

Photovoltaic Power Plant Performance Optimizer

PV|HARVESTER[®]



EXCELLENCE IN
RENEWABLES

in cooperation with



MOTIVATION

Experience in the field shows:

Almost every solar PV power plant does not operate at its optimum!

→ Waste of revenues for plant owners and investors.

→ Operational risks to lenders and operators.

Harvesting maximum yields is a gain for owners, lenders and operators!

The **PV|HARVESTER** delivers:

- Detailed and fast performance analysis on string level.
- Clear view on improvement potential.
- Health check of the asset.



DEVELOPMENT ALGORITHM – BASIS

- Latest scientific approach
- Best practice engineering
- Long-term experience in algorithm development and PV research
- According to latest PV research and development

BASED ON SCIENCES | PROVEN IN THE FIELD

DEVELOPMENT ALGORITHM – APPROACH

1. Data collection

- Import of PV power plant data
- Import of meteorological measurement data

2. Data Processing

- Exclusion of any corrupt values
- Data quality check
- Temperature-correction to standard test conditions (STC)
- Determination of system KPIs (PR, P1000, spec. yield, availability,...)

3. Data analysis

- Localizing underperformance
- Root cause analysis
- Data visualization
- Standardized box plots, scatterplots and histograms
- Ranking and best in class identification

4. Reporting

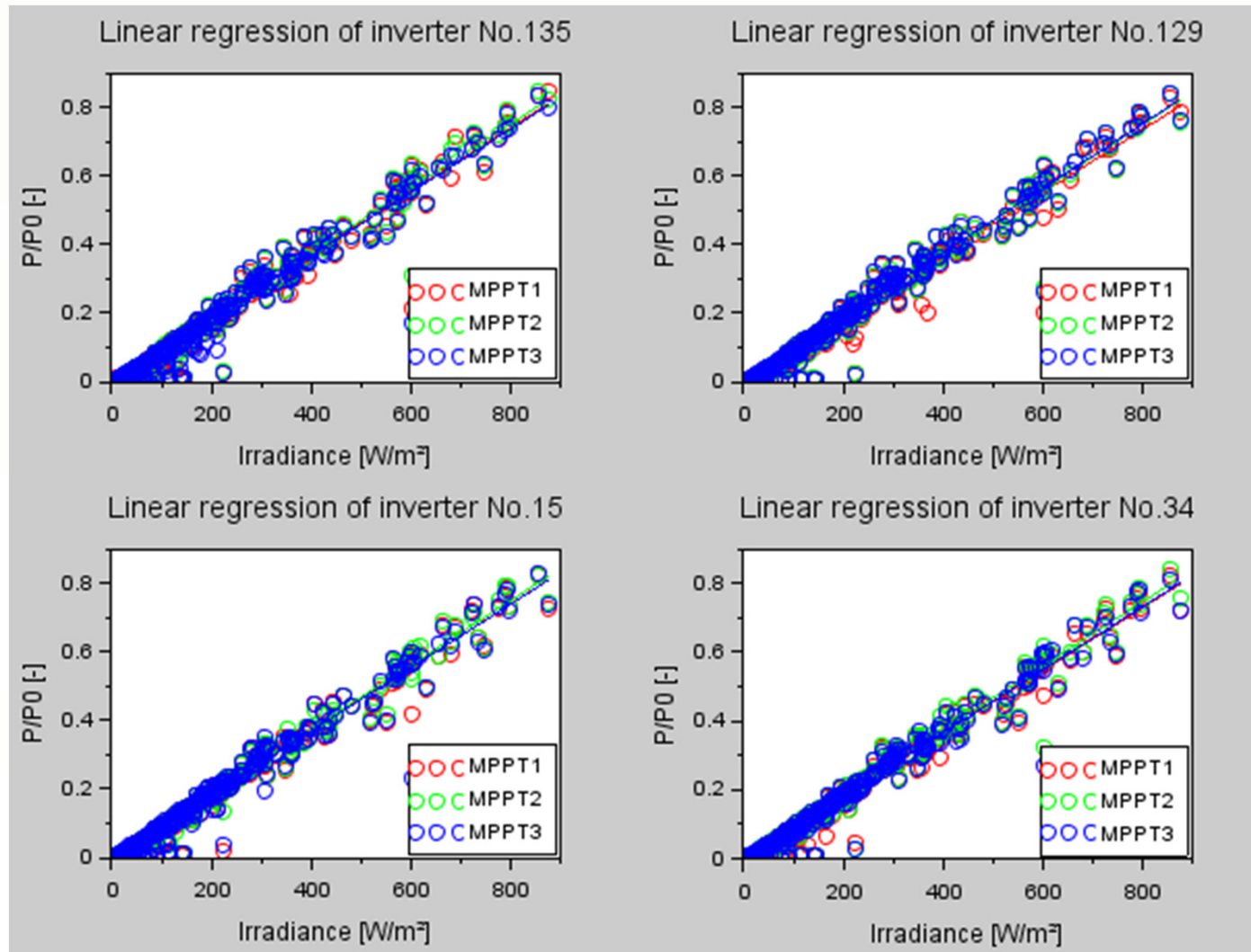
- Evaluation and interpretation of exported results
- Elaboration of cure measures and costs
- Calculation of added value

DEVELOPMENT ALGORITHM – RESULTS

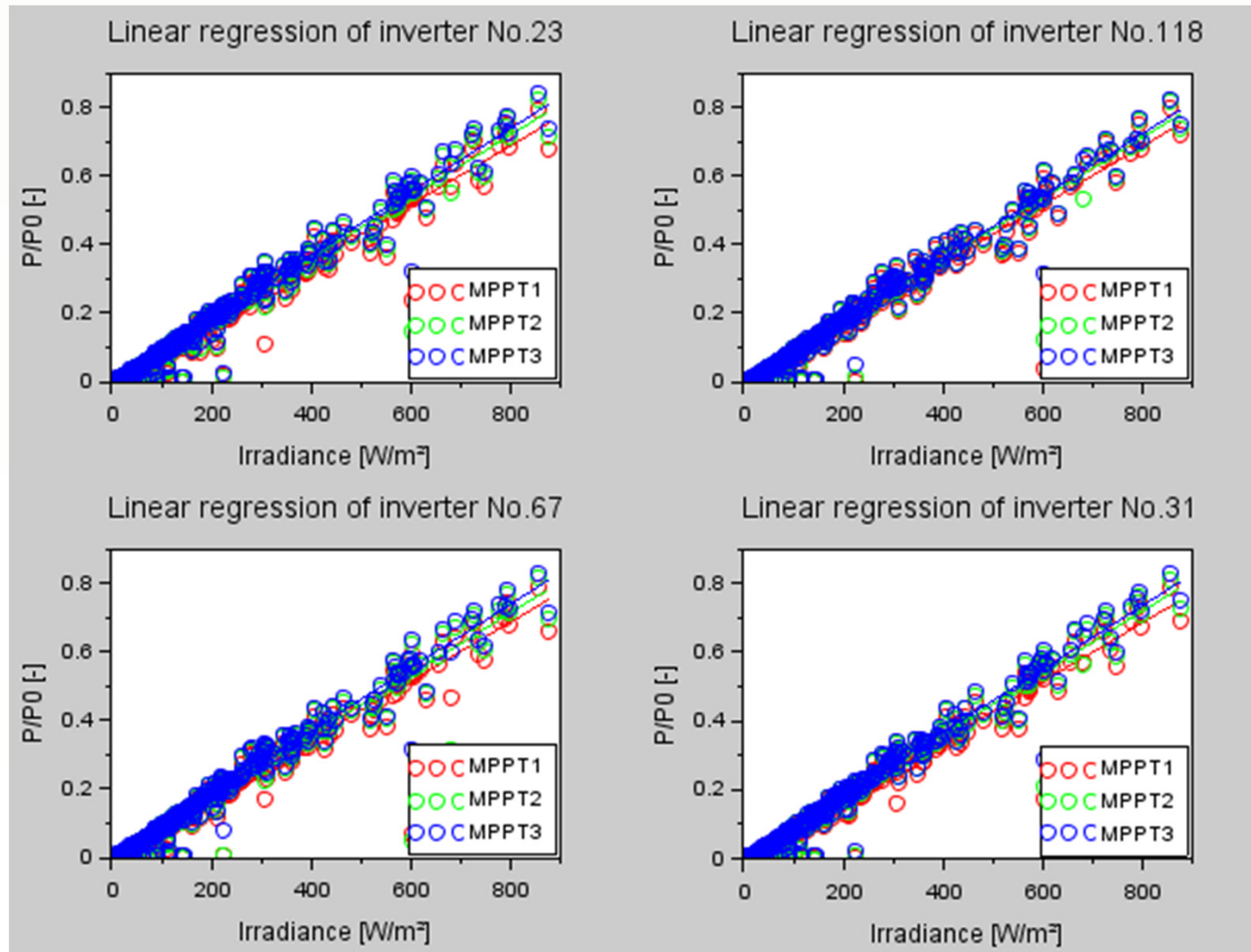
- Monthly and annual performance analysis
- Performance Ratio and availability analysis on inverter level
- P1000 values on string and MPP level
- Visualization of PV plant data
- Full-fledged health check of the assets

Maximized energy yield, revenues and profit!

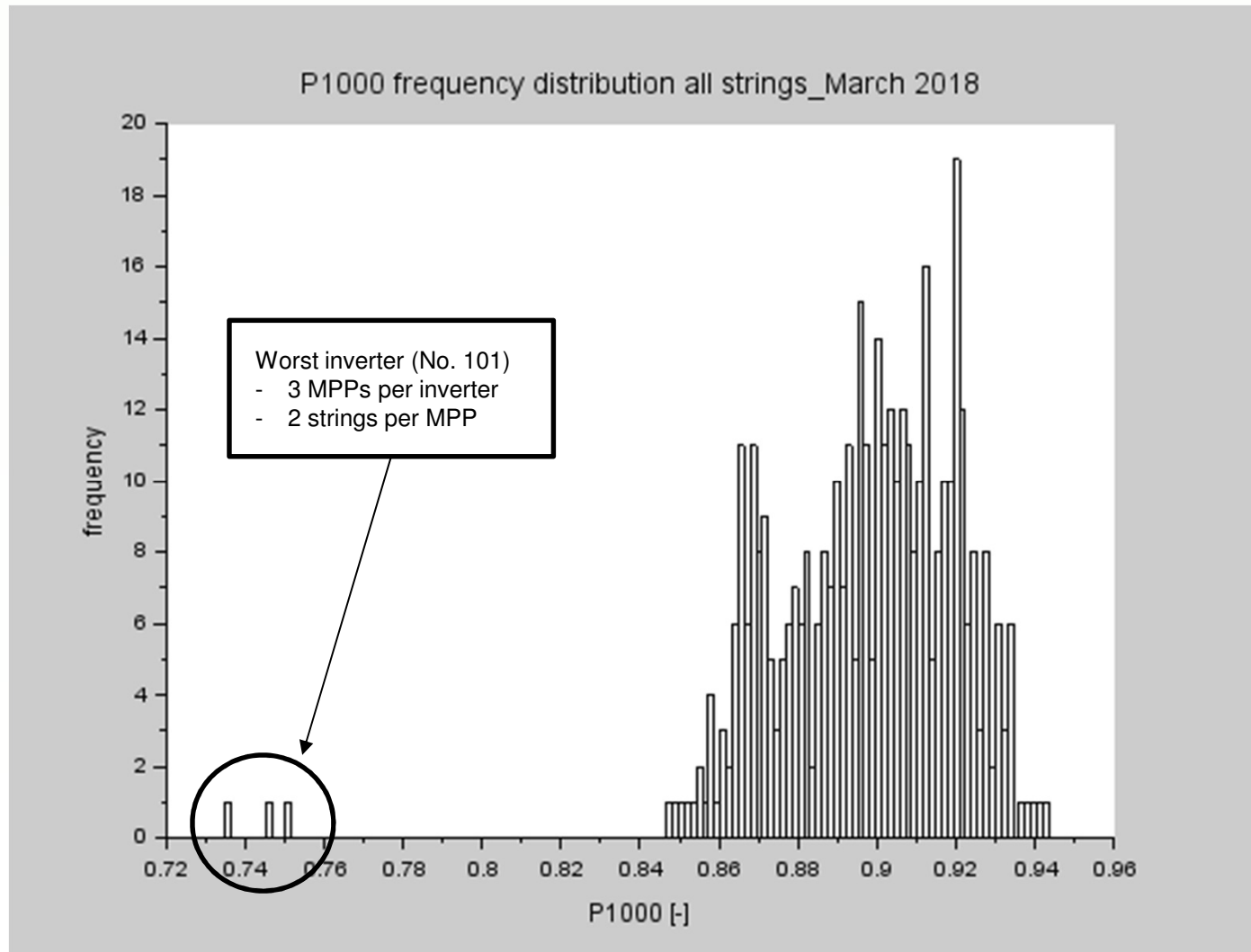
SCATTERPOTS – BEST IN CLASS INVERTERS



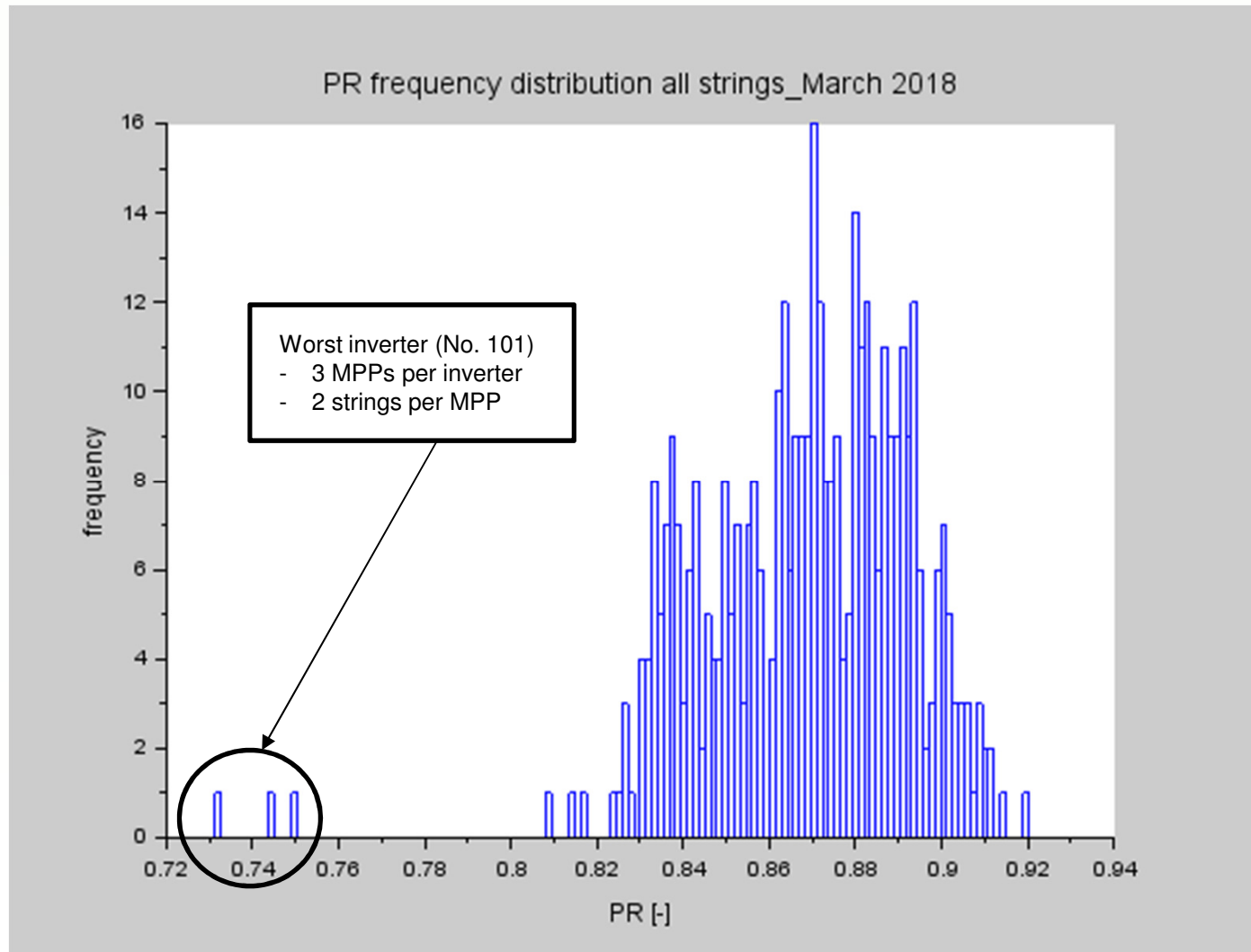
SCATTERPOTS – WORST IN CLASS INVERTERS



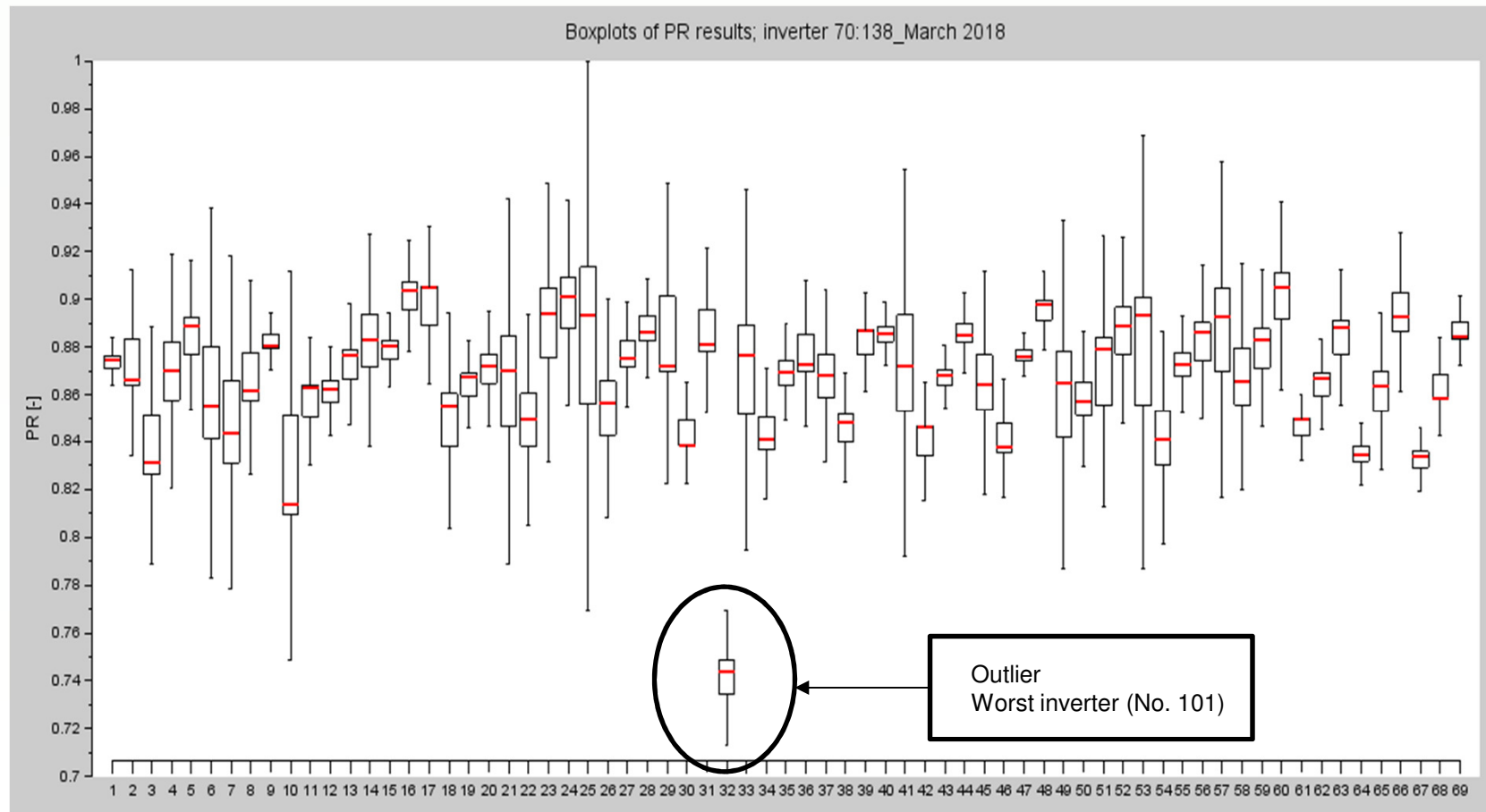
P1000 HISTOGRAMM



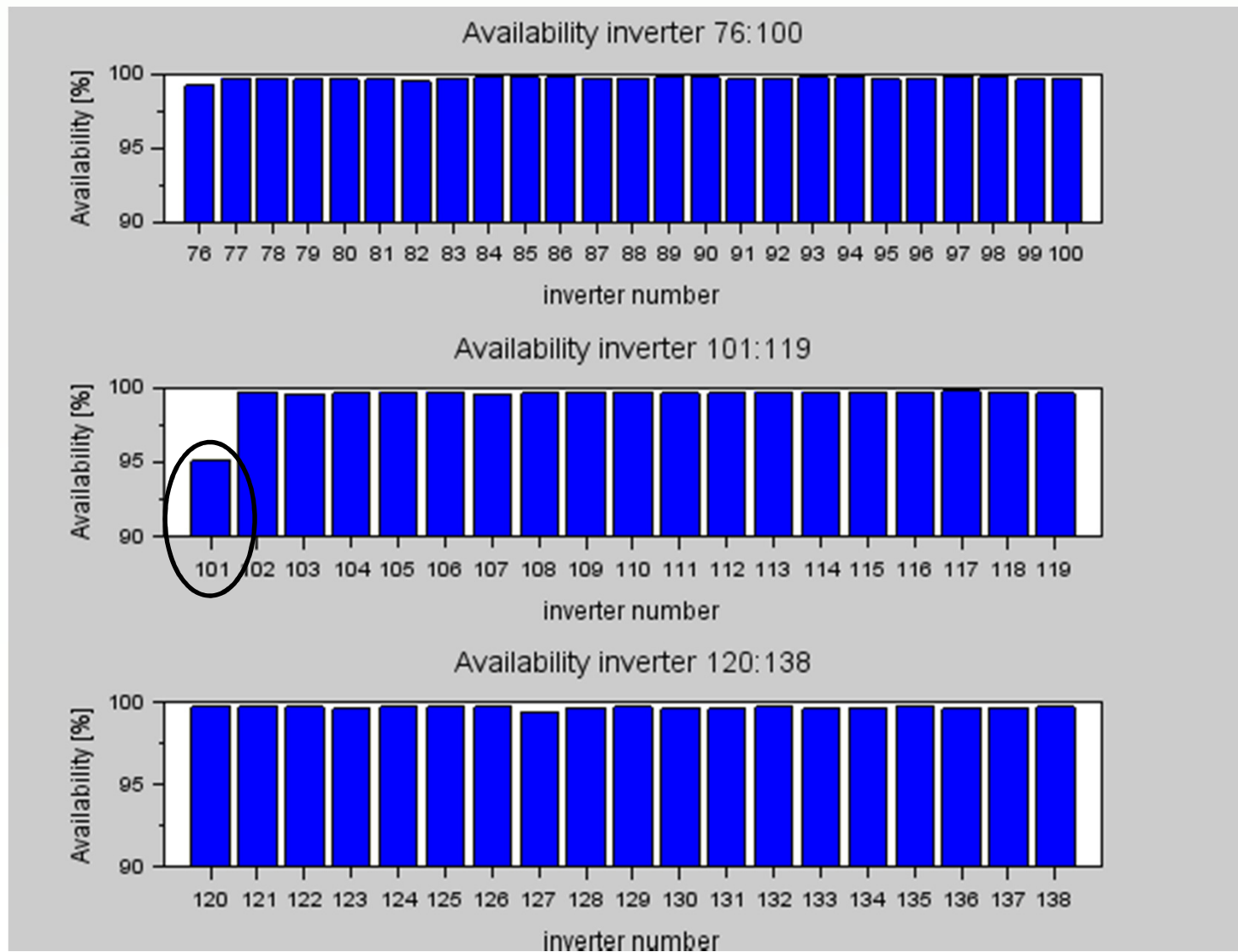
PERFORMANCE RATIO HISTOGRAM



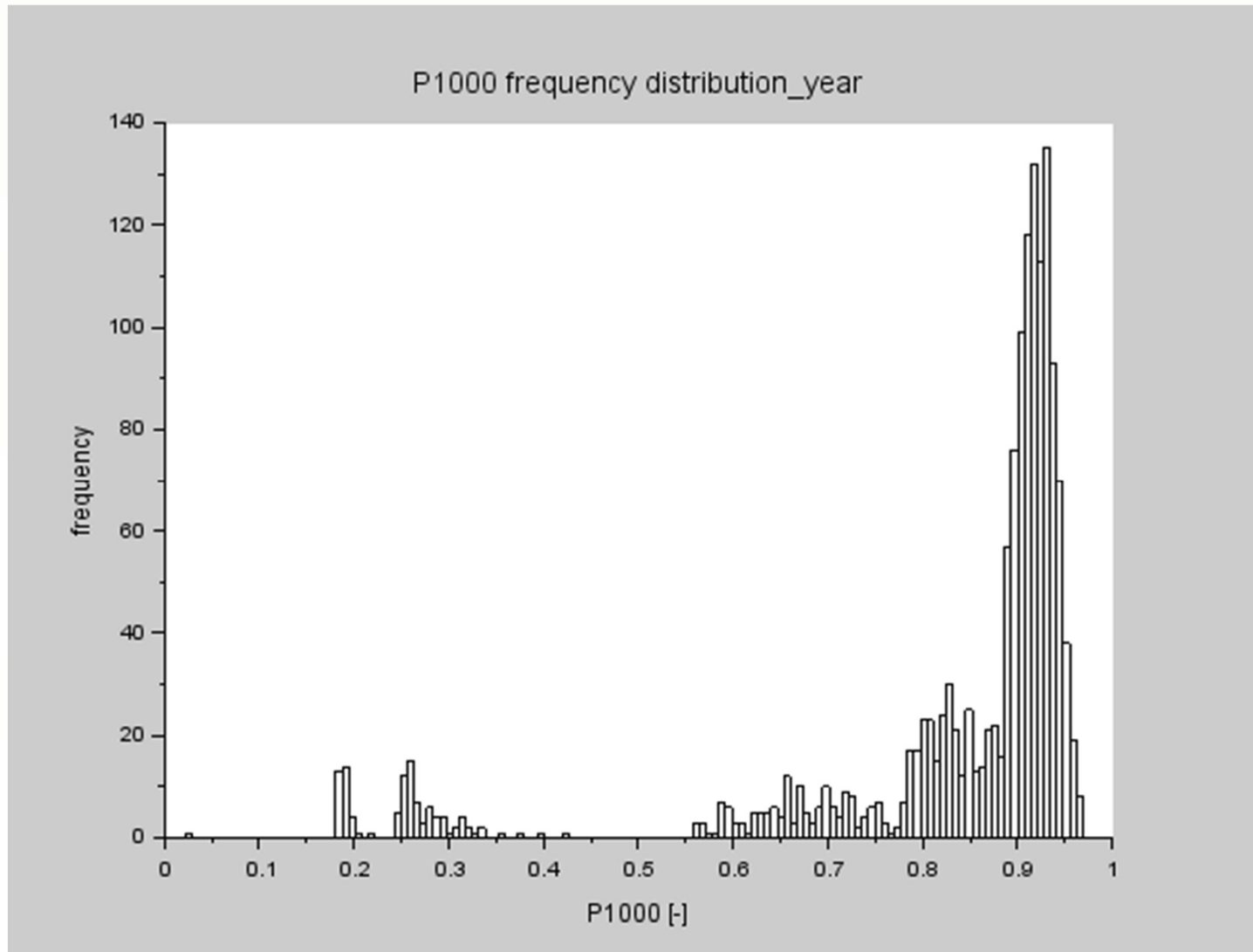
PERFORMANCE RATIO BOXPLOTS



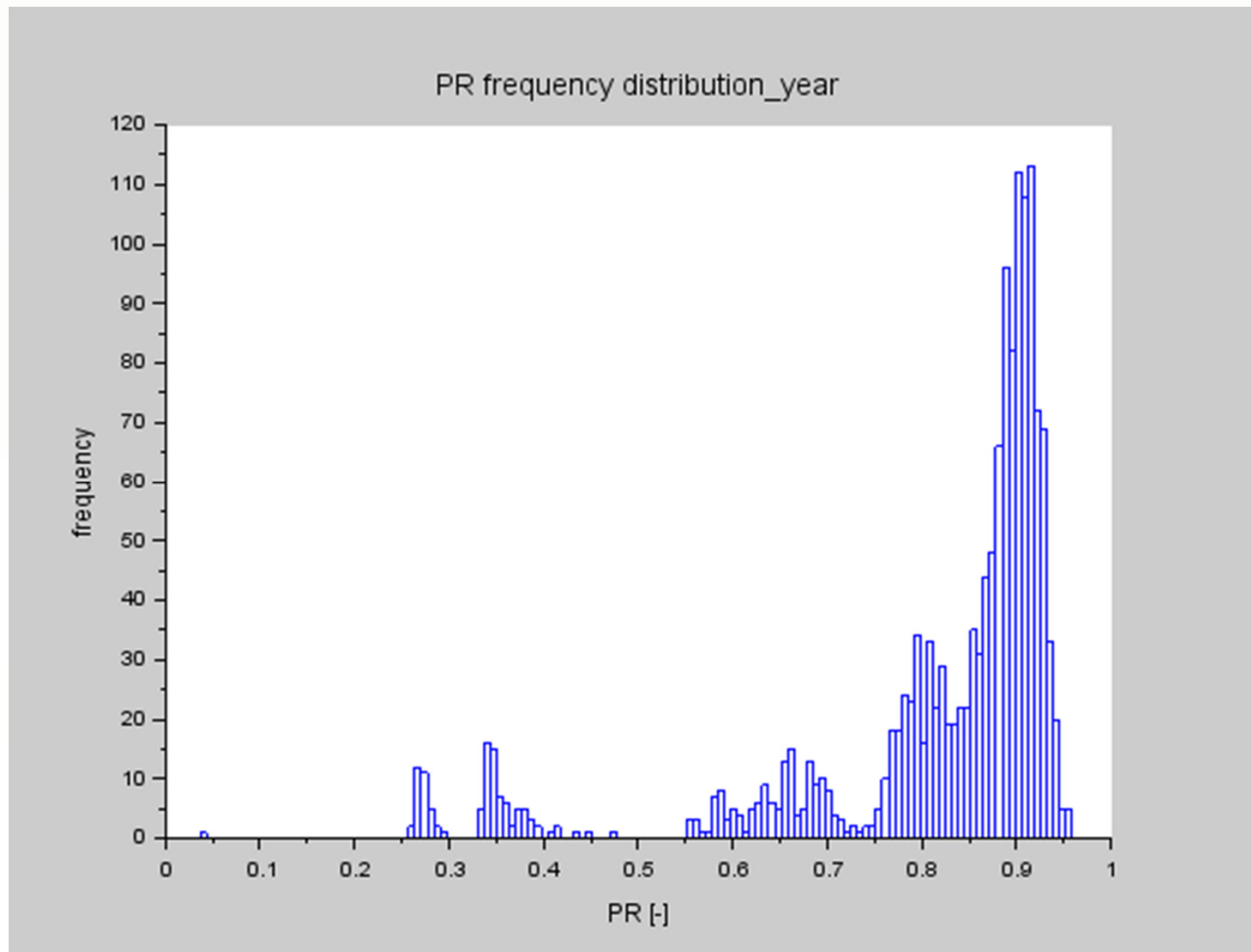
ANNUAL INVERTER AVAILABILITY



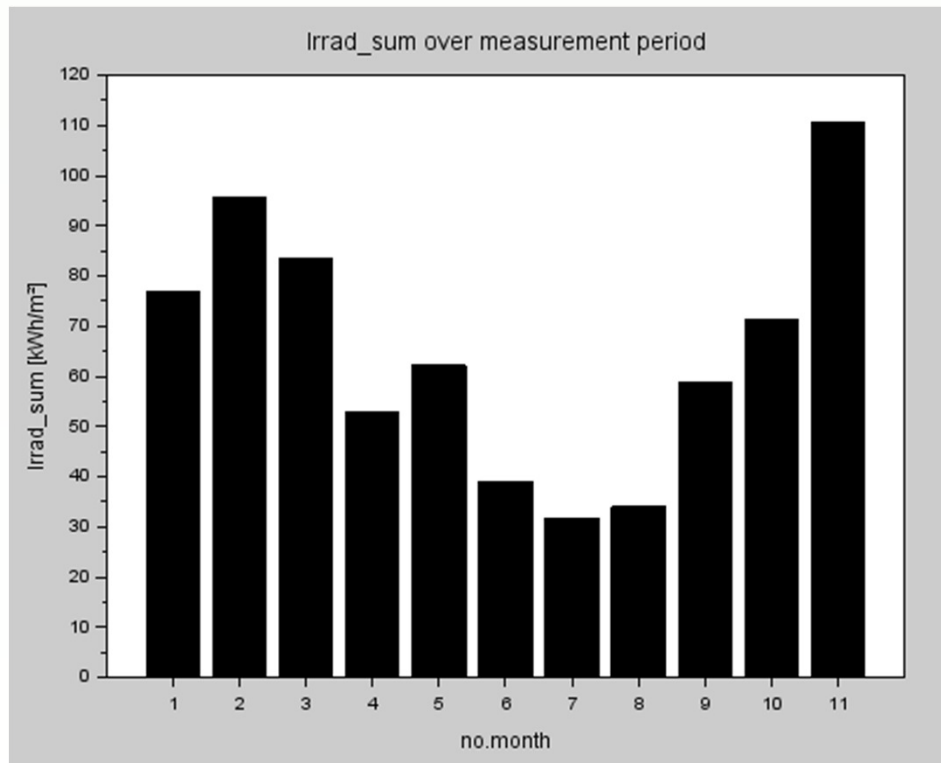
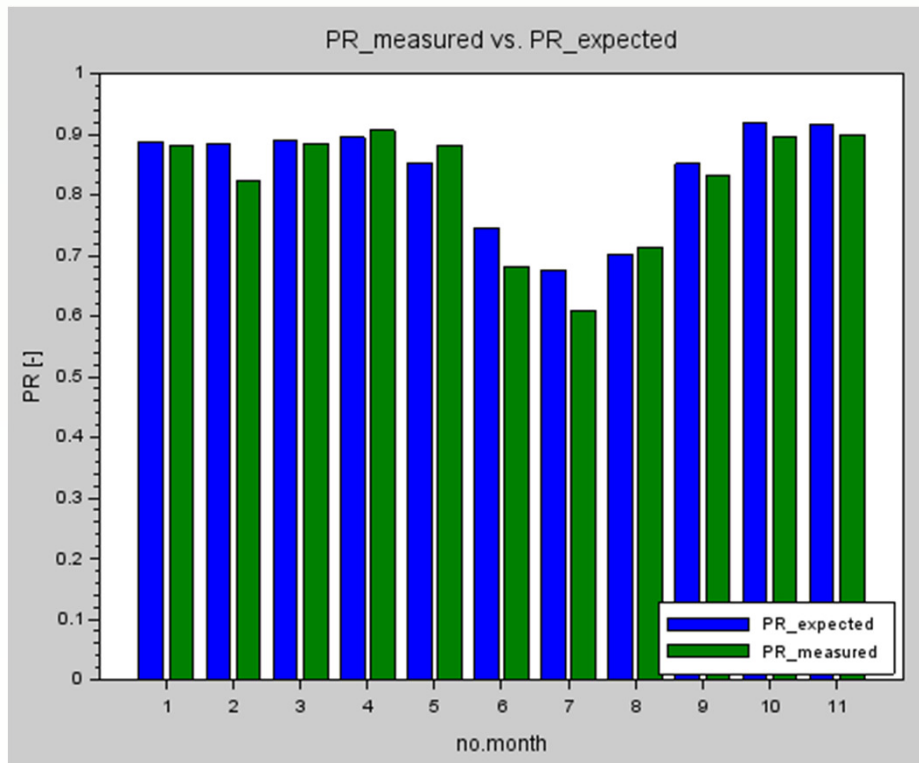
ANNUAL P1000 HISTOGRAM



ANNUAL PERFORMANCE RATIO HISTOGRAM

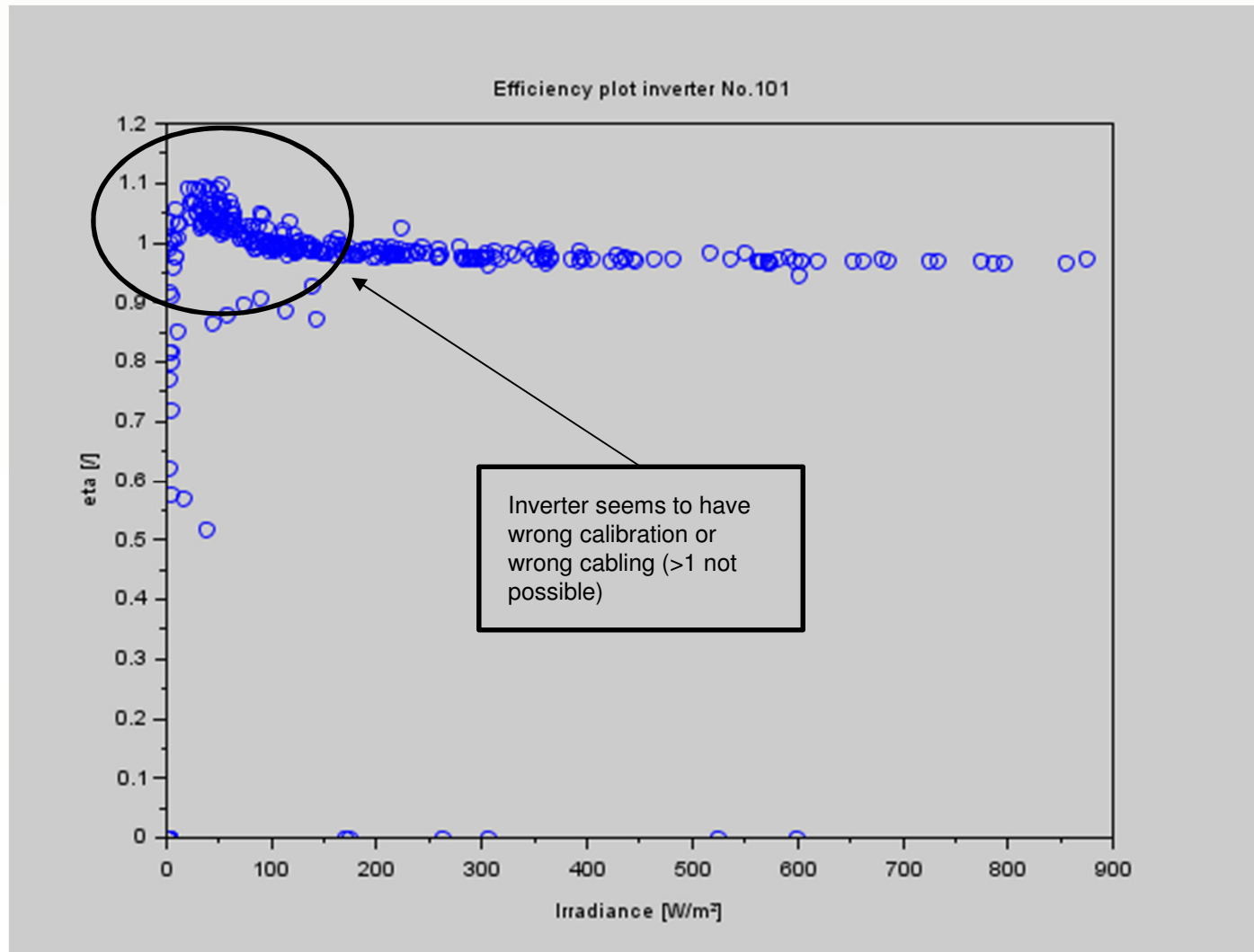


COMPARISSON - PR_{measured} vs. PR_{expected}



- Note: Month no. 1 = June 2017; no.11 = April 2018

INVERTER EFFICIENCY PLOT



CALCULATION OF ADDED VALUE

- Comparison of actual performance with data from yield assessment
- Ex-post simulation of power plant with measured irradiation and temperature data (assuming 100% availability and ideal technical conditions)
- Comparison of actual plant performance with ideal performance according to simulation
- Calculation of optimization potential in terms of energy yield and profit

AREAS OF APPLICATION

- Revenue tuning
- Health Check of the asset
- Due Diligence for asset transfer
- Calculation of Liquidated Damages
- General failure analysis and localization

Applicable to all solar PV technologies!

Fast and profitable!

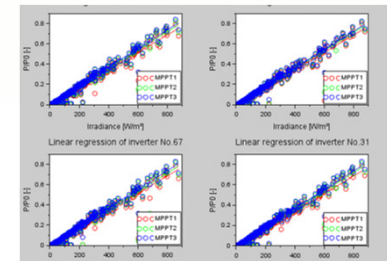
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ACHIEVEMENTS



PLANT ANALYSIS & TDD

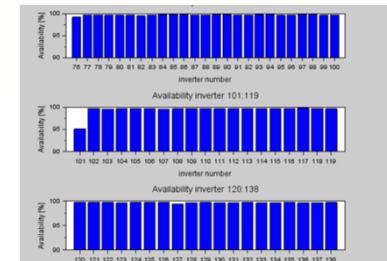
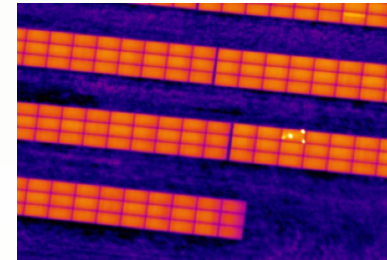
Location	Germany
Installed capacity	52 MWp
COD	2010
FiT	28.43 ct€/kWh
FiT expiry	2030
Underperformance	3.12%
Losses till FiT expiry	4.007.184 €
Estimated cure cost	25,000 €
Harvester fee incl. TDD	143,000 €



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PLANT ANALYSIS & TDD light

Location	Germany
Installed capacity	3.5 MWp
COD	2008
FiT	35.49 ct€/kWh
FiT expiry	2028
Underperformance	4.83%
Losses till FiT expiry	438,476 €
Estimated cure cost	8,450 €
Harvester fee incl. TDD light	22,250 €



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EXCELLENCE IN RENEWABLES

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