PV ARRAY CHARACTERISATION FROM OPERATIONAL DATA

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PERFORMANCE PLUS

Theoretic expected performance ≠ actual operational performance

- Pro-active maintenance requires accurate anomaly detection and alerting
- Accurate anomaly detection requires an accurate model of expected field system behaviour
- Theoretic PV system models are based on up-front assumptions, not behaviour in the field

How to assess the real expected behaviour of a well-functioning PV array?

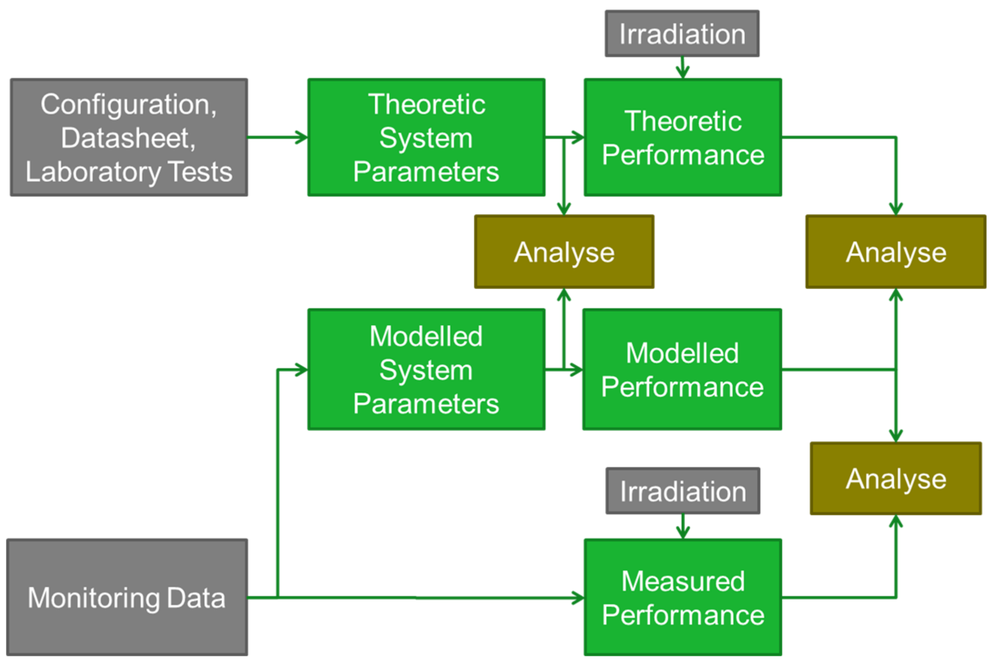
Several options with different qualities:

	PAN files	IV curve tracer	Operational data
Effort	Low	Very high	Low
Characterisation	Lab up-front	Field once	Field continuously
Accuracy	Low	Moderate	High (potentially)
Methodology	Well defined	Various	Not settled (yet)

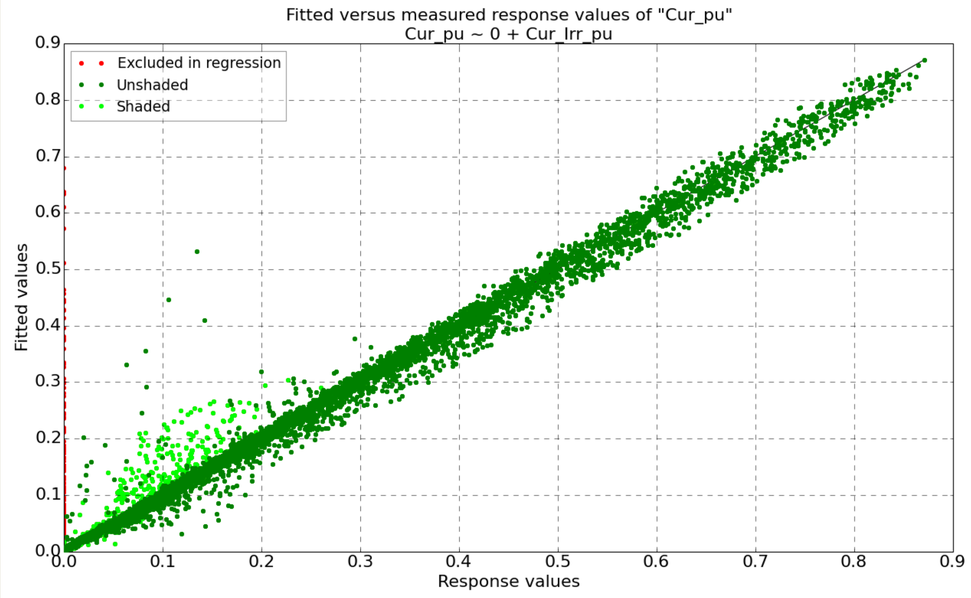
→ Operational data is very well suited for PV array characterisation
… but a good methodology is lacking!

Methodology and results

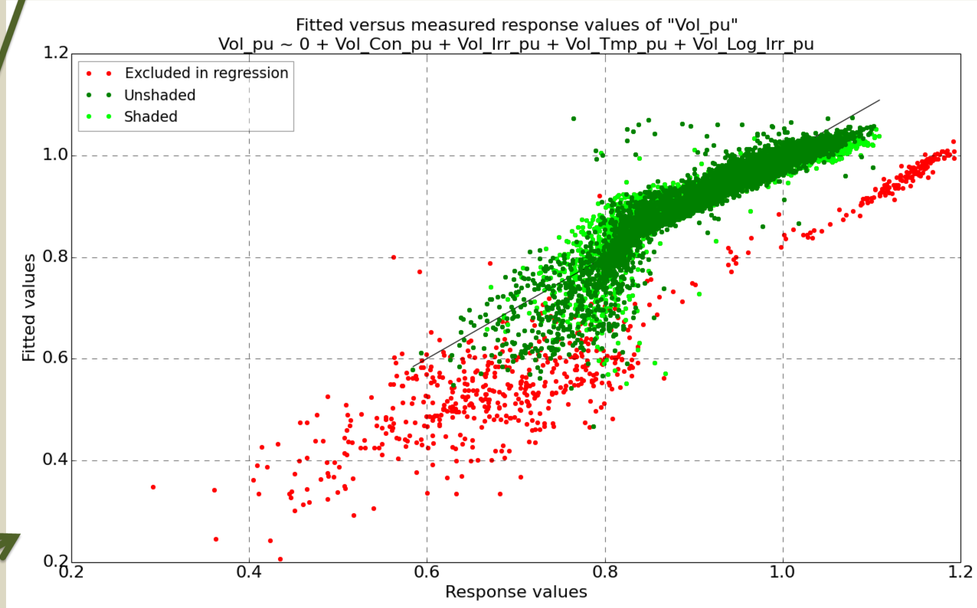
- Define physical models of MPP voltage and current as a function of the environment
  - Problem: link between MPP models and IV curve models not well described
  - Problem: present MPP regression models do not reflect physics well!
- Train coefficients of physical models with operational data
  - Problem: coefficients are correct only when physics are reflected in model!
  - Partly circumvented by training on high irradiation hours only
- Analyse differences between theoretic and trained model parameters
- Analyse differences between measured, modelled and theoretic performance



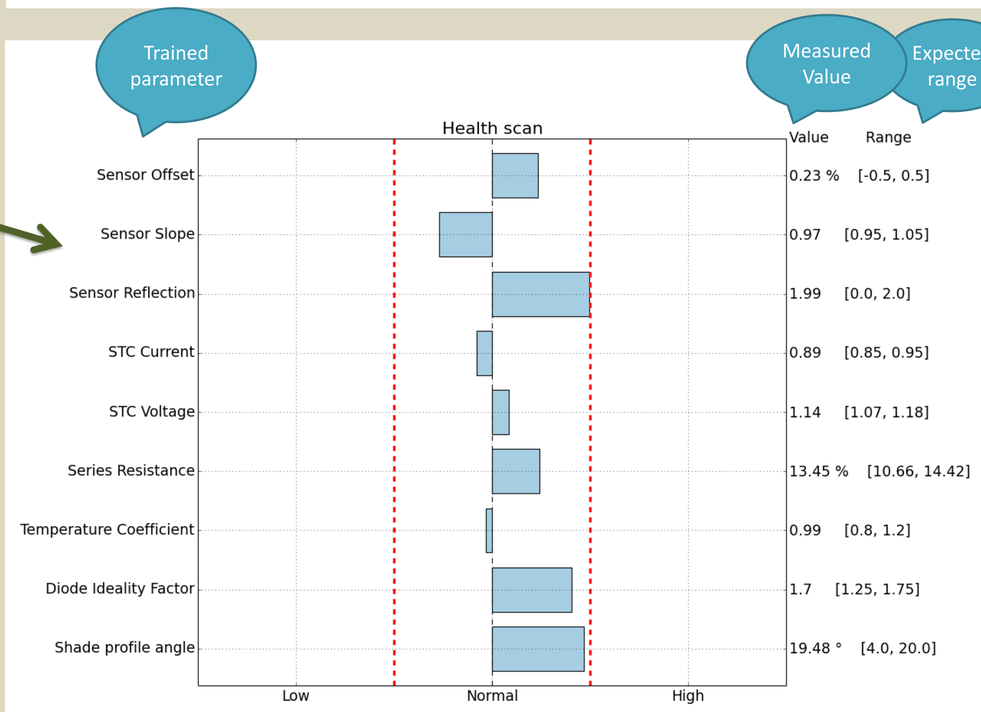
3E Health Scan methodology



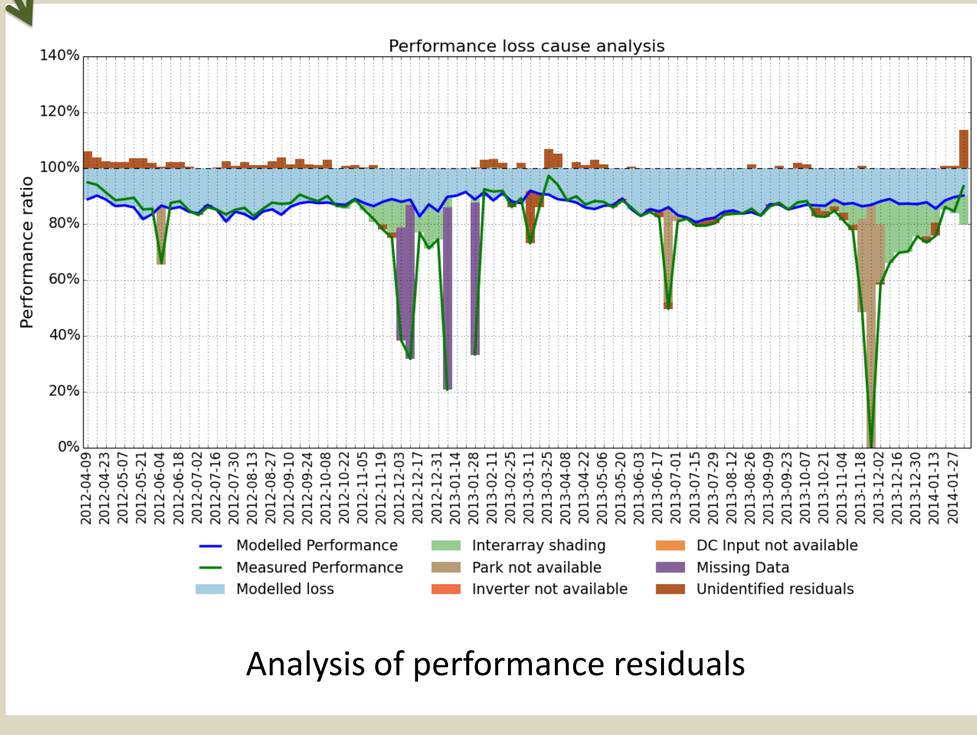
Training of MPP current coefficients



Training of MPP voltage coefficients



Compare model parameters



Analysis of performance residuals

Conclusions

- Pro-active maintenance requires accurate models of expected PV behaviour
- Accurate MPP models would ideally be created and updated using operational data
- 3E Health Scan methodology provides insight in root causes of performance losses

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