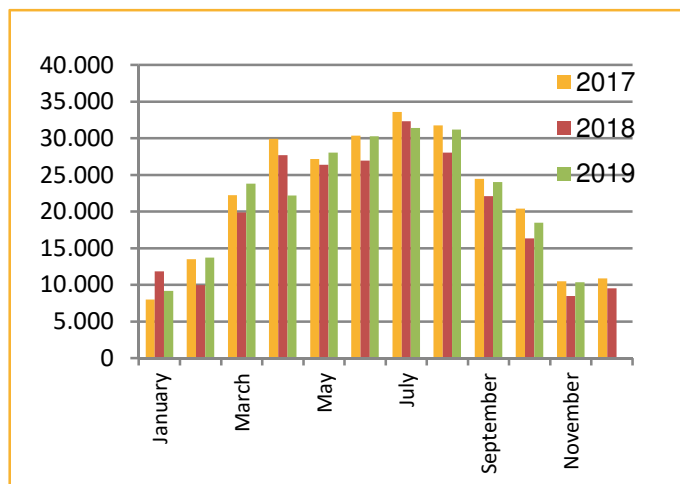
### Production period

JANUARY 2017 - NOVEMBER 2019

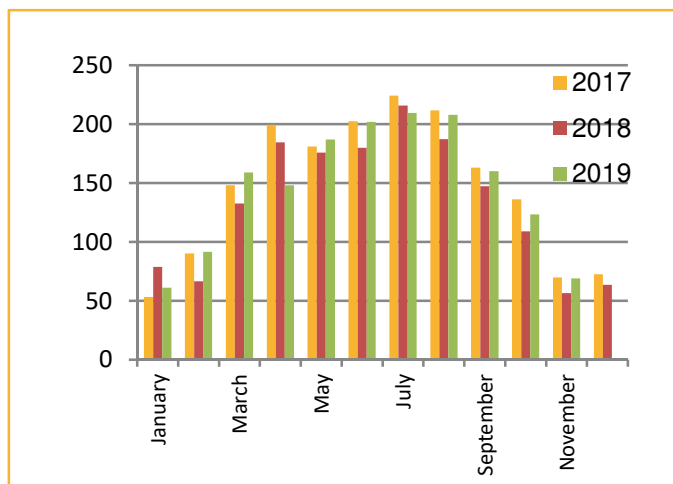
|           | 2017      |         | 2018      |         | 2019      |               |
|-----------|-----------|---------|-----------|---------|-----------|---------------|
| Month     | kWh total | kWh/kWp | kWh total | kWh/kWp | kWh total | kWh/kWp       |
| January   | 8000      | 53,33   | 11830     | 78,87   | 9190      | 61,27         |
| February  | 13520     | 90,13   | 9970      | 66,47   | 13720     | 91,47         |
| March     | 22230     | 148,20  | 19890     | 132,60  | 23830     | 158,87        |
| April     | 29940     | 199,60  | 27700     | 184,67  | 22220     | 148,13        |
| May       | 27170     | 181,13  | 26380     | 175,87  | 28040     | 186,93        |
| June      | 30390     | 202,60  | 26980     | 179,87  | 30290     | 201,93        |
| July      | 33620     | 224,13  | 32350     | 215,67  | 31430     | 209,53        |
| August    | 31750     | 211,67  | 28070     | 187,13  | 31180     | <b>207,87</b> |
| September | 24480     | 163,20  | 22100     | 147,33  | 24030     | <b>160,20</b> |
| October   | 20420     | 136,13  | 16330     | 108,87  | 18510     | <b>123,40</b> |
| November  | 10490     | 69,93   | 8470      | 56,47   | 10360     | 69,07         |
| December  | 10880     | 72,53   | 9530      | 63,53   |           |               |

|              |                  |                |                  |                |                  |                |
|--------------|------------------|----------------|------------------|----------------|------------------|----------------|
| <b>TOTAL</b> | <b>262890,00</b> | <b>1752,60</b> | <b>239600,00</b> | <b>1597,33</b> | <b>242800,00</b> | <b>1618,67</b> |
|--------------|------------------|----------------|------------------|----------------|------------------|----------------|

150 Kw

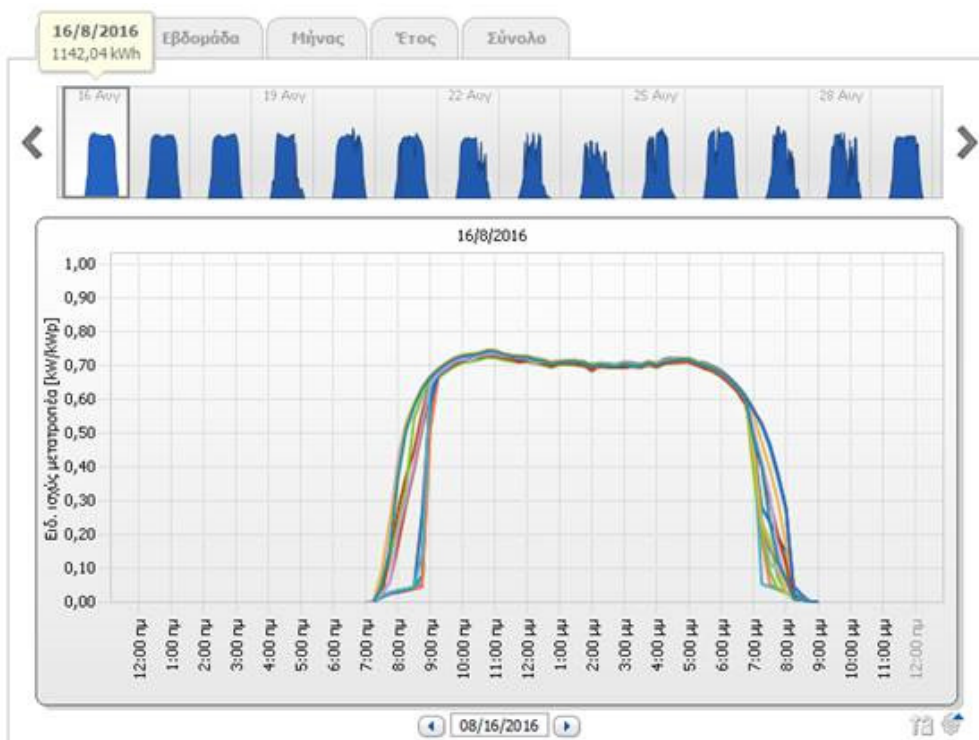
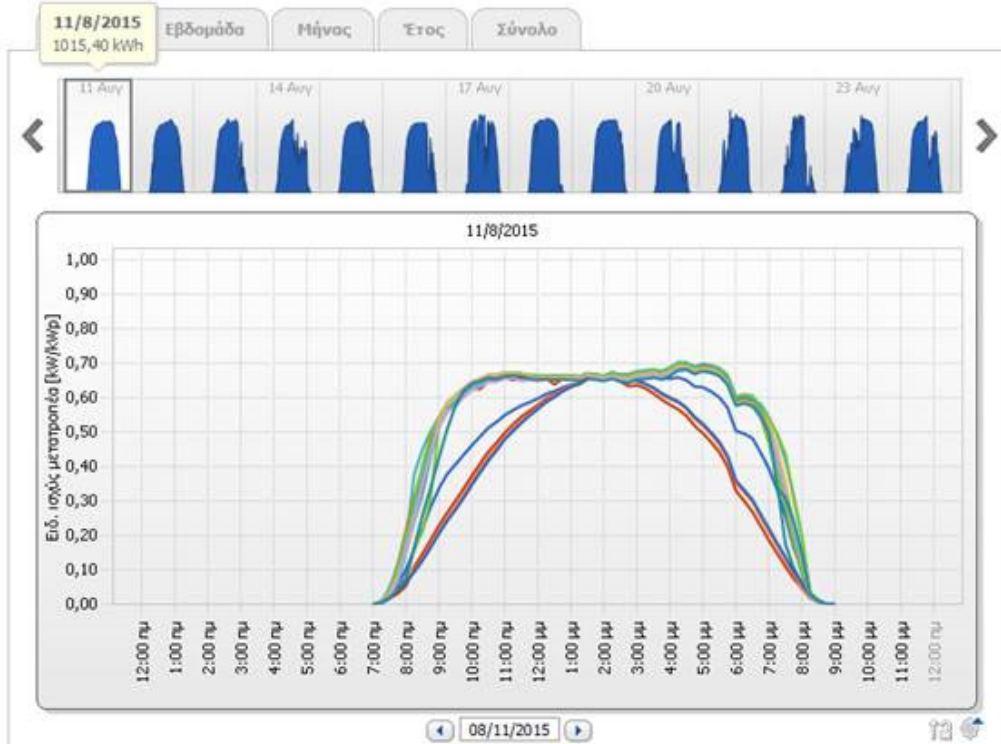


Total production graph



Production performance: kWh/kWp

Diagrams below show the increase in energy production (kWh/kWp), from a day before upgrade (August 2015) to a year later (August 2016) when MLD technology has been installed on trackers.





A graphic in the top left corner showing a bright yellow sun with rays and a grey gear with two circular cutouts, partially overlapping the sun.

## PHOTOS FROM DELERIA INSTALLATION



