



# IEA PVPS Task 16

## Subtask 3- Forecasting

**ISES Webinar- An International Collaboration to Advance the Use of Solar Resource Information**

PVPS

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# Subtask 3 - Forecasting

- Evaluation of current and emerging solar forecasting techniques

## 3.1 Value of solar power forecasts

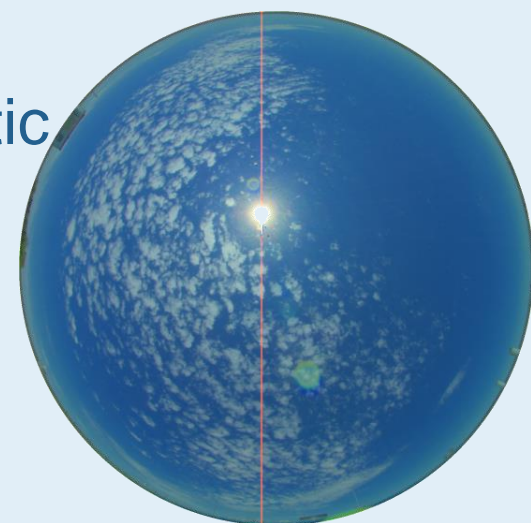
Lead: Richard Perez, SUNY, USA

## 3.2 Regional solar power forecasting

Lead: Alessandro Betti, i-EM, IT

## 3.3 Variability forecasting and probabilistic forecasting

Lead: Sylvain Cros, Reuniwatt, FR





# Activity 3.1

## Overview:

- **Participants:** USA (Cleanpower Res., SUNY, UCSD, Vaisala), AUT (FH OOE, Blue Sky), FRA (EDF, Piment, Mines Paristech), ESP (Ciemat, Cener, Univ. of Jaen, US), CHE (Meteotest), AUS (UNSA), NLD (Uni Utrecht), ITA (i-em, Univ. Roma2), GBR (WEMC, UEA)
- Forecast requirements for different applications
- Assessing value-based accuracy metrics
- Evaluation and comparison of solar forecasts with respect to their economic value in use cases



# Activity 3.1

## Milestones:

- W3.1 Workshop on analysis of solar forecast requirements for different application
- Q3.1.2: User – questionnaire on analysis of forecast requirements for different applications
- R3.1.1: Forecast evaluation and benchmarking from basic measures to the assessment of (economic) value



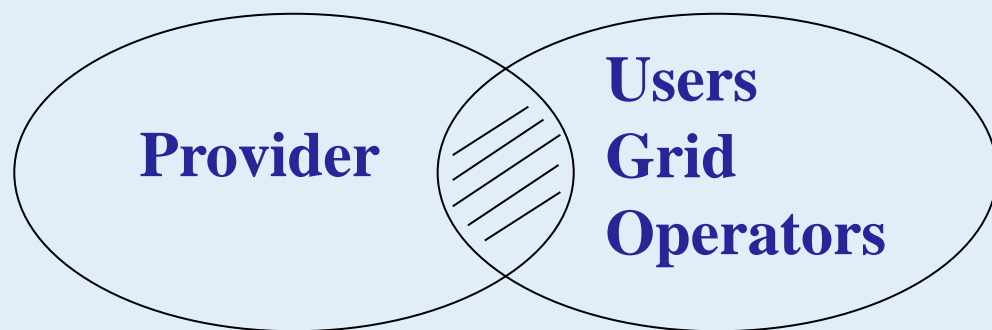
# Activity 3.1

## Ongoing Work:

Workshop on *Analysis of solar forecast requirements for different application*

at Intersolar Europe Munich 21<sup>st</sup> of June, 14-16 h

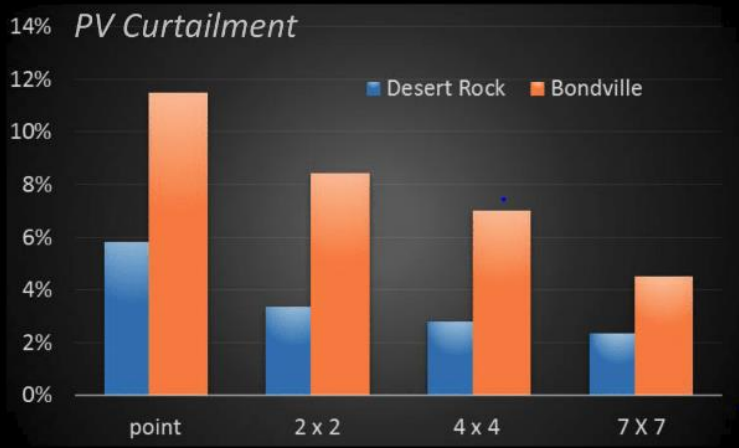
- Analysis & Value of forecast requirements for different applications
- Service providers, R & D, utility, TSO industry



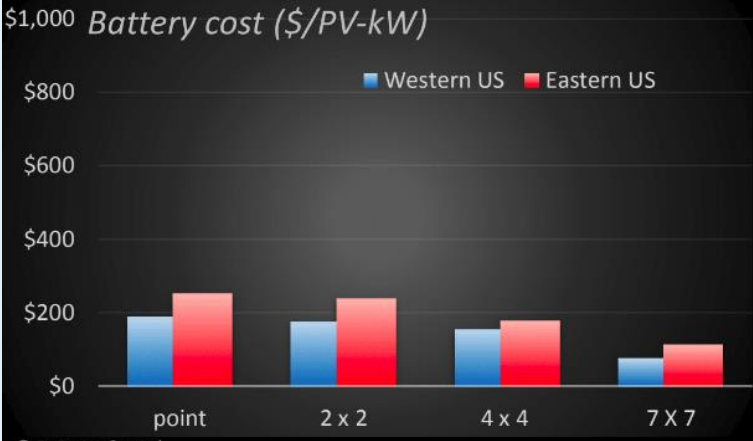
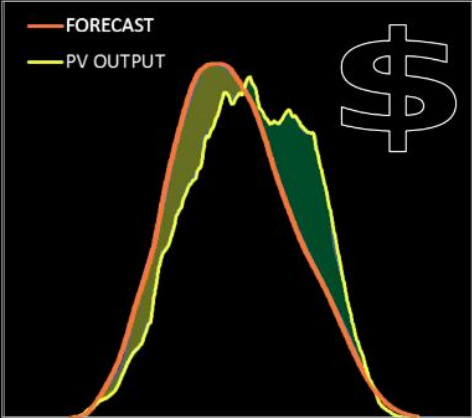


# Activity 3.1

## 24 hrs. ahead



## Cost of a perfect forecast?



© R. Perez & et al.



# Activity 3.2

## Overview:

- **Participants:** FRA (EDF, Reuniwatt, Piment, Mines Paristech), AUT (FH OOE, Blue Sky), CHE (Meteotest), ESP (Univ. of Jaen), NLD (Uni Utrecht), ITA (i-em, Univ. Roma2), GBR (UEA), GRE (Univ. Patras), SWE (SMHI, Angstrom)
- Estimation of aggregated regional PV power production
- Analysis and comparison of different spatial aggregation methods
- Challenges in regional forecasting



# Activity 3.2

## Ongoing work:

- Collection of dataset for PV power production at regional level
- Evaluation of collected data
- Survey of applied methods
- Definition of benchmarking criteria





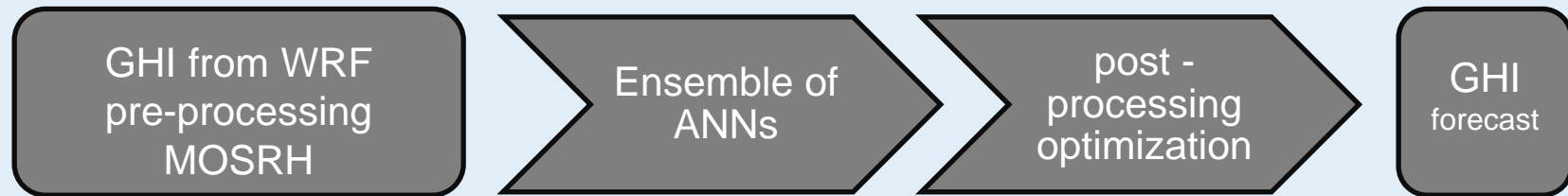
# Activity 3.2

## Dataset Acquisition:

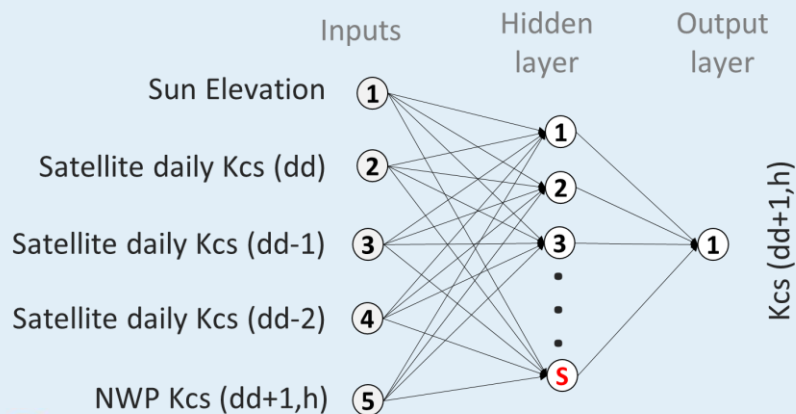
- [pvoutput.org](http://pvoutput.org) (R. Fritz)
- <https://renewalsa.sa.gov.au/projects/lochiel-park/> (J. Boland)
- <https://www.ausgrid.com.au/Common/About-us/Corporate-information/Data-to-share/Solar-home-electricity-data.aspx> (J. Boland)
- Italian market zone data, <http://www.terna.it/it-it/sistemaelettrico/transparencyreport/generation/expostdataontheactualgeneration.aspx> (i-EM)



# Activity 3.2



Ensemble of 20 MLP Neural Network



Forecast of the optimal linear combination

$$GHI^{for} = C_1^{for} GHI_1^{for} + C_2^{for} GHI_2^{for} + C_3^{for} GHI_3^{for}$$

$GHI_1^{for}$  = refined ANN forecast

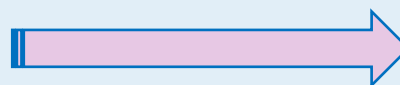
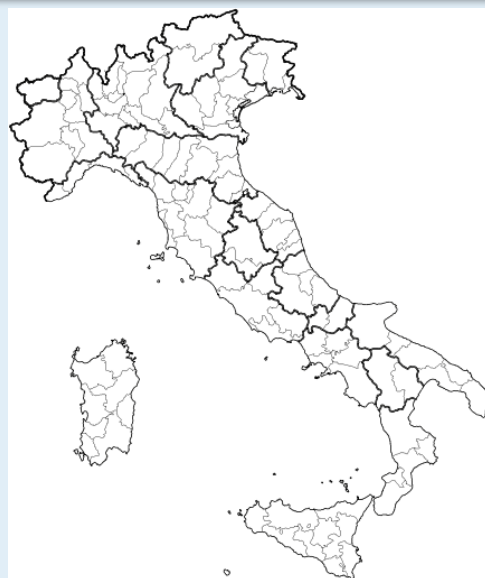
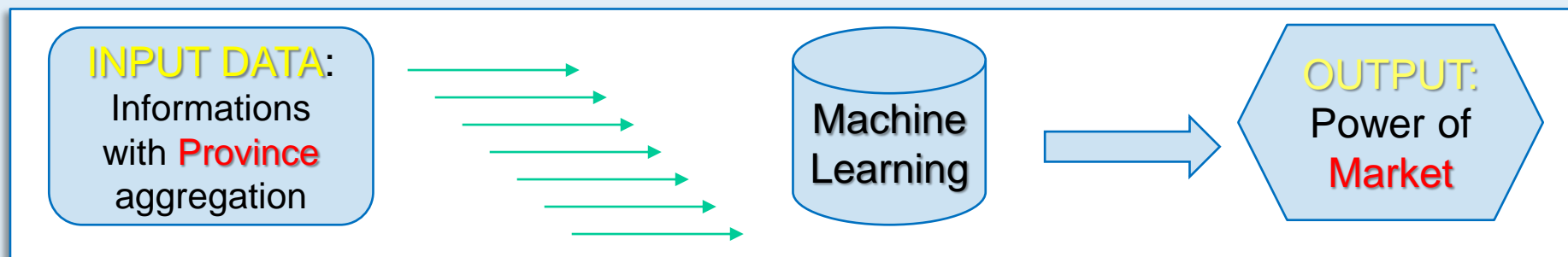
$GHI_2^{for}$  = NWP forecast

$GHI_3^{for}$  = smart persistence forecast

Marco Pierro et al. -Mapping accuracy of day ahead solar irradiance forecast all over Italy, University of Rome “Tor Vergata”, EURAC Research, Italy



# Activity 3.2



Alessandro Betti, i-EM, Italy



# Activity 3.3

## Overview:

- **Participants:** ESP (Cener, Univ. of Jaen), NLD (Uni Utrecht), AUT (FH OOE, Blue Sky), FRA (EDF, Reuniwatt, Piment), CHE (Meteotest), AUS (CSIRO, UNISA), USA (Vaisala), ITA (i-em), GBR (UEA), GRE (Univ. Patras), SWE (AF Consult, SMHI, Angstrom)
- Evaluation and benchmarking of different forecasting approaches with respect to variability forecasting
- Evaluation and benchmarking of probabilistic forecasts



# Activity 3.3

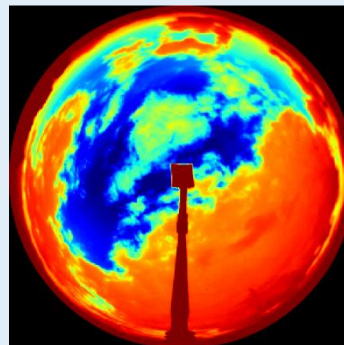
## Ongoing work:

- Collection Sky camera forecasting benchmark
  - Selection of an end-user oriented case
  - Organization steps proposition
- Proposition of new accuracy metrics (all sky camera, variability and probability forecasts)



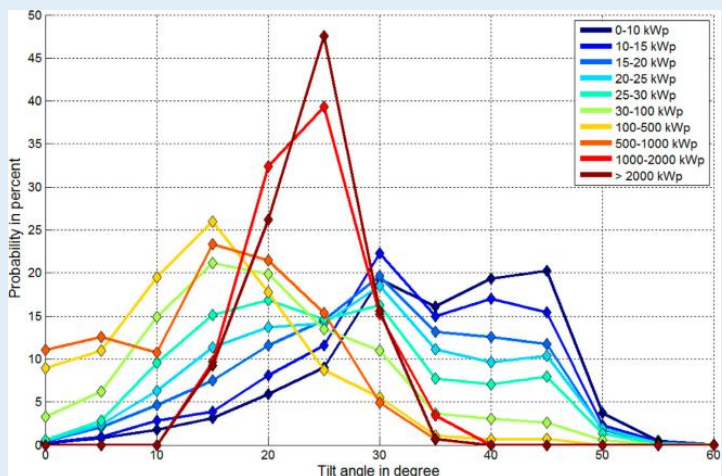
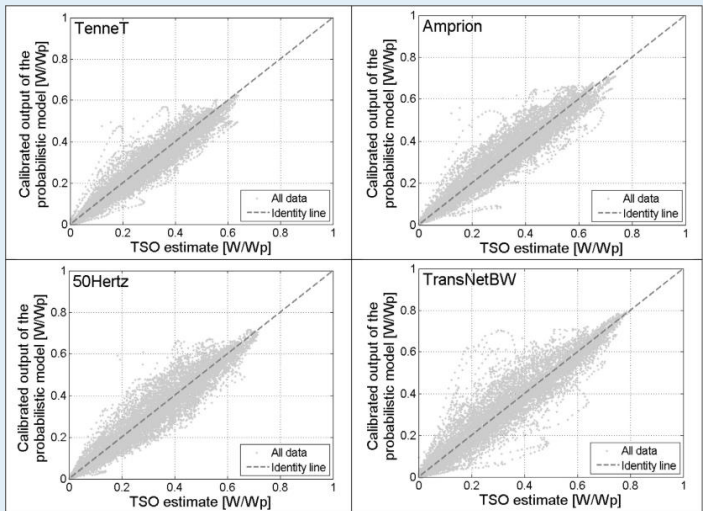
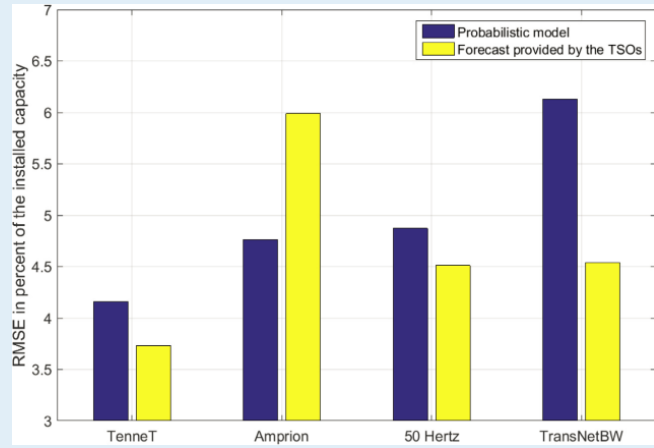
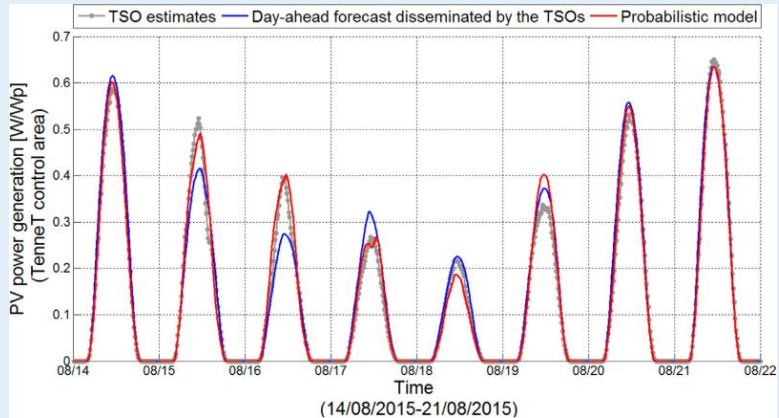
# Activity 3.3

- Benchmark on hybrid PV-Diesel systems



Sylvain Cros- Sky -imager forecasting benchmark proposition focused on hybrid PV-Diesel systems, Reuniwatt, France

# Activity 3.3



Yves-Marie Saint Drenan et al.; Solar Energy 147 (2017) 257–276





# Thank you!



# Questions?