5/ Integrating Agri-PV Systems in Weak Rural Grids [CRES/BRITE]

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The Challenge

As agrivoltaic (agri-PV) installations expand in rural and remote areas, a major industrial and technical challenge emerges: **how to connect and operate large-scale agri-PV systems within weak or underdeveloped electricity distribution grids.** Many rural regions lack the infrastructure capacity to support high renewable energy penetration without costly reinforcements.

This challenge focuses on developing **best practices, design methodologies, and digital tools** for the integration of agri-PV systems into weak grids or even **off-grid microgrids.** The solution should incorporate **distributed energy resource (DER)** management principles — including energy and power balancing, storage integration, flexibility mechanisms, and sector coupling (e.g., linking electricity, heat, and water systems). Such an approach would allow agri-PVs to operate efficiently and securely while optimizing local energy use and minimizing grid stress.

Technology Readiness Level (TRL)

8 – Core agri-PV components are commercially mature. Integrating them into advanced distributed energy architectures could raise the system's overall TRL to 9 through scalable, grid-ready configurations.

Expected Outcomes

- Secure and stable operation of agri-PVs in rural and off-grid contexts
- Reduced grid congestion and voltage instability
- Higher utilization of locally produced renewable energy
- Scalable, cost-effective deployment models for large agri-PV farms

Impact on Operations

Addressing this challenge will enable wider adoption of agri-PVs without requiring extensive grid upgrades. It will also **support rural electrification**, **improve energy autonomy for farmers**, and **enhance the business case for renewable deployment** in remote areas.

Current State / Next Actions

The agri-PV systems developed under the SolarHub project are technologically mature and field-ready. However, **their grid interaction and scalability potential remain unstudied.** Due to resource limitations, additional expertise and tools are needed to evaluate and optimize grid integration strategies.

Next Steps / Collaboration Opportunities: Development of methodologies, software tools, and operational guidelines for grid integration; joint R&D activities and demonstration projects in EU or national funding frameworks.

About Brite

BRITE HELLAS is a Greek high-tech company specializing in advanced photovoltaic products, including customized transparent PV modules for building and agricultural applications. Its R&D focuses on product innovation and market adaptation for integrated solar solutions.

About CRES (Centre for Renewable Energy Sources and Saving)

CRES is Greece's national energy research center, specializing in renewable energy, energy efficiency, and smart grid technologies. With extensive experience in **microgrids, distributed energy systems**, and **energy management optimisation**, CRES plays a key role in bridging research and industrial deployment. Through its work in SolarHub and related initiatives, CRES aims to **advance sustainable agri-PV integration**, ensuring that rural and remote areas can fully benefit from clean energy without compromising grid reliability.

Contact

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