

Sandia-Performance-Model Quality Tests in Sandia Pecos for Near-Real-Time Detection of Anomalies

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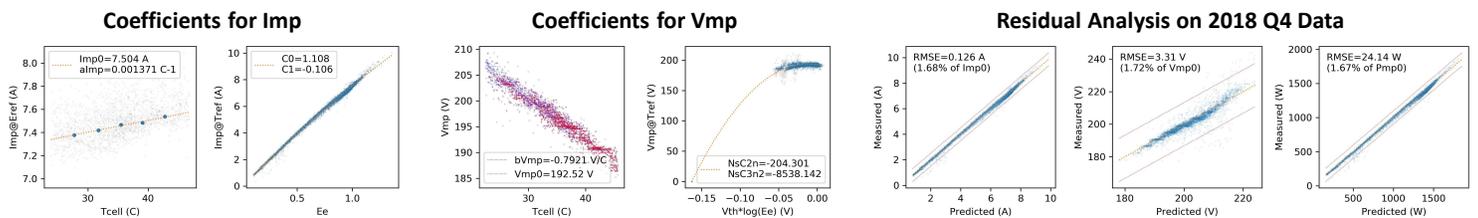
Motivation and Methodology

- CFV uses Sandia Pecos to check the quality of its outdoor test data daily (instrument failures, wiring errors, etc).
- Can we detect even subtle anomalies with performance-model-based quality tests?



Deriving Sandia-Array-Performance-Model Coefficients

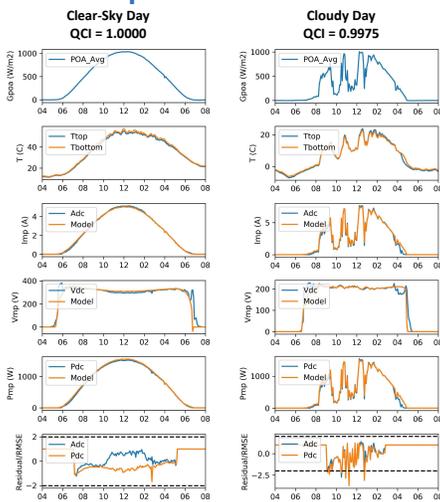
- Coefficients were derived on eleven different arrays* based on 2018 Q4 data; AOI and spectral effects were ignored.



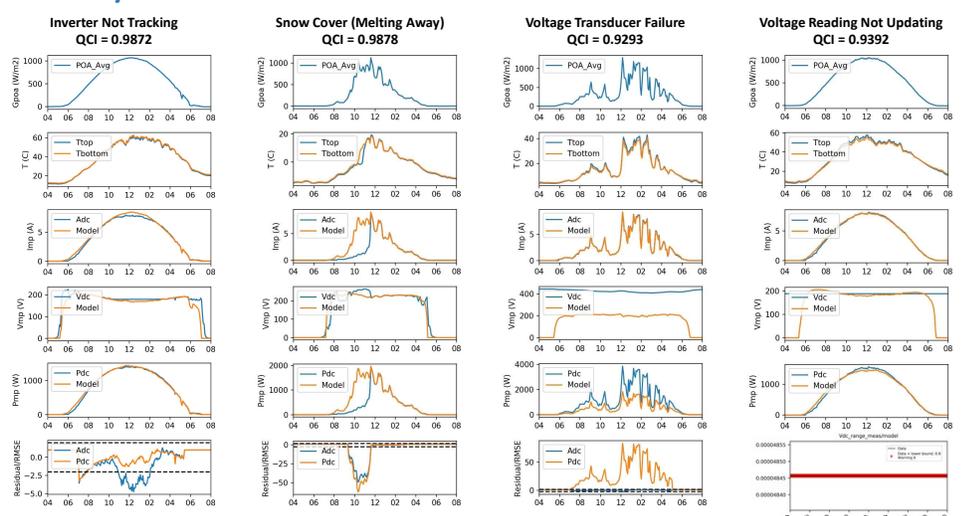
Performance-Model-Based Quality Indices, for Use with Pecos Range Tests

Index	Definition	Applied On	For Detecting
$\frac{\text{Residual}}{\text{RMSE}}$	(Measured Value – Model Value)/RMSE; RMSE from 2018 Q4 residual analysis	Imp, Pmp	Inverter failures/anomalies, shading events, fuse failures, instrument failures/anomalies, etc.
$\frac{\text{Measured Range}}{\text{Expected Range}}$	(Measured Max – Min)/(Model Max – Min)	Vmp	Instrument failures/anomalies, etc.

Normal Operation



Failures/Anomalies



Summary + Future Improvements

- Pecos range tests on performance-model-based quality indices help detect failures and anomalies quickly.
- Residual/RMSE indices lead to false positives on cloudy days => Apply only to clear sky points? Match time constants?

* Data and arrays are not owned by CFV. Data is used with permission from the owner.