Towards 2 GWp of Bifacial PV

Commercial and R&D activities of Solitek

The 6th bifiPV workshop 2019

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2019.09.16
ABOUT SOLITEK

- The Northern/East-Europe leader in solar energy
- We are middle-sized and specialized.
- Main business - manufacture, sale, and delivery of glass-glass c-Si PV panels.
- All of our products are manufactured in the EU, using 100% renewable energy.
OUR CUSTOMERS

- Over 60% of our solar panels is exported to Sweden, Norway, and Germany.
- Over 90% to the EU as a whole.
- The majority are PV installers, distributors, and project developers in the EU.
- Separate business unit to serve the local market in Lithuania (household owners)
FACTS & FIGURES

SOLITEK PRODUCTION, 2018:
- 100K panels
- 27 MW total produced capacity

SOLITEK PRODUCTION FORECAST, 2019:
- 200K panels
- 50 MW total produced capacity
- Production line upgrade in 2020 Q1, 9-12 BB panels, 100 MW
PRODUCT PORTFOLIO

- Glass - Foil STANDARD 270W/300W
- Glass - Glass PRO 270W/300W
- Glass - Glass SOLRIF 270W/300W
- Glass – Glass Framed
- Glass - Glass SolidWALL
- Glass - Glass BIFACIAL

Features:
- SELF-CLEANING EFFECT
- SALT MIST RESISTANCE
- FIRE CLASS A
- DUST & SAND RESISTANCE
- AMMONIA RESISTANCE
- EXTREME LOAD RESISTANCE
OVERVIEW OF COMMERCIAL N TYPE PROJECTS

Projects completed in 2019:

• 512 kWp system in Netherlands
• 2 MWp project in Ukraine
Bifacial PV projects: Ochten, Netherlands

- Operating since 2019.03.29
- Panels: Solitek Solid Bifacial
- Installed power – 512,21 kW
- Mounting system - BayWa Novotegra E-W
- Roof albedo – 0,45-0,5
- Simulated energy gain with PVSyst - +3,4%
- Monitored energy gain: +6,5%
- Contractor - Solardarity
Bifacial PV projects: Vilnohirsk, Ukraine

- Opened in 2019.08.28
- Modules: Solitek Solid Bifacial
- System size – 2 MWp
- Tracker configuration – two portrait
- Axis height – 2,5 m
- Artificial increase of ground albedo (0,5 ct/Wp)
- Tracker pitch – 12,5 m
- Inverters – ABB
- Simulated energy gain: + 40%
<table>
<thead>
<tr>
<th>Material</th>
<th>Texture</th>
<th>Reflectivity</th>
<th>Transparency</th>
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</thead>
<tbody>
<tr>
<td>Glass shards</td>
<td>N/A</td>
<td></td>
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<tr>
<td>Sand</td>
<td>0.4</td>
<td>0.5</td>
<td>0.65</td>
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<tr>
<td>Glass painted in white, light</td>
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<td>reflective paint</td>
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<tr>
<td>Sand painted with white, light</td>
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<td>reflective paint</td>
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<td>Sand excessively painted with</td>
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<td>white, light reflective paint</td>
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<td>Sand mixed with concrete</td>
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<td>excessively painted with white,</td>
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<tr>
<td>light reflective paint</td>
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<tr>
<td>Sand mixed with concrete</td>
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<tr>
<td>White polymeric foil</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
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<tr>
<td>White, UV stable</td>
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<tr>
<td>Steam film (aluminium)</td>
<td>0.7</td>
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<tr>
<td>Agro textile</td>
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Towards 2 GWP: Changes of Lithuanian energy system

- Lithuania will be disconnected from the “east” until 2025.
- Increase in energy price expected
- National strategy:
  - 45% of electricity produced from renewable sources by 2030.
  - 100% from local production by 2050

Unused ground around a closed nuclear power plant
1.5 - 2 GW of bifacial HSAT PV systems could be installed in several unused locations across the country.

- 3 GW Ignalina nuclear power plant has been shut down in 2009
- Infrastructure for power transmission is still available

Stable price for 20 years at 4.5-5 ct Eur / kWh

Preparation for a 10 MW “pilot” PV project is on going.
Development of superior quality PV systems, based on a hybrid combination of technological innovations and business operation solutions, aiming to accelerate large scale deployment in Europe and help EU photovoltaic business to regain leadership on world market.
SUPER PV project: overview

Enhancing PV power electronics durability and efficiency by deploying technological advancements in module level power electronics and fault-tolerant converter topologies.

Integration of innovations (multifunctional nanocoating, in-laminate bypass diode, advanced encapsulation for flexible PV modules and bifacial panels improvement) into state of the art PV module technologies.

LCOE

7-14 %

4-5 %

12-18 %

ADDITIONAL REDUCTION

Innovative digital platform for Photovoltaic Information Management (PIM) based on Building Information Management (BIM) tools, ensuring integrated information flow through the PV value chain.
SUPER PV project: functional coatings (AR, AS & IR)

- Nanomaterial based technology
- Easy to apply with a spray gun, curing at room temperature
- AS properties developed and demonstrated on mini modules
  - UV, DH and TC resistant
- Development of AR and IR properties is on going.

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<tr>
<th>COATING</th>
<th>TRANSMITTANCE</th>
<th>WATER CONTACT ANGLE</th>
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<tbody>
<tr>
<td>HFL</td>
<td>92 %</td>
<td>15 – 20°</td>
</tr>
<tr>
<td>HFB</td>
<td>91 %</td>
<td>110°</td>
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SUPER PV project: in-laminate by pass diodes

- Prototype diodes manufactured by ISFH
- Integration into standard and bifacial modules test has been completed at Solitek and Apollon Solar
- Large batch of diodes & modules to be produced at the end of 2019.
- Module cost reduction potential: 1.5 – 2.0 Eur/module
SUPER PV project: light harvesting

- Modelling and testing of light harvesting patterns on the rear side
- Estimated power gain: 5-7 Wp
- First module results expected by end of 2019, more coming 2020.
Demosites for data collection and monitoring

- Test fields: Sevilla, Oslo, Trondheim, Vilnius, Quarzazate, Rabat, Tozeur
- System size: 45-90 panels. Up to 30 kW
- Start of demosite construction in 2019 Q4.