

eurac research

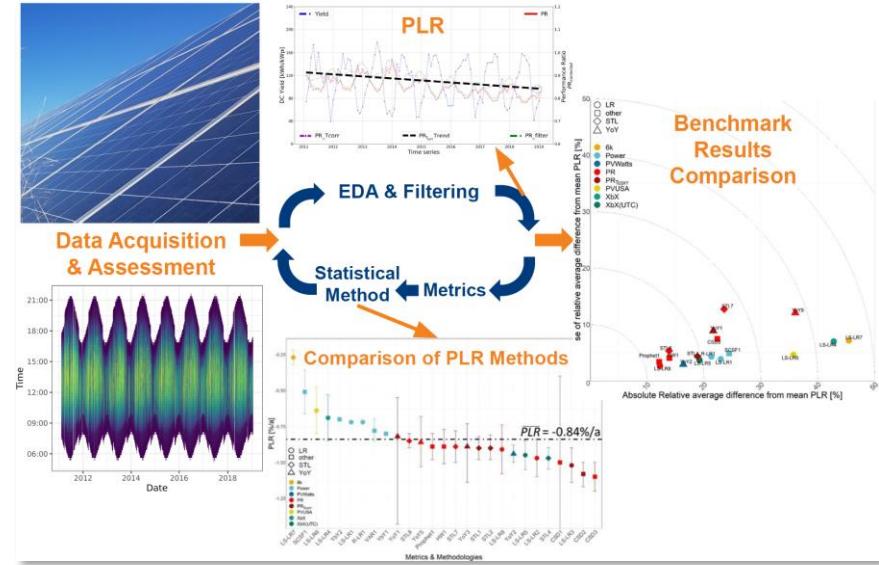


IEA
PVPS

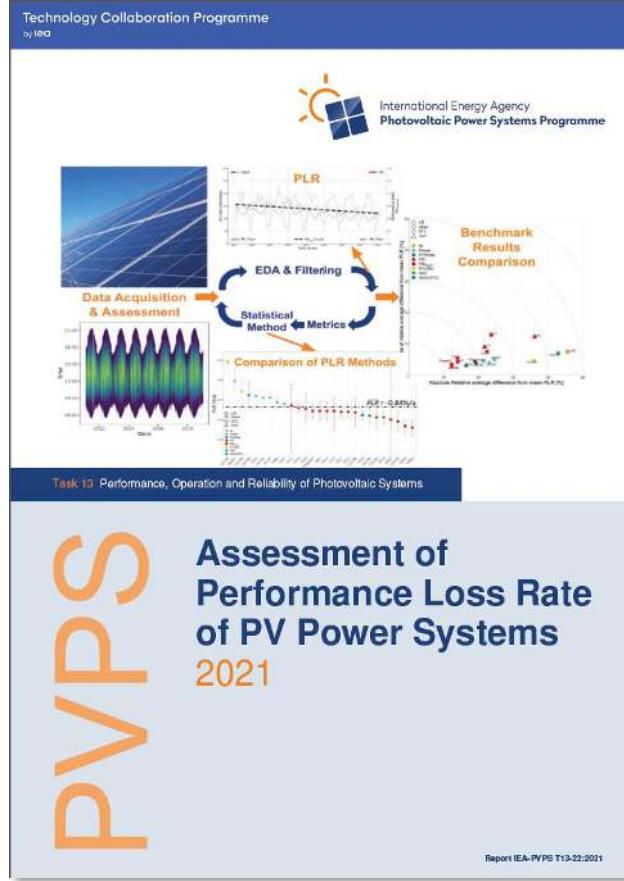
International Collaboration Framework for the Calculation of PLR

Sascha Lindig, IEA PVPS Task 13 ST2.5, EURAC Research

Intersolar Europe 06.10.2021

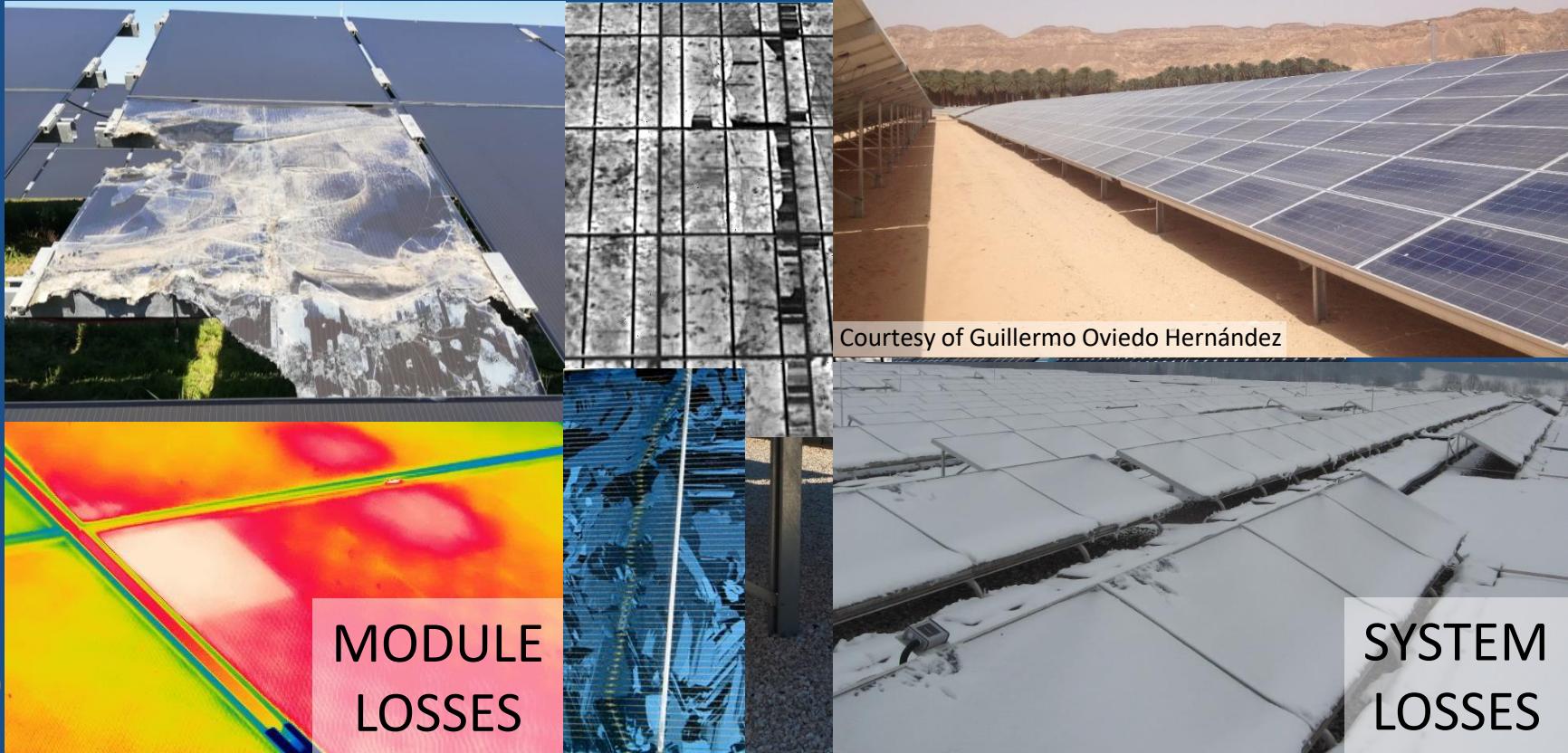


Highlights of our report

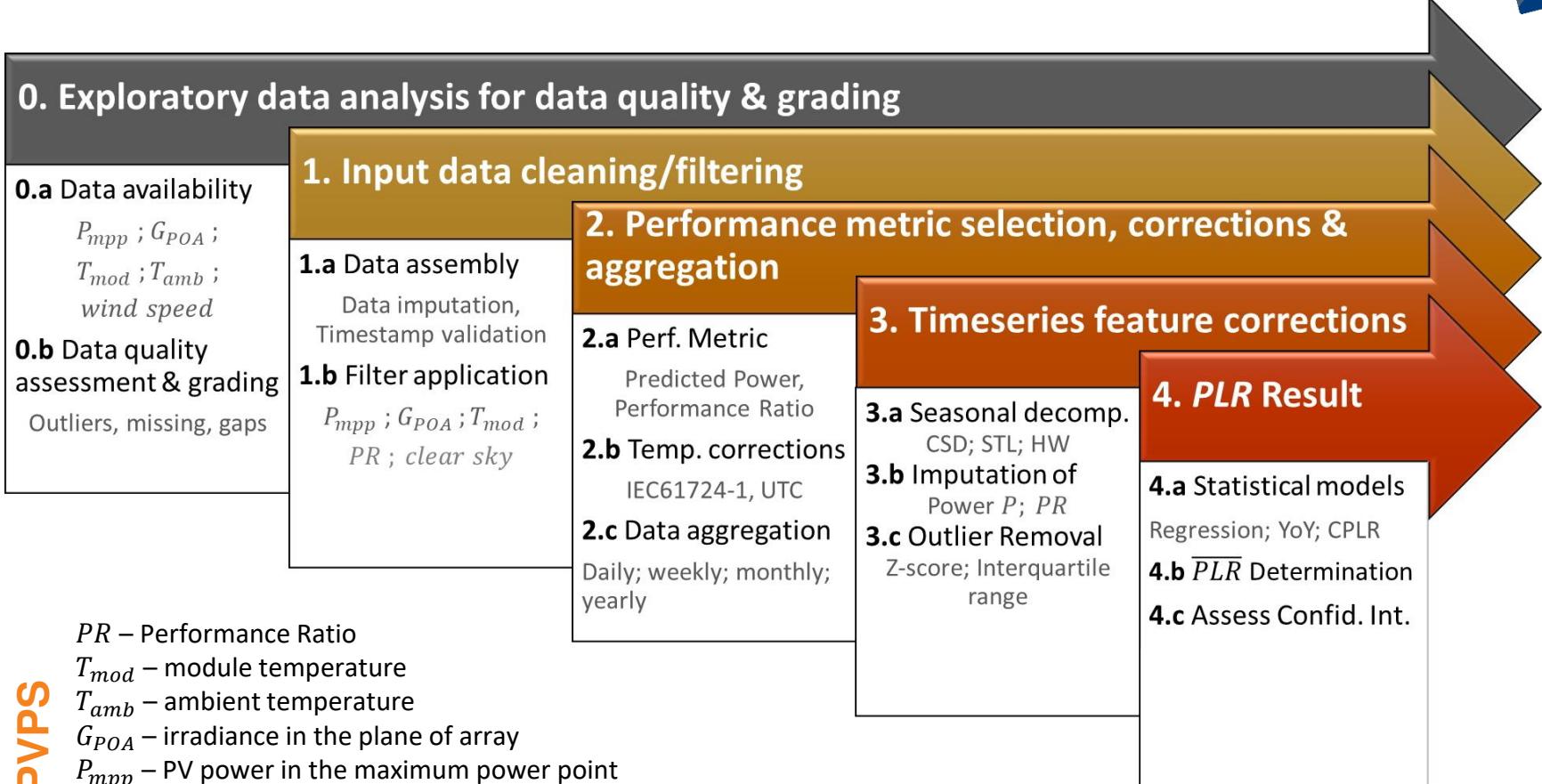


- Definition performance loss rates
- Critical review of existing calculation methodologies
- Best practice guidelines
- Development of data quality grading scheme

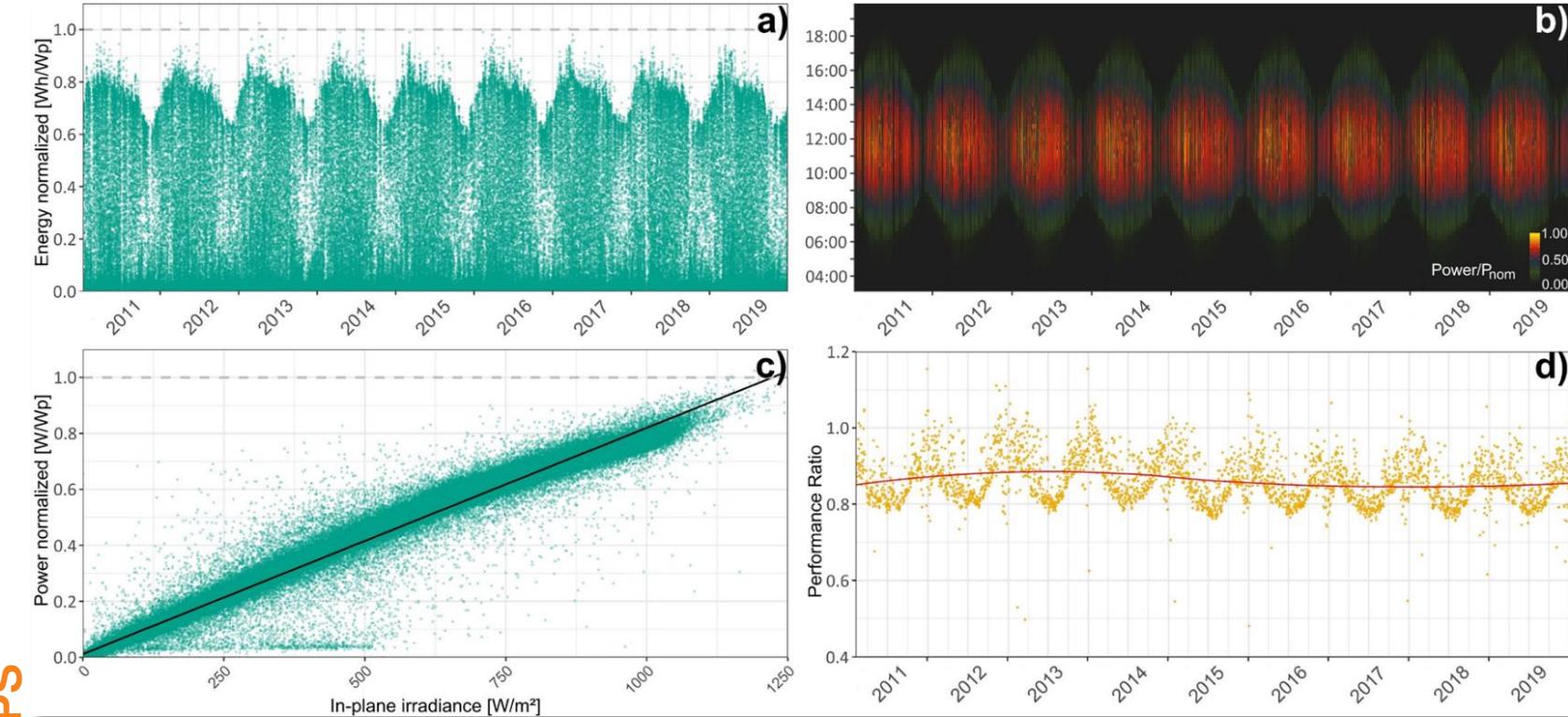
Motivation



PLR calculation



PLR calculation



PLR calculation

Letter Grade	Outliers [%]	Missing percentage [%]	Longest gap [days]
A	Below 10	Below 10	Below 15
B	10 to 20	10 to 25	15 to 30
C	20 to 30	25 to 40	30 to 90
D	Above 30	Above 40	Above 90

Pass/fail criteria

Time series > 24 months => PASS

0. Exploratory data analysis for data quality & grading

Filtering

0.a Data availability

P_{mpp} ; G_{POA} ;
 T_{mod} ; T_{amb} ;
wind speed

0.b Data quality assessment & grading

Outliers, missing, gaps

1.a Data assembly

Data imputation,
Timestamp validation

1.b Filter application

P_{mpp} ; G_{POA} ; T_{mod} ;
 PR ; clear sky

2.a Perf. Metric

Predicted Power,
Performance Ratio

2.b Temp. corrections

IEC61724-1, UTC

2.c Data aggregation

Daily; weekly; monthly;
yearly

3.a Seasonal decompr.

CSD; STL; HW

3.b Imputation of

Power P ; PR

3.c Outlier Removal

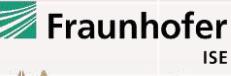
Z-score; Interquartile range

4.a Statistical models

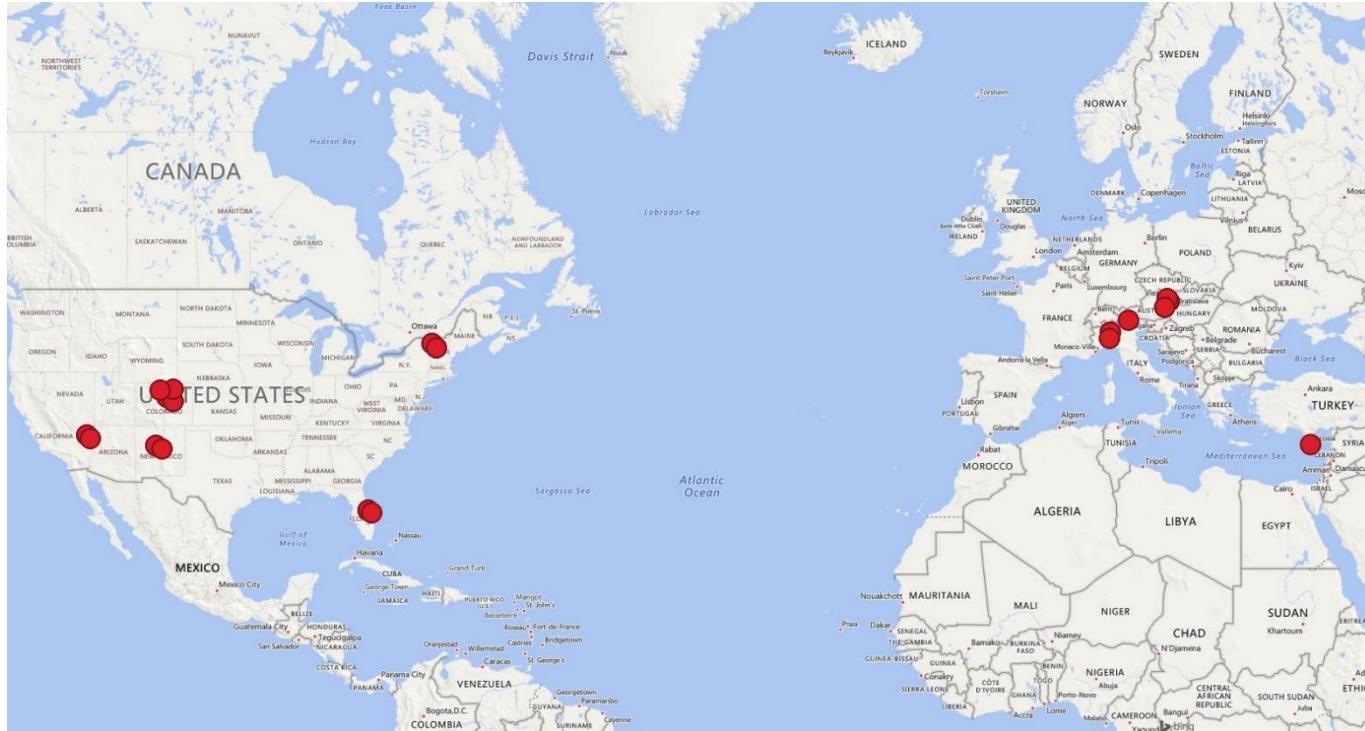
Regression; YoY

4.b PLR Determination

Methodology comparison

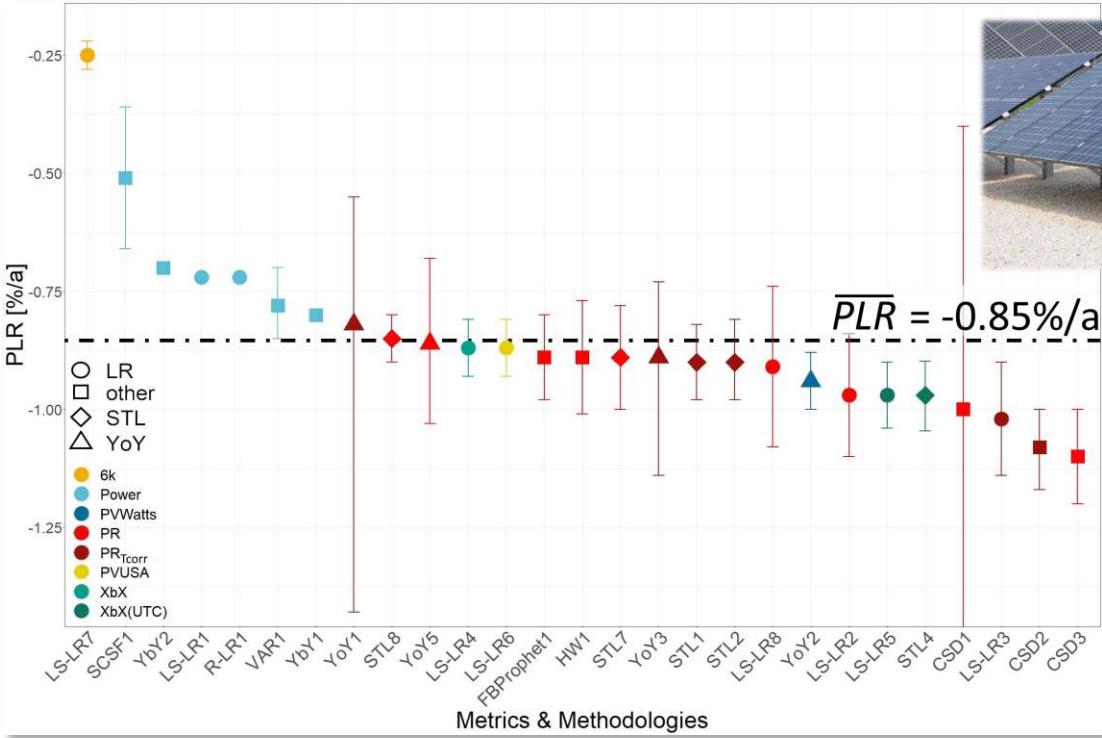
Stat Mod Metric	LR	STL	YoY	VAR	CSD	YbY	SCSF	HW	Prophet
PR	LS-LR2 LS-LR8	STL7 STL8			CSD1 CSD3			HW1	Prophet1
PR_{Tcorr}	LS-LR3	STL1 STL2	YoY1 YoY3		CSD2				
XbX	LS-LR4	STL3							
XbX+UTC	LS-LR5	STL4	YoY4 STLYoY1						
PVUSA	LS-LR6	STL5							
6K	LS-LR7	STL6							
PWatts			YoY2						
Power	R-LR1 LS-LR1			VAR1		YbY1 YbY2	SCSF1		

Methodology comparison

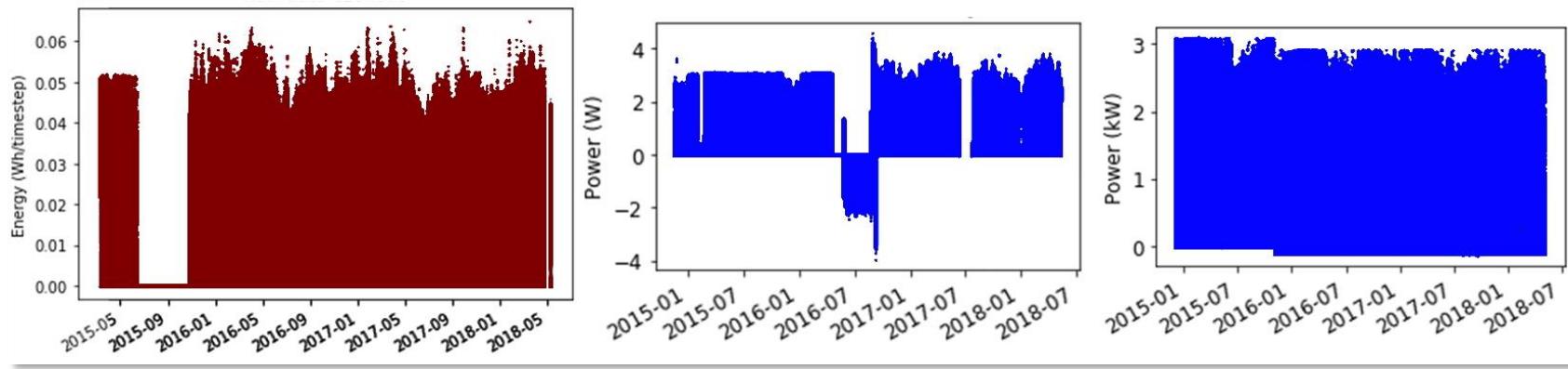


S. Lindig, A. Curran, K. Rath, et al.,
“IEA PVPS Task 13-ST2.5: PLR
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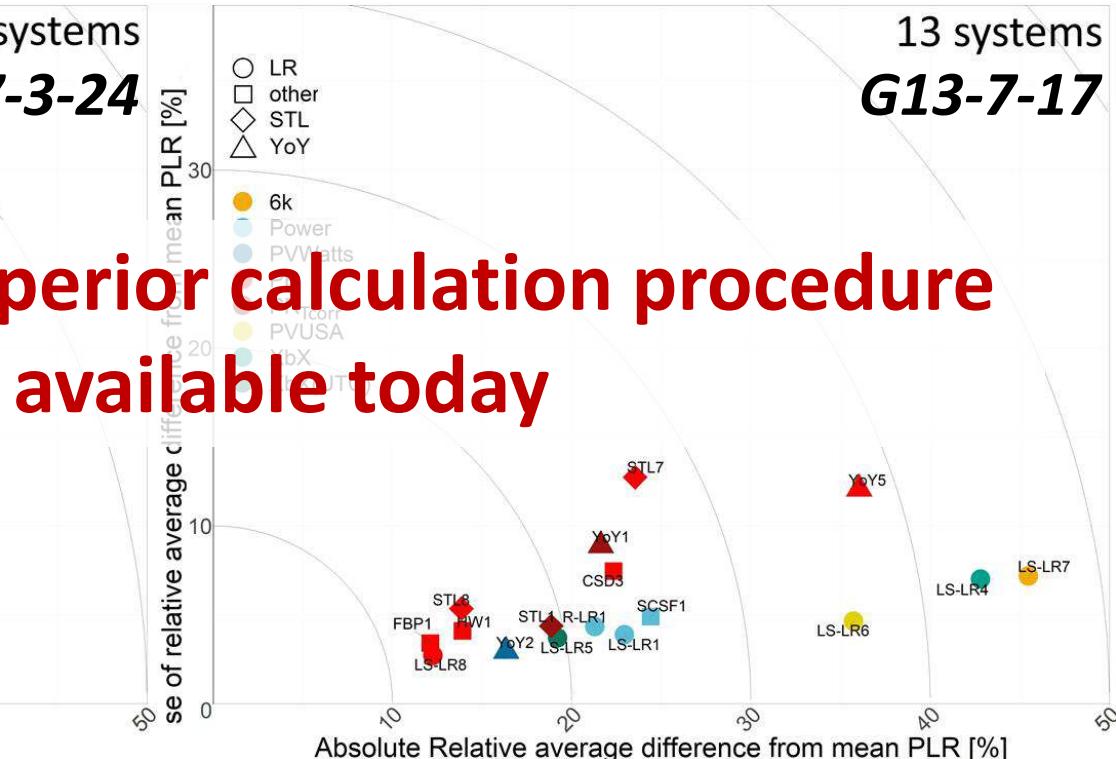
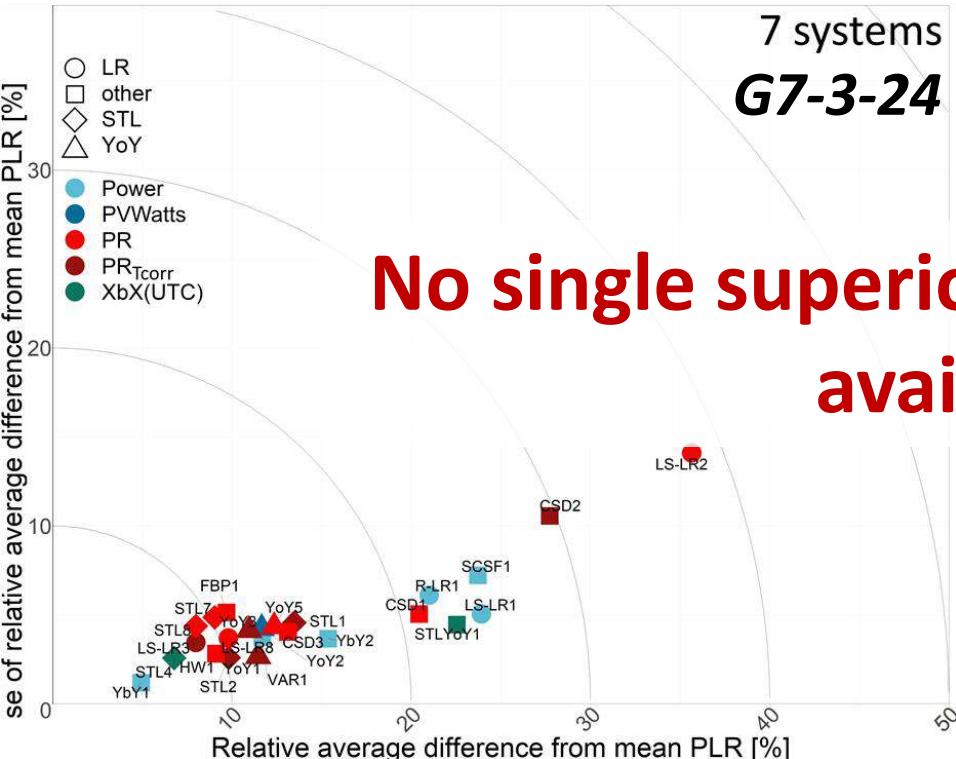
Methodology comparison



Methodology comparison

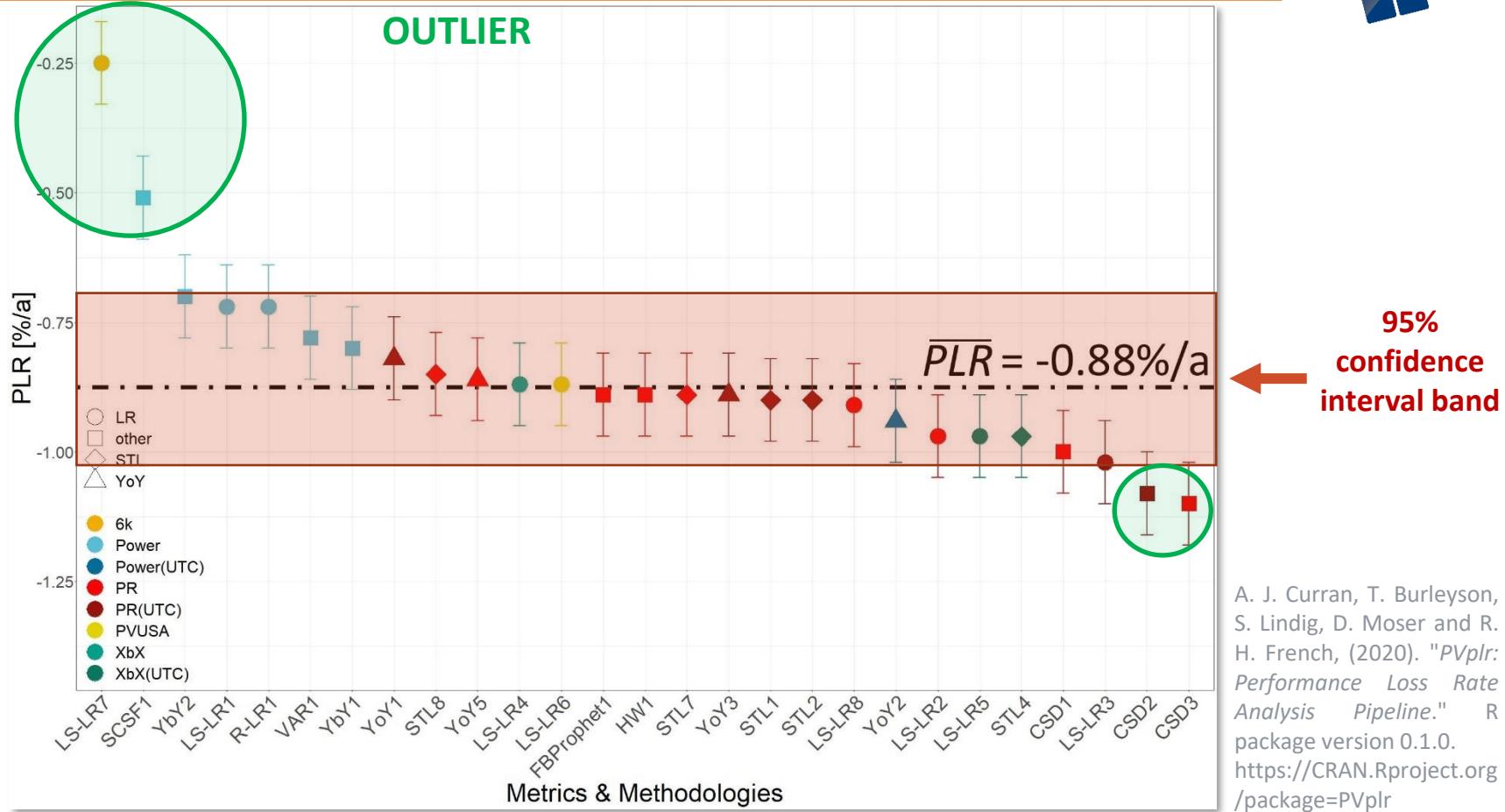


Methodology comparison



No single superior calculation procedure available today

Methodology comparison



PLR is an important parameter to assess the **health status of a PV system**

- Calculating PLR values is not straightforward
 - **Input data quality** has to be evaluated
 - No superior uniform calculation approach
 - **Averaging** over several reliable approaches considering **95% CI** yields best results

Assessment of PLR of PV Power Systems

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