### A4 Analysis for Innovators



# RINA innovates to boost solar power adoption

RINA, a diverse multinational company with a strong renewable energy division, partnered with the National Physical Laboratory (NPL) to advance innovation in solar power by gaining a better understanding of the yield produced by bifacial photovoltaic (PV) panels.

#### Challenge

RINA works with clients around the world who develop and invest in solar photovoltaic (PV) plants. These customers come to the renewable energy specialist for accurate forecasting of the energy output of their proposed PV plants in order to reduce the technical and financial risks. RINA has been witnessing increased customer demand for bifacial photovoltaic (BFPV) energy yield analyses. BFPV panels convert light into electricity from both the front and rear of the panel and current estimates are that up to 40% of new installations will be BFPV by 2025.

The current simulation procedures and inputs used to determine BFPV energy production come with a number of uncertainties. RINA's challenge was to be able to reduce these uncertainties, and thereby produce more reliable and better-understood measurements that could be confidently and robustly validated.

Overcoming these challenges would continue to secure RINA's position as a leading technical advisor in innovative PV and boost investment in BFPV across the sector by being able to reduce both the associated technical and financial risks.

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#### **Solution**

The principal energy gain from using BFPV panels above standard monofacial panels - is determined by ground albedo, which is how much light is reflected from the ground up to the panel.

RINA initially partnered with NPL through Round 3 of the Analysis for Innovators (A4I) programme on a feasibility project.

During this project, NPL completed analysis on ground and satellite data which enabled an accurate source of albedo data to be identified through the partners investigating the wavelength composition of reflected light and the spectral response of the BFPV module.

These data analysis methodologies provided RINA with a method to evaluate high-resolution albedo data that worked well for large, spatially uniform sites.



The partners then came back together for a follow-on project to standardise and formalise these data analysis methodologies, and integrate them into RINA's systems.

While being able to determine typical datasets for specific climates and land-types gave RINA the ability to provide a better estimate of the albedo, the most accurate measurements would be those taken in-situ at proposed BFPV sites.

RINA and NPL worked together to install measurement systems on a number of sites. Collaborating on this activity has progressed RINA's capability in developing both measurement and monitoring systems.

NPL's expertise in BFPV technology and uncertainty analysis, along with measurements from these systems, fed into the development of new uncertainty calculation tools so RINA can better assess the financial risks associated with different albedo measurement methods.

The partners' work on establishing these initial onsite measurement systems paved the way for a new methodology for forecasting future albedo at BFPV plants, in a major advancement for the sector.

Our capabilities in bifacial photovoltaics have been significantly extended from a year ago.
We have several new tools and methodologies and are placed to offer new services immediately to clients. We are seeing huge client interest in several aspects of bifacial PV energy modelling and have projects looking at on-site albedo measurement and effective albedo calculation in the pipeline.



Jenna Holder Senior Energy Consultant, RINA and A4I Project Leader

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#### Impact

The A4I project has delivered a significant step-change in the company's technical capability, providing a competitive advantage over its clients and majorly enhancing its expertise in the BFPV sector.

The project has enabled RINA to offer several new products to its client base. With the introduction of these new products and their enhanced technical competency, RINA expects to see an increase in revenue and strengthening of its brand reputation.

The new products it will bring to market as a result of the A4I project include the calculation of effective albedo; an on-site albedo and irradiance monitoring portal; and typical datasets of albedo categories across locations globally that vary in their climates and landscapes. The latter can be used when an initial assessment is required or where there are no on-site measurements.

RINA has also developed a Measure-Correlate-Predict tool to enable short-term on-site data to be correlated with satellite data to feed into a forecast albedo.

The company can now offer in-house expertise in albedo measurement set-up, guidelines on the best way to determine albedo and refined energy yield simulations for BFPV, including the ability to feed monthly albedo values into ray-tracing simulations.

For RINA, the A4I programme has been central in extending its capabilities and the new services it can offer to clients.

RINA anticipates that the broadened and deepened product offering will strengthen its external reputation as a leading renewables technical adviser. It expects that the increased exposure it predicts it will gain by being an industry leader in this area will lead to a competitive advantage and attract new customers across the global RINA business. NPL is feeding insights gained from this project into the working group for the improvement of the IEC 61724-1 standard, which is focused on the monitoring of PV system performance.

RINA expects the adoption of effective albedo studies to become more commonplace within the industry and a standard requirement over time, with the results of this project playing a central role in their development.

RINA predicts that industry-wide standard requirements will lead to more accurate BFPV energy yield quantification, resulting in higher confidence in the financing sector and a reduction in project costs globally. This will be key in the greater adoption of BFPV globally over the next few years, underpinning the enhanced potential of solar power as a renewable of choice in providing greener energy and tackling climate change.

Going forward, RINA will continue to carry out more on-site data testing at locations around the world to continually validate its yield modelling assumptions.

RINA will market its new products and incorporate the innovative tools into its methodology training for staff to build and increase its in-house technical capabilities.

#### A4I

A4I is a programme that gives UK businesses, of any size, access to cutting-edge R&D expertise and facilities to help solve problems that they have been unable to tackle using standard techniques. The focus is on solving issues affecting product cost, reliability or lifetime and production problems.

