Procedures to reduce PV performance uncertainties through in-field testing

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QualifyingPhotoVoltaics

Growing up is a road full of uncertainty

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Main uncertainty sources

- **Solar resource:** DB accuracy, interanual variation, long-term trends
- **Soiling:** non-homogeneus covers, effective impact
- **Operating conditions:** effective irradiance, IAM, cooling effects
- **PV system characteristics:** strings, inverters, QC for bifacial & floating
- **Ageing:** modules + inverters
- **Bifacial:** albedo evolution, irradiance gain, shading & mistmatch factors…

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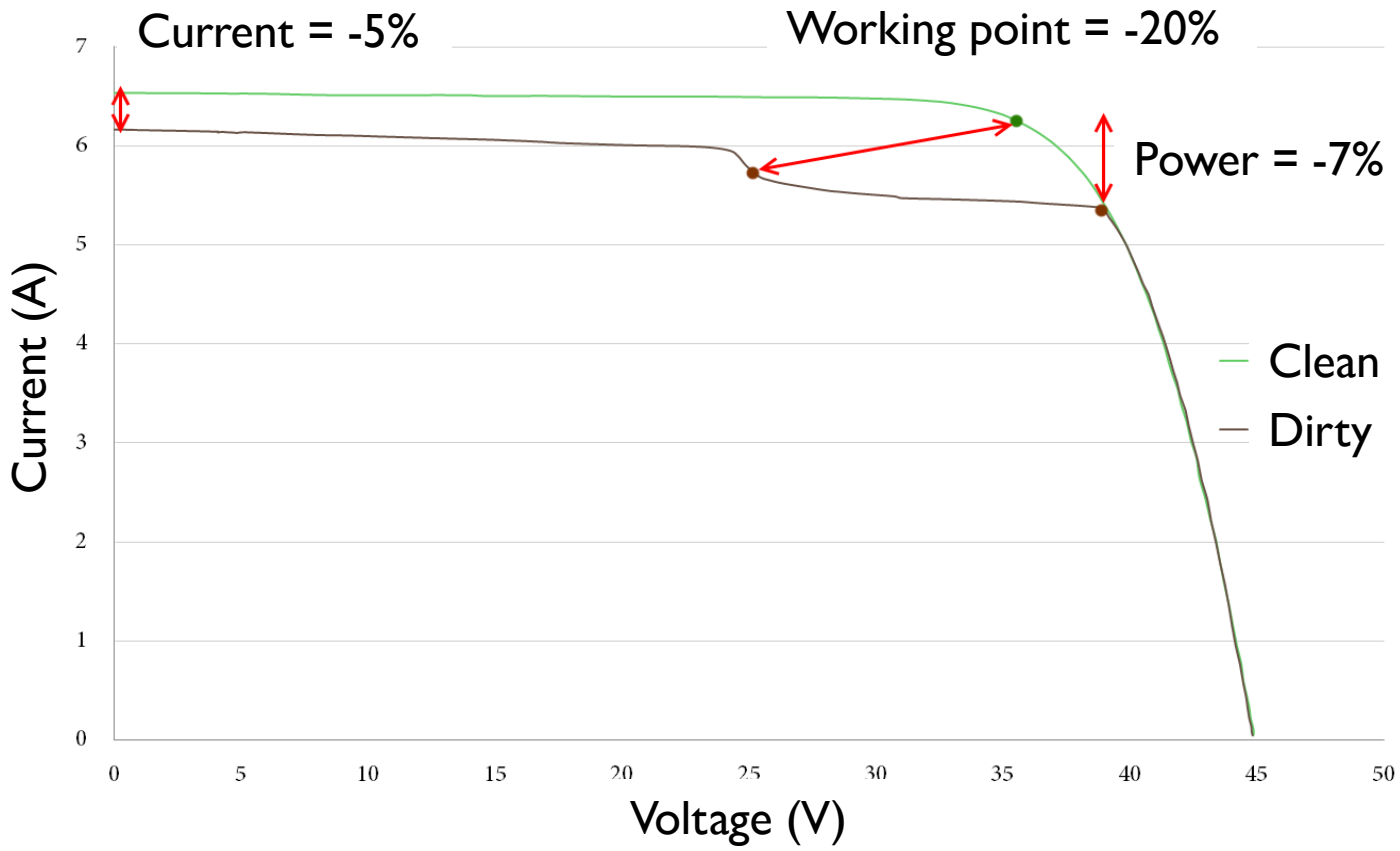
Soiling assessment



Key approach: PV modules as sensor + measure the effective impact

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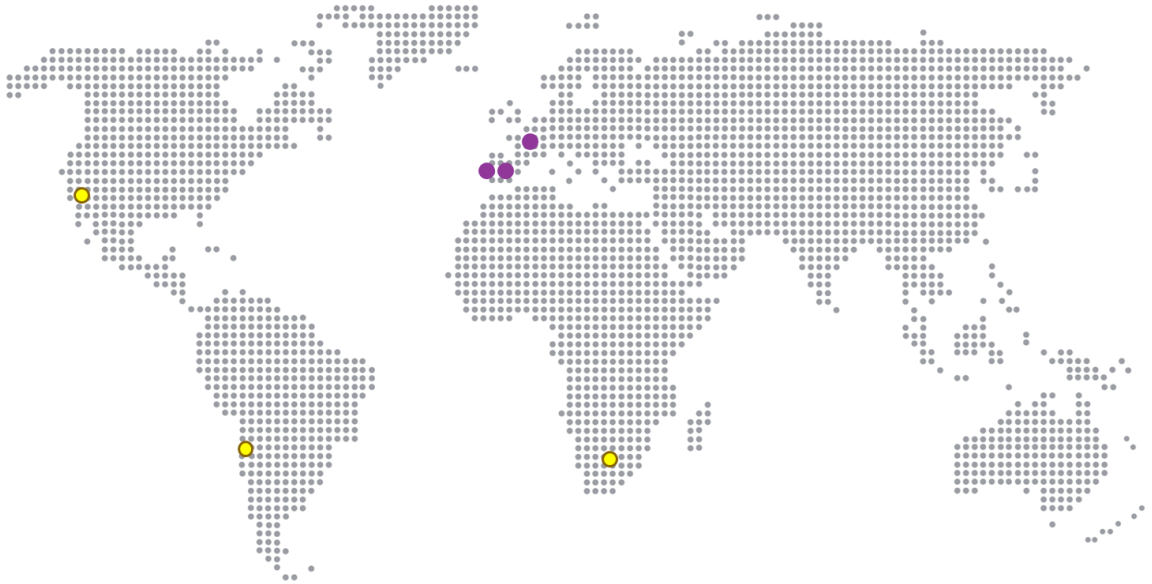
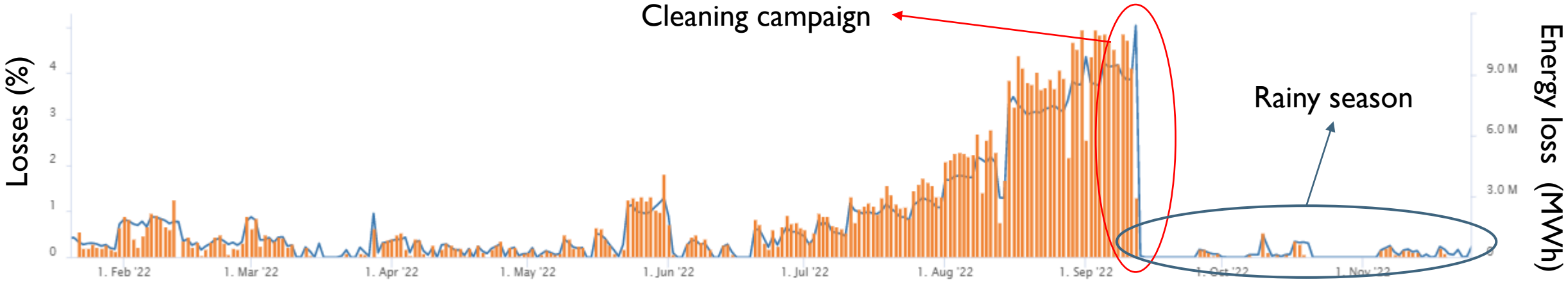
Soiling assessment



Portugal – feb'22 to nov'22



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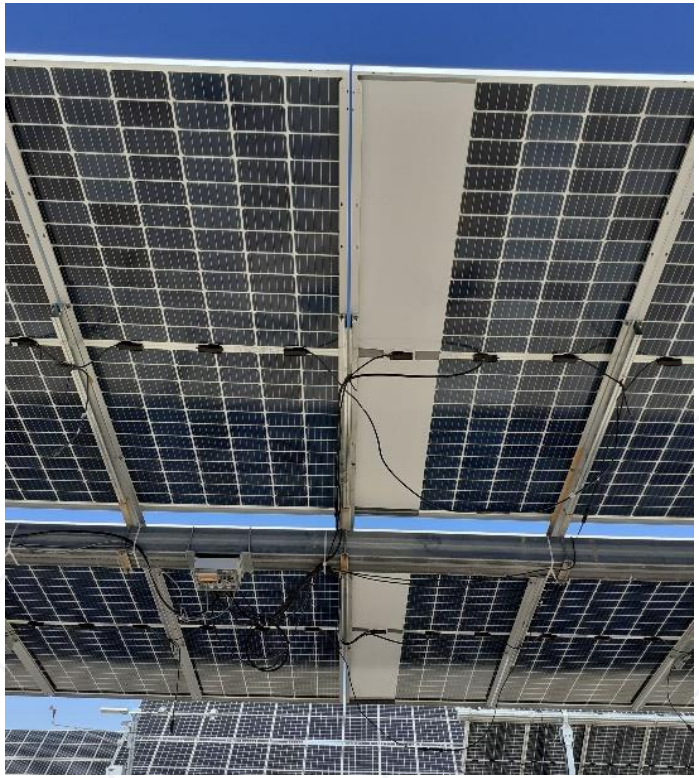
Operating conditions – Bifacial PV plants

Albedo (+100 locations): spatial and temporal variability, cover evolution, humidity

Bifacial reference modules: most representative all in one sensor



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In-field quality control procedures

- ✓ Modules (**+3000** tests): I-V testing for bifacial PV modules
- ✓ I-V tracer upgraded to 1500 V + 40A and tested on **25,000** strings.
- ✓ Inverters (**+300** units tested)
  - ✓ **Conversion and MPPT efficiencies**
  - ✓ Central + string inverters
  - ✓ Ageing
- ✓ Batteries: SoH, charging cycles, degradation…

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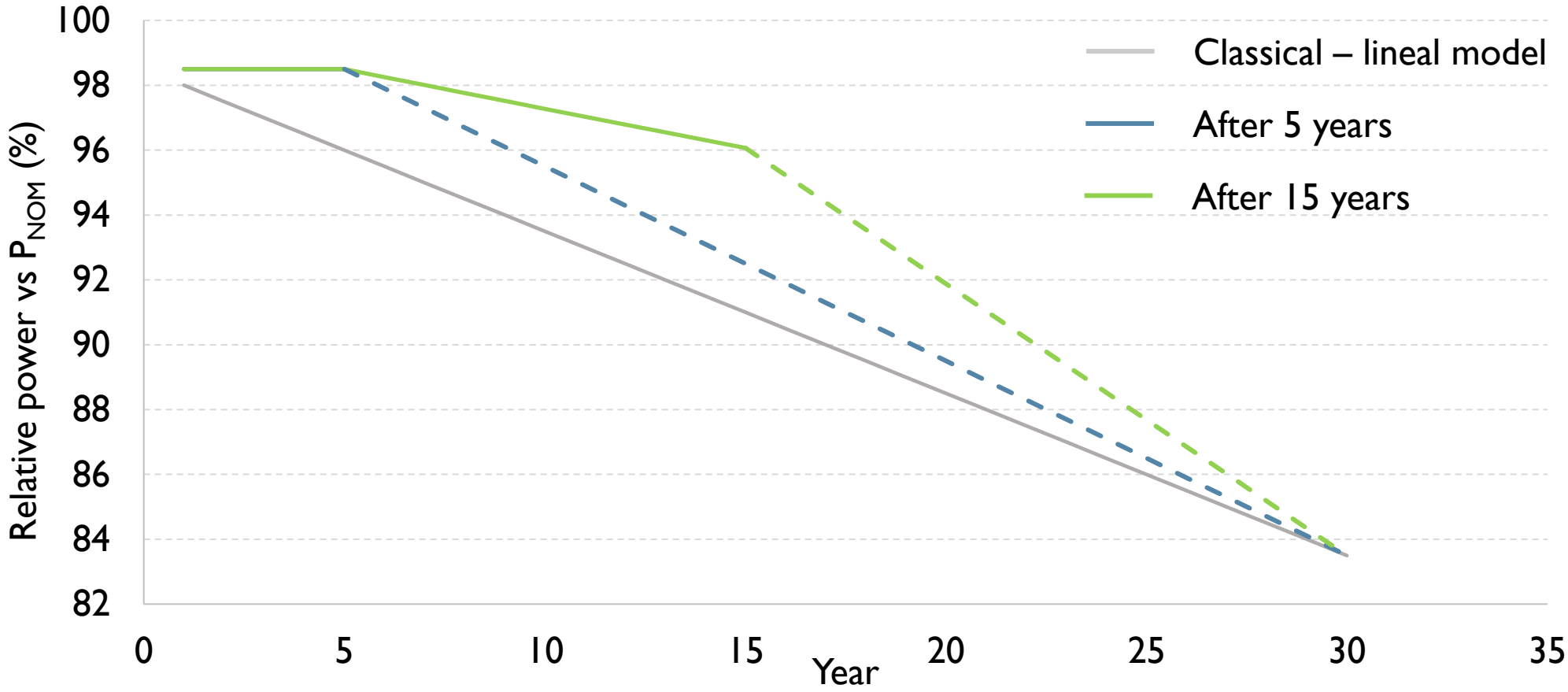
Ageing

- Very low uncertainty measurement procedures
- Need for anticipation



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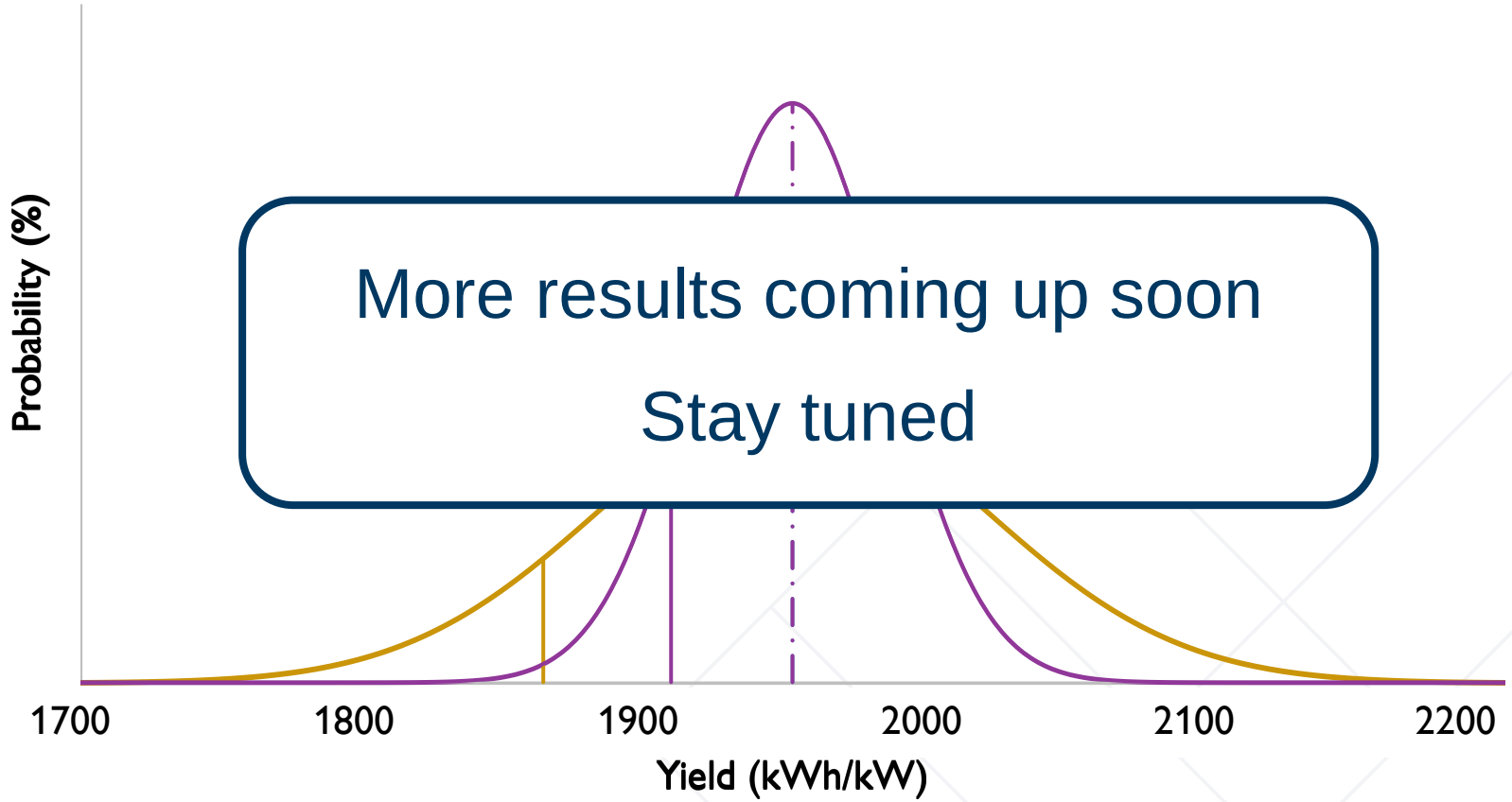
Uncertainty: a key issue for long-term projects

- Long-term scenarios: +30 years
- More need for predictability

⟹ Improve in financing ✓



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Panel Discussion

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