Space-based Solar Resource Intelligence for Regional Energy Planning and Forecasting

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ONLINE INFO SESSION: SPACE4ENERGY

The Laboratory of Atmospheric Physics

- Solar Radiation resource and forecasting.
- Weather and atmospheric pollution monitoring and modeling.
- Artificial intelligence methods applied to atmospheric and environmental physics problems.
- Ultraviolet radiation: measurements, modeling and biological dose rates.
- Weather/climate effects and early warning for epidemics
- Measurements, quality control, processing and homogenization of meteorological and environmental time series.
- Stable isotopes ($\delta^{18}O$ & $\delta^{2}H$) in rain and in atmospheric water vapor.

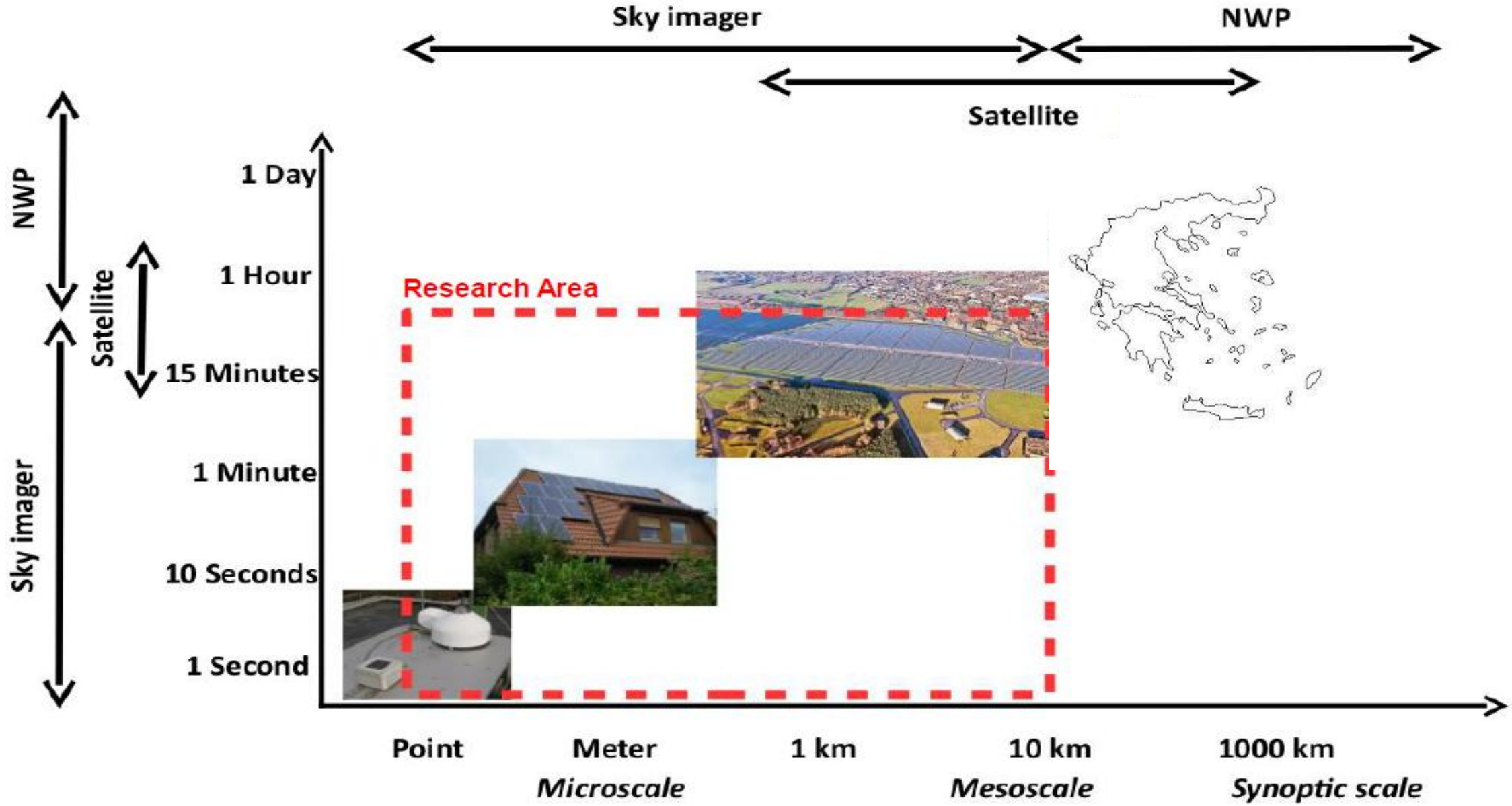
www.atmosphere-upatras.gr

Why Solar Resource Data Are Important to Solar Power

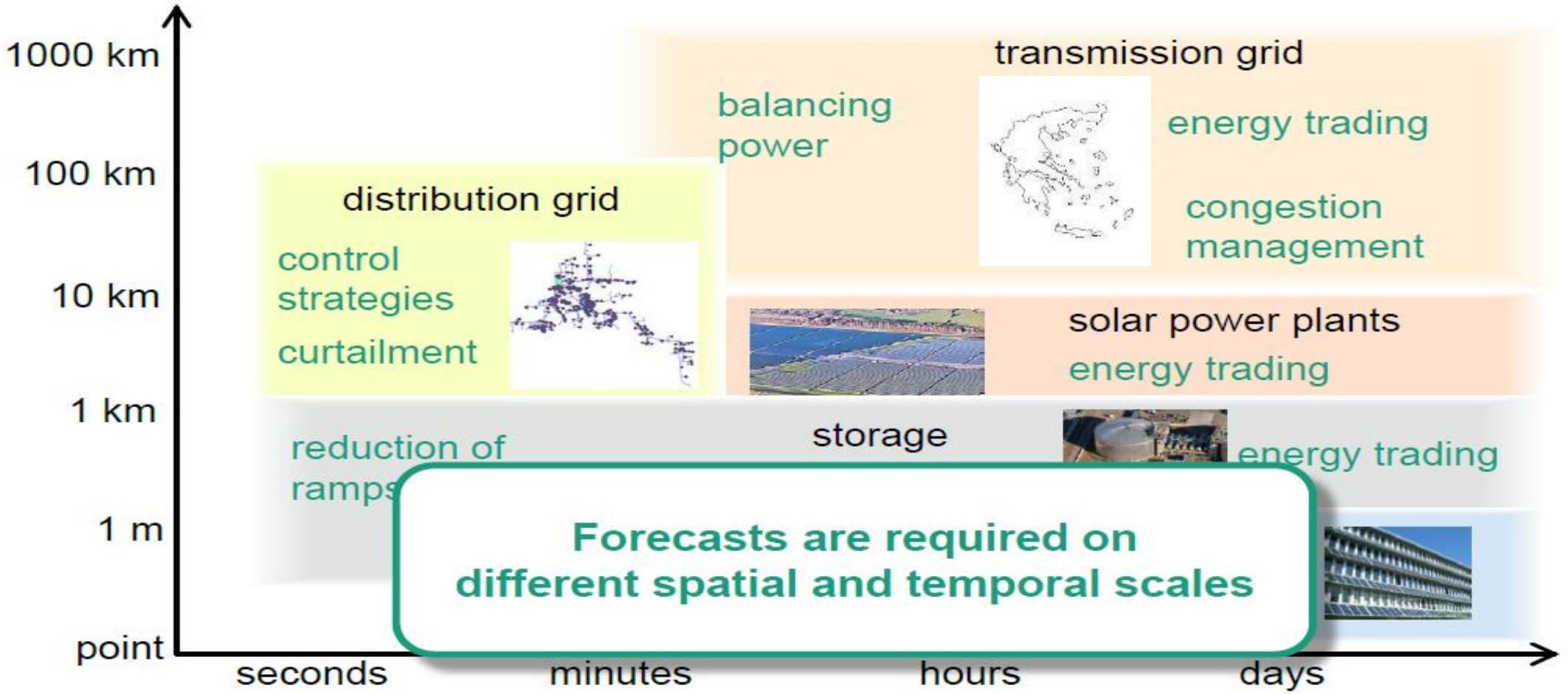
- ✓ Sunlight is the fuel for all solar energy generation technologies.
- ✓ The knowledge of the quality and future reliability of the fuel is essential for accurate analyses of system performance and to determine the financial viability of a project.
- ✓ For solar energy systems, the variability of the supply of sunlight probably represents the single greatest uncertainty in a solar power plant's predicted performance.

Solar resource data and modeling factor into three elements of a solar project's life:

- Historical long-term data for site selection during feasibility studies
- Prediction of power plant output for plant design and financing
- Real-time measurement and solar forecasting for plant and grid operations

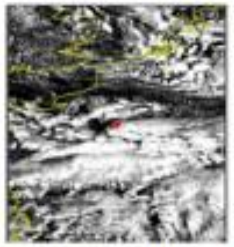

Sky imager
NWP
Satellite
NWP
Satellite
Sky imager
1 Day
1 Hour
15 Minutes
1 Minute
10 Seconds
1 Second
Research Area
Point
Meter
1 km
10 km
1000 km
Microscale
Mesoscale
Synoptic scale

Solar power forecasting for energy management and system integration



Satellite-based forecast

MSG Image



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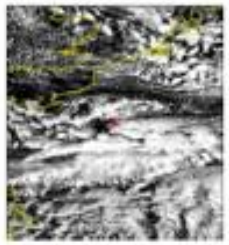
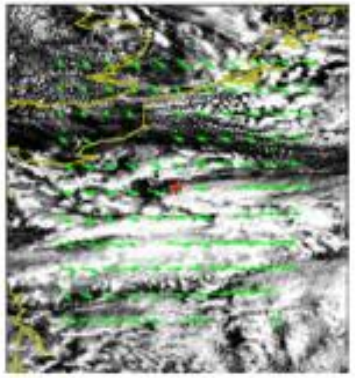
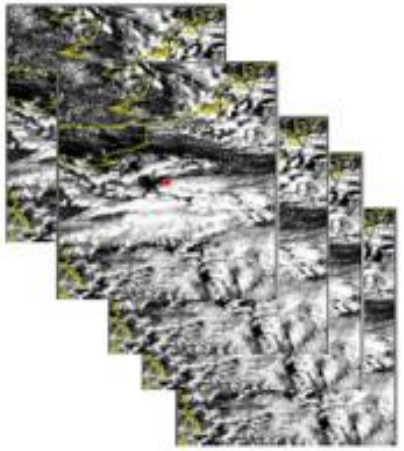


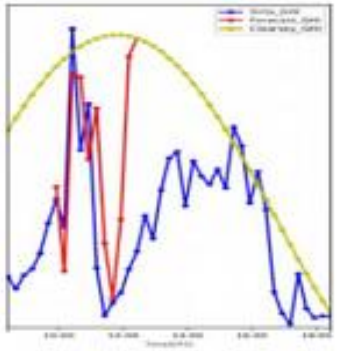
Cloud albedo



CMV computation



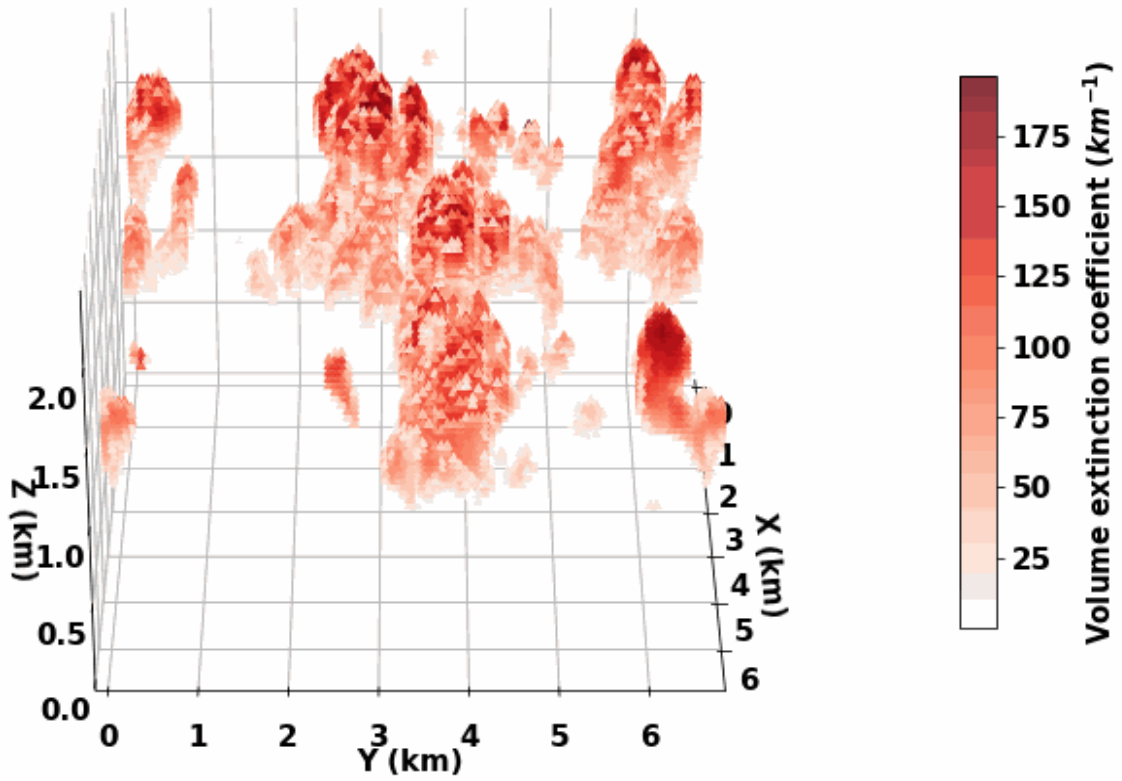
Extrapolation and smoothing



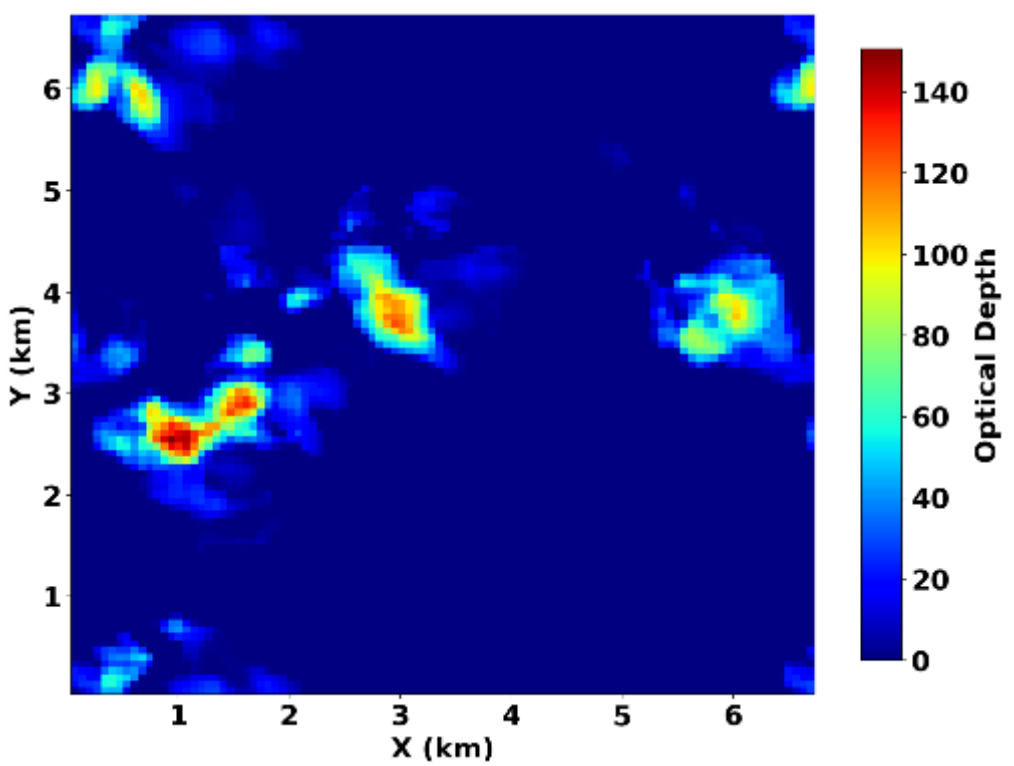
GHI forecast

PV power modelling

3D cloud effect on solar irriadiance



3D reconstruction of of cloud extinction coefficient



2D cloud optical depth

ISES: Connecting solar knowledge and action

Research, people and policy for a renewable energy world

Research and publications

Solar Energy journals, books and open conference proceedings

Events and exchange

Solar World Congress, EuroSun, webinars and national events

Education and people

Workforce development, Young ISES and national Sections

Policy and partnerships

A credible solar voice in international forums and renewable energy alliances

Regional value: a route from local evidence to international exchange, partnerships and policy dialogue

Andreas Kazantzidis, Secretary, ISES 2026–2028

ises.org

IEA PVPS Task 16: Solar resource for high penetration and large-scale applications

Fourth phase, July 2026–June 2029

Overall goal

Lower the cost and uncertainty of PV planning and grid integration

01 Solar resources

Measurements, radiation models and data for integrated PV systems

02 Forecasting

Nowcasting, day-ahead and sub-seasonal or seasonal horizons

03 Focus topics

Benchmarks, climate extremes, firm power and AI best practices

04 Dissemination

Webinars, open tools, the Solar Resource Handbook and standards

Activity 2.1: Nowcasting, 0–6 h

Co-led by the University of Patras

- **Inputs**

  ASI networks, satellite and MTG data, ground measurements and NWP

- **Common verification**

  Reference datasets and metrics for ramps, uncertainty and spatial aggregation

- **Operational value**

  Grid operations, battery dispatch, congestion management and intraday markets

Activity leads: Andreas Kazantzidis, University of Patras, and Khadija Barhmi, Utrecht University

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Thank you!