

Spring cleaning your Solar Park?

Boost its output too with
DSM Retrofit Anti-Reflective (AR) coating

TechTalk Product Series Webinar

joern.brembach@dsm.com

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NUTRITION • HEALTH • SUSTAINABLE LIVING



DSM

BRIGHT SCIENCE. BRIGHTER LIVING.

Content

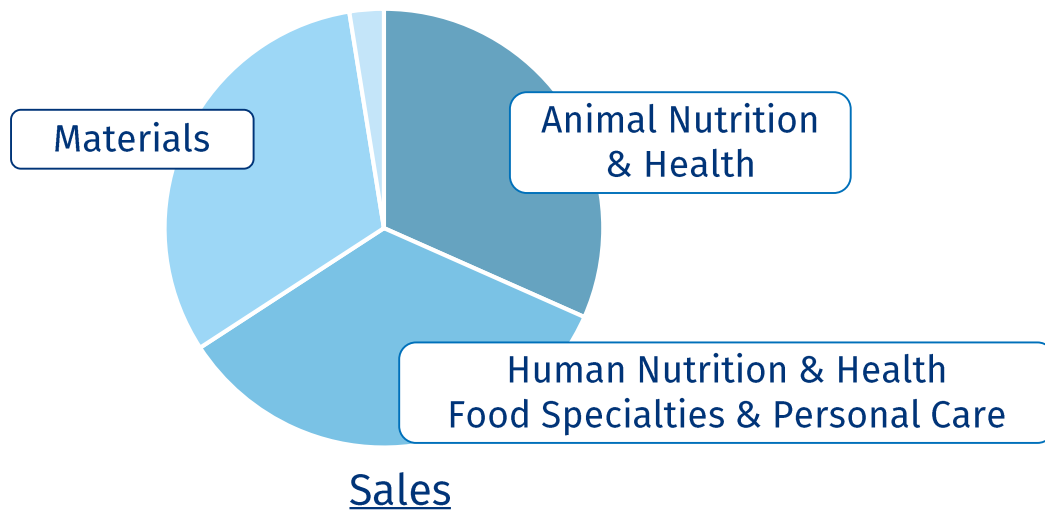
Let's go retro!

- Introduction DSM
- Why applying our Retrofit AR coating
- The science behind our coating
- Retrofit ARC from O&M perspective
- Bankability – investors view
- Way forward



Royal DSM: A company with a purpose

- Global workforce ~22,000 employees
- Sales ~€9.0bn
- EBITDA ~€1,7bn
- 50% purchased electricity from renewable sources
- 63% of our products are "Brighter Living Solutions"
- Global company with 66% of sales outside Europe



DSM solutions are lowering the cost of solar power

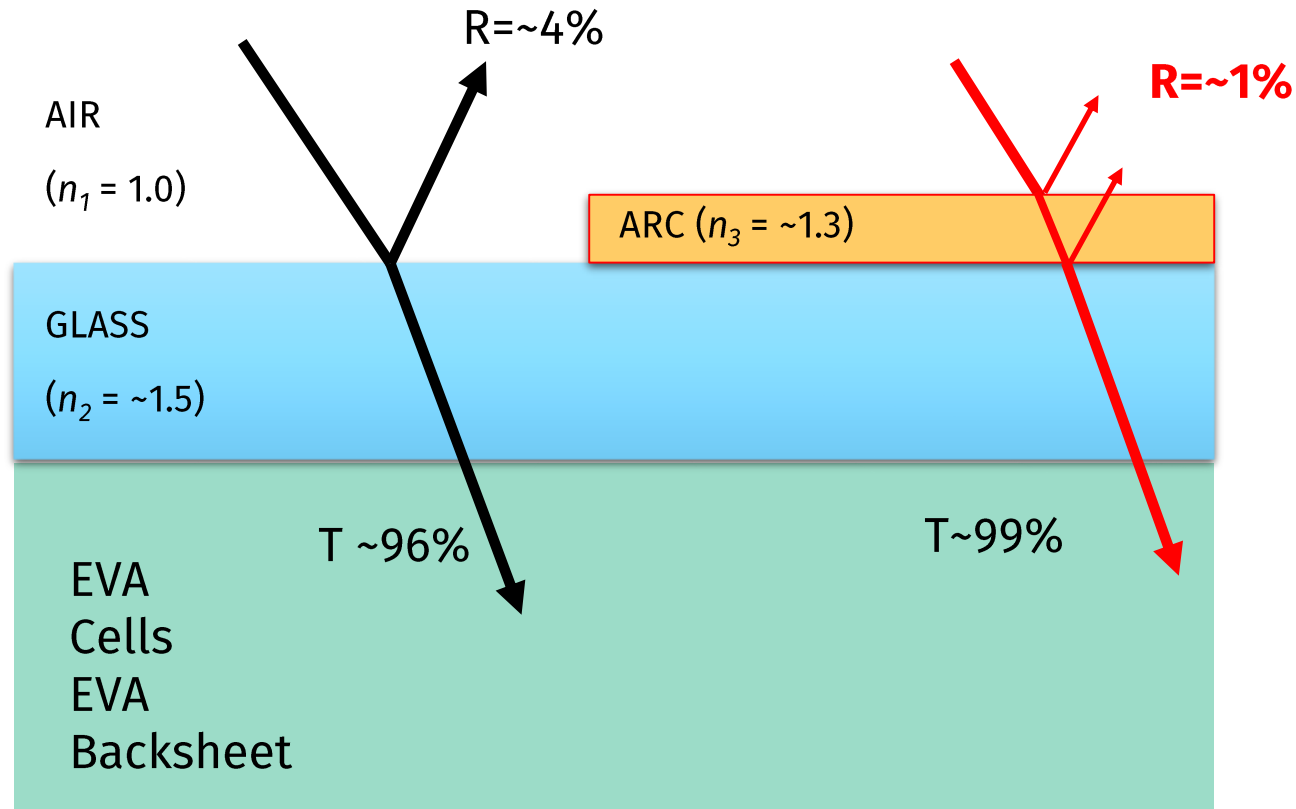


WHY retrofitting older PV parks with AR coating

- MOST older parks don't have an AR coating
- Old PV parks in Europe receive a FiT/PPA based on kWh produced
- PV modules in the field degrade over the years (even in the best case 0.4%/year degradation after the 1st year* is seen in Europe)
- PV parks leave some extra revenues on the table



Basic principles of ARC technology: PV-module, single sided coated

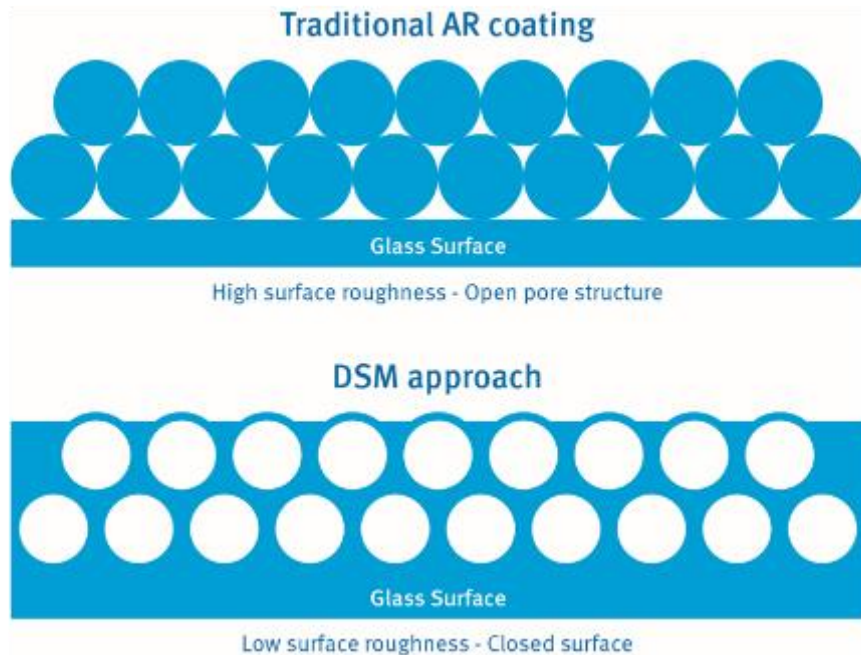


Simplified illustration disregarding e.g. absorption of glass

DSM Retrofit Anti-Reflective coating

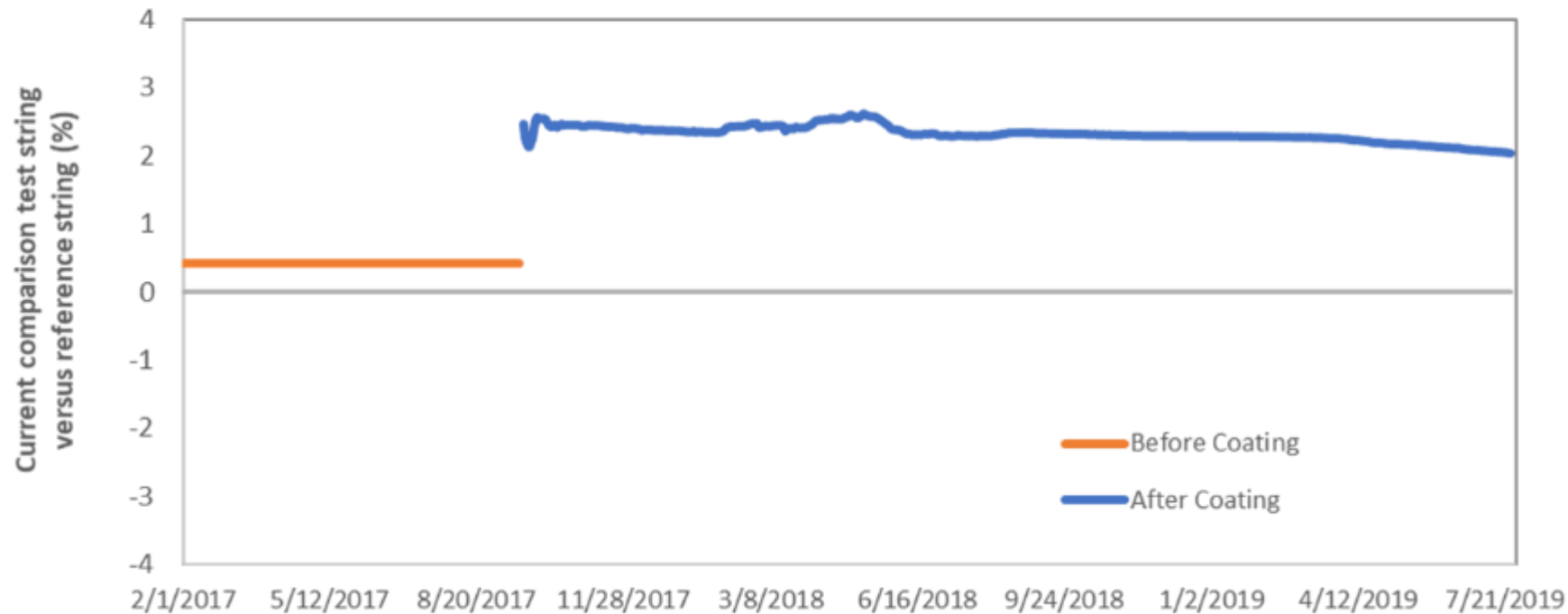
For up to 3% more power

- Based on DSM proven “core-shell” technology, re-formulated for outdoor application
- Patent protected product & application technology
- For older solar parks that are uncoated
- The performance has been extensively lab-tested



DSM Retrofit Anti-Reflective coating – outdoor performance

- DSM is validating the outdoor performance and durability, focusing on existing ground mounted PV parks
- The boost in output is visible immediately after coating application. The coating dries very fast
- The first outdoor tests have been implemented in 2017
- 10 field tests (in total ~1 MWp) have been implemented in 2018 and are continuously being monitored. The typical increase in output is 2-3%



Retrofit Anti-Reflective coating – from O&M perspective

- The coating is applied by a tractor driven spray coating applicator which can coat modules at extremely high speed
- Up to 3% more power output
- Turnkey Service according to field specifications
- Almost zero plant downtime
- Application up to 3 modules portrait or 5 modules landscape orientation
- Further improvements in the pipeline for almost all module table designs

Retrofit Anti-Reflective coating – field application

- Environmentally friendly (SHE)
- Machinery regulatory (CE)
- All workmanship according to Risk Assessment/RAMS
- Extensive field data analysis insights



The investor's view: Bankability

- investors leave some extra revenues on the table
- DSM Retrofit AR coating provides up to 3 % more power output
- Average Payback period ≤ 3 years

DSM's Turnkey Service

Best in class bankability

- EU and national product regulatory files
- Module warranty statements
- Documented Reliability and Durability
- Field work insured by leading EU insurance
- Optional project price reimbursement
- Continuous product optimization in terms of application and output gain

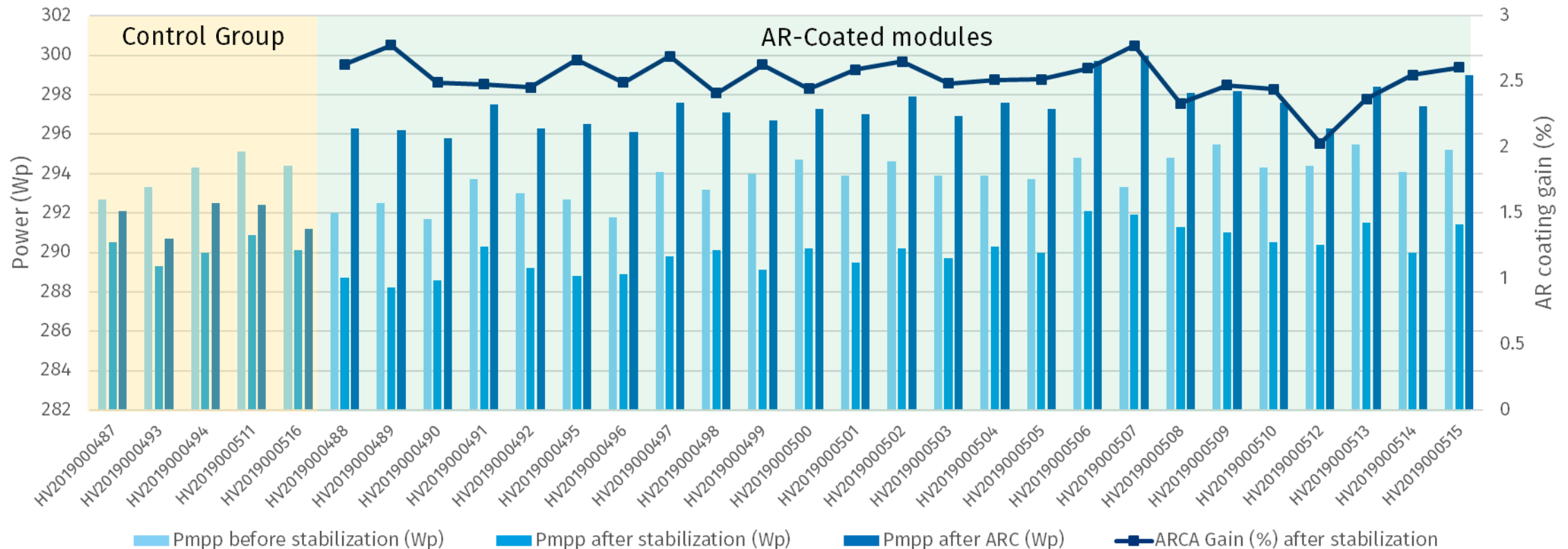


✓ Financial strength
✓ Technology leadership
✓ Experience
✓ Global reach

DSM Retrofit AR coating testing at TÜV Rheinland

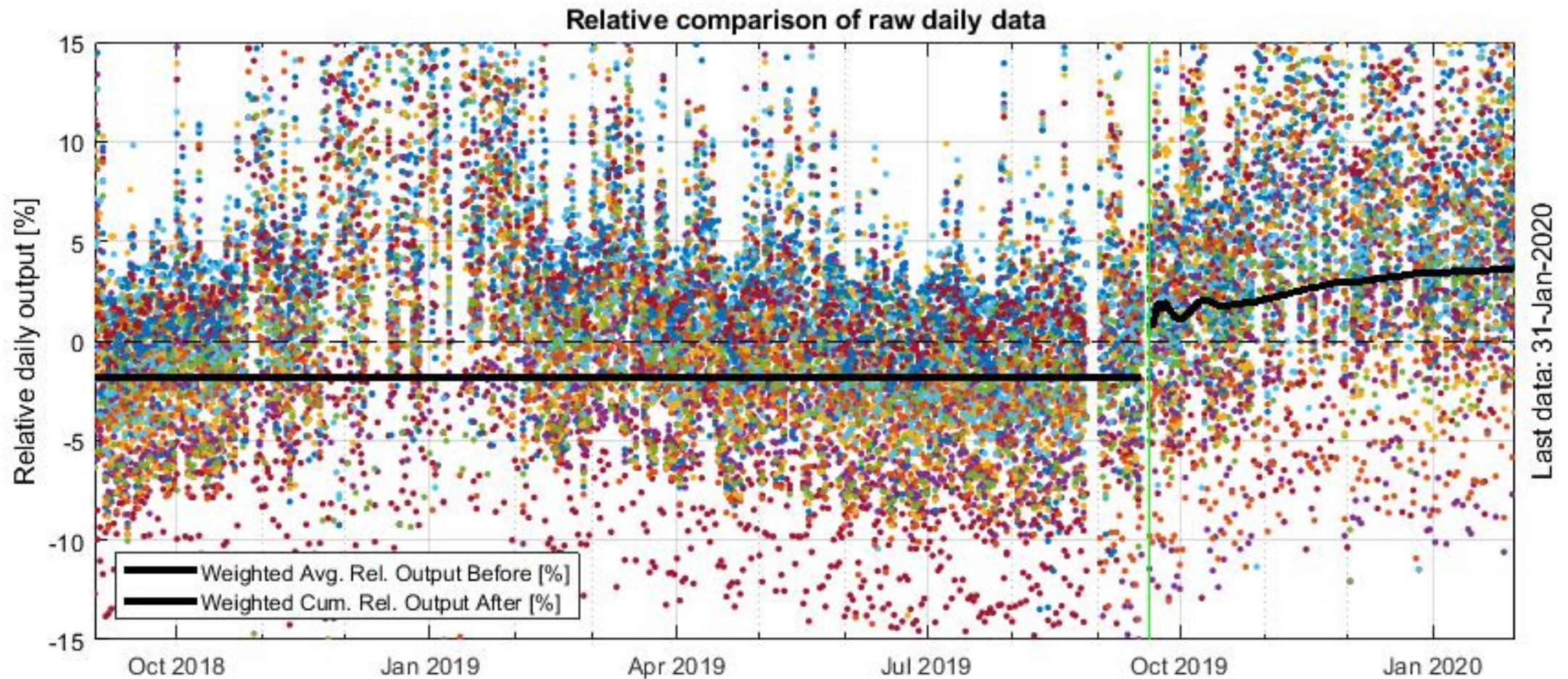
- summary Flash test results acc. to IEC 61215 (report 21245698.001)

Power rating measurements (Wp) at STC and Retrofit AR Gain (%)



- The 25 retrofit AR-coated modules show an average gain of +2.53% on Power and 2.24% on Isc. variations. Uncertainty of measurements: $\pm 1.5\%$ on Power, $\pm 1.9\%$ on Isc.

Business case Germany: actual performance



gain expectation: 2.75%

Actual average gain: 4.20%

Business case example for a 2.5 MWp park



PV Park & Module

- Italy
- Installed capacity: 2.5MWp
- Grid connection: 2011
- 10638 panels
- 235Wp / Poly 60
- Surface per panel: 1.63m²
- Average energy output: 1330 kWh/kWp



Economics

- Energy boost of Retrofit AR coating: 3.0%
- Value calculated for: 6 yrs
- FiT: 0.348 €/ kWh

Value generated by ARC:

~ 190.000€

less than 3 years
pay back time

Way forward

- Commercial in Europe
- Currently coating applied on multi-MWp PV parks with biggest EU asset owners
- continuous Service and Bankability improvements
- Expansion, both in region and ecosystem partners in 2020

