Faculty of Engineering
School of Photovoltaic and Renewable Energy Engineering

LeTID: What is it? What do we know? What's the impact?

All Energy

5th November 2020

Dr. Alison Ciesla

LeTID – What is it?

Light- and elevated Temperature-Induced Degradation [1]

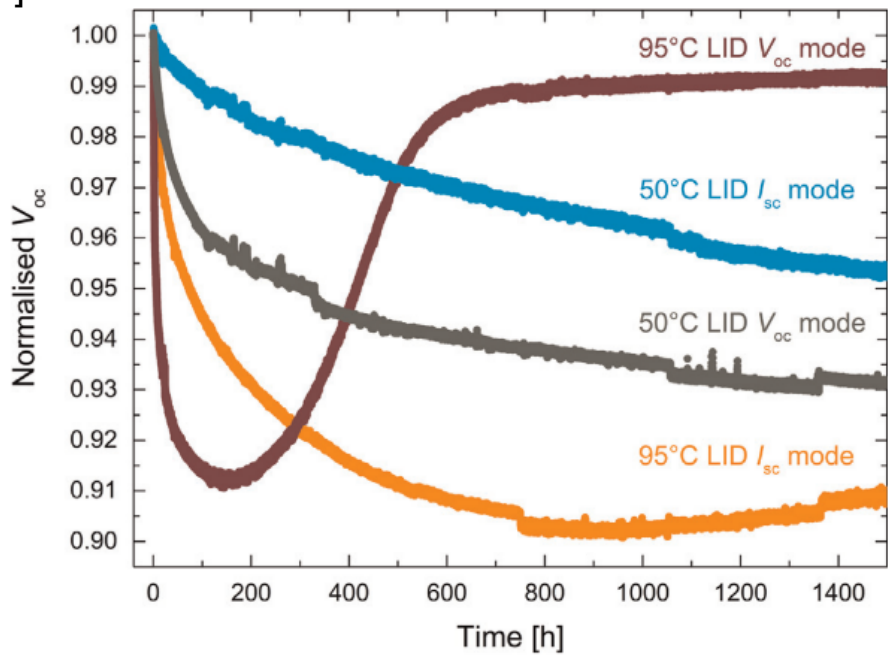
An electrical defect that forms under light or heat -> caused by hydrogen

>10% power loss if untreated [2]

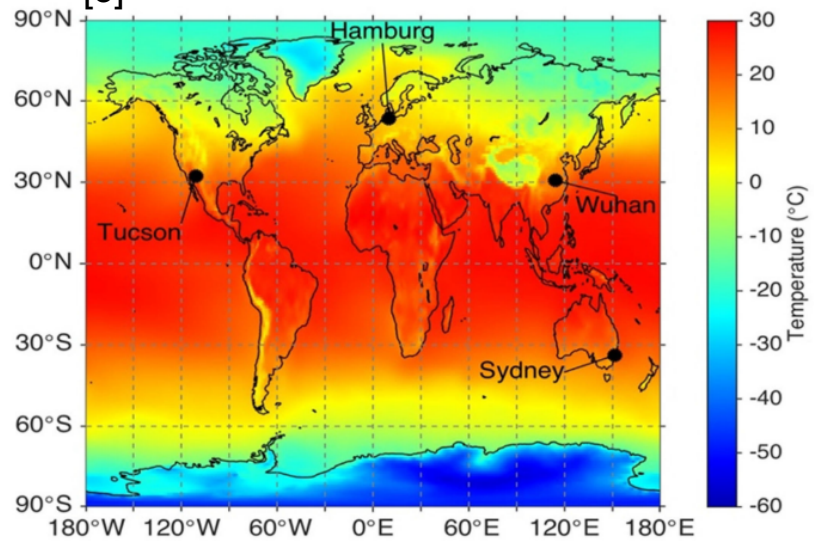
Degrades over several years

Accelerate -> heat + increased electrical carriers (light/voltage/current)

[2]



[3]



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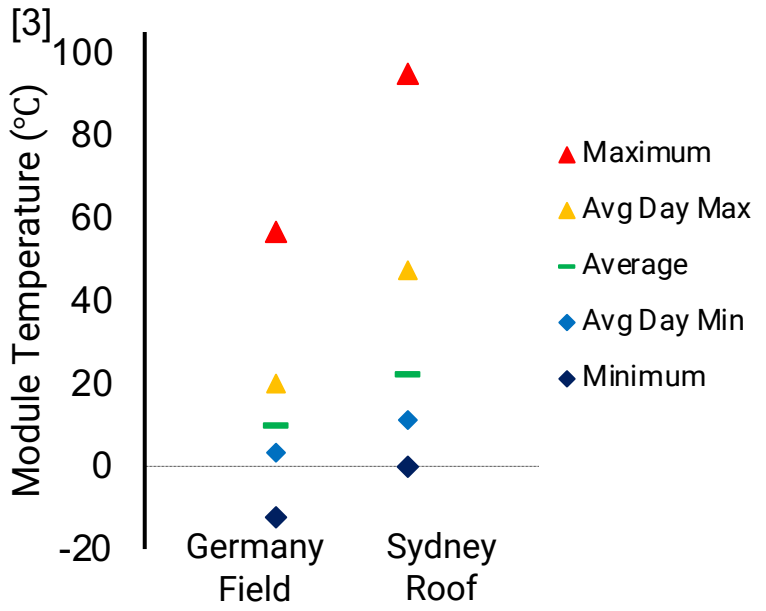

[1] F. Kersten *et al. IEEE 42nd PVSC* (2015) 1–5
[2] F. Kersten et al., Sol. Energy Mater. Sol. Cells 142 (2015) 83–86.
[3] A. M. Ciesla *et al.*, *IEEE J. Photovoltaics*. **10**, 28–40 (2020)

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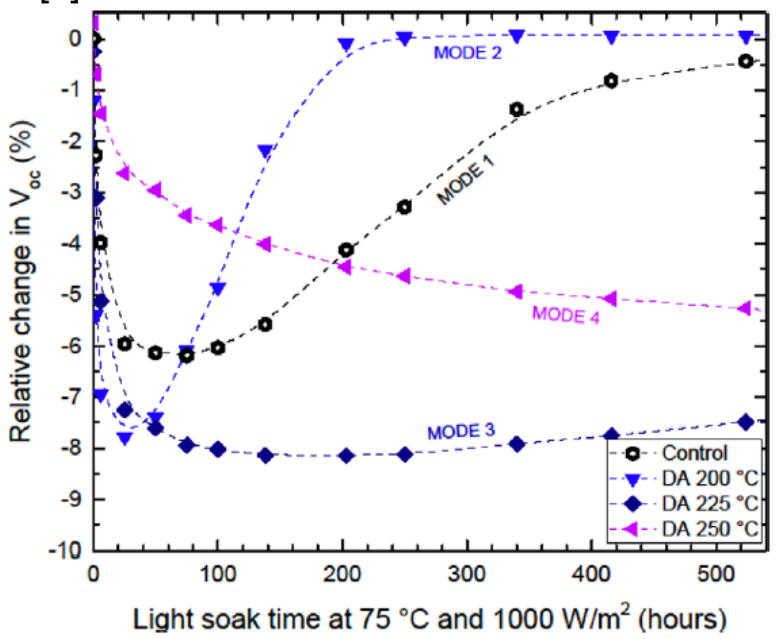
What do we know?

It is highly variable!

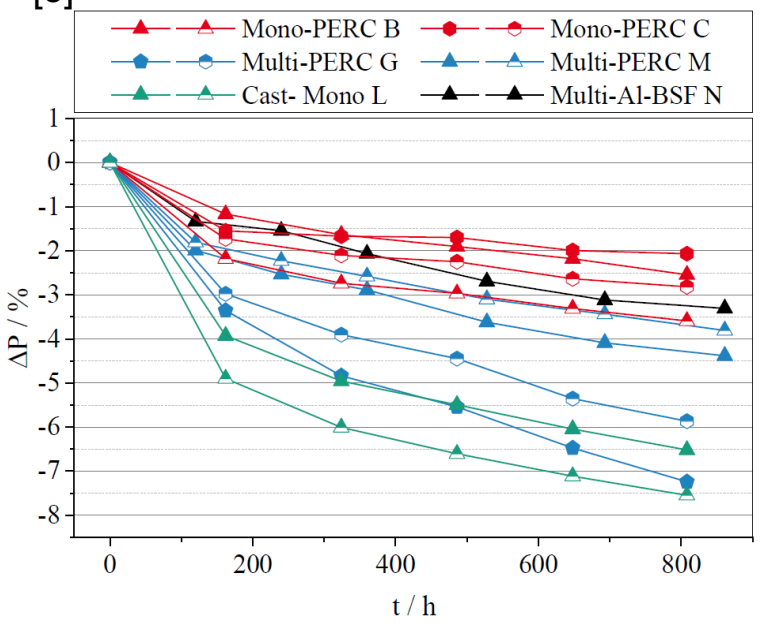
Different thermal history

[4]



Different wafer or technology

[5]



Same wafer and technology

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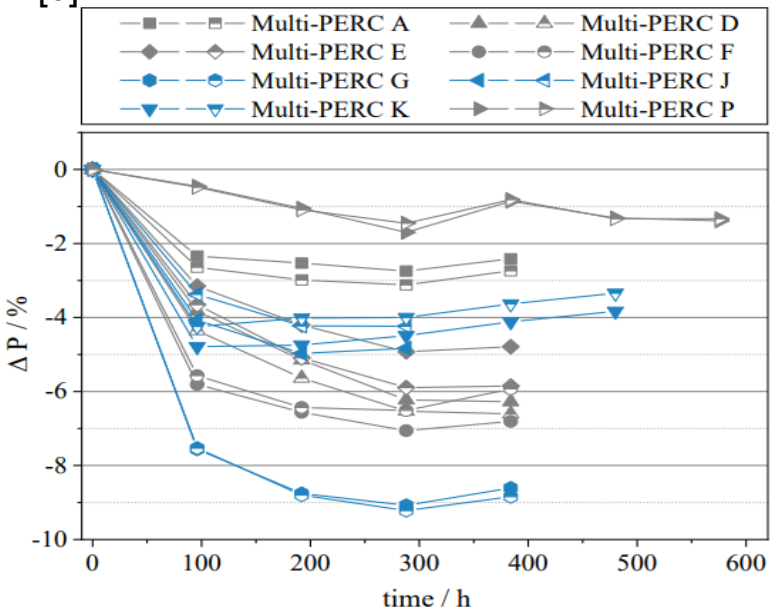

[4] C. Chan et al., Sol. RRL. 1, 1600028 (2017)
[5] E. Fokuhl et al., 36th Eur. PV Sol. Energy Conf. Exhib. 4 (2019) 75–84.

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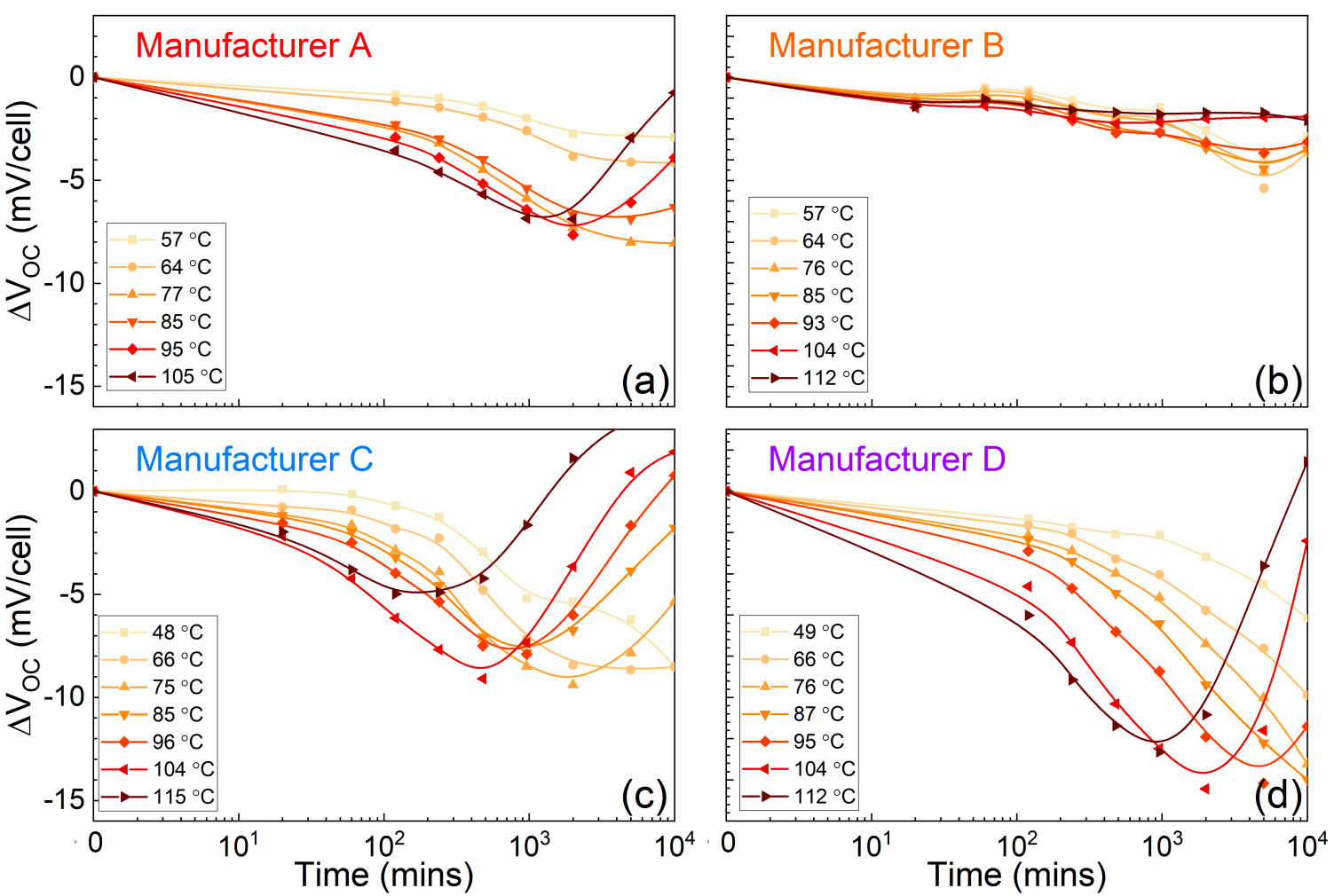
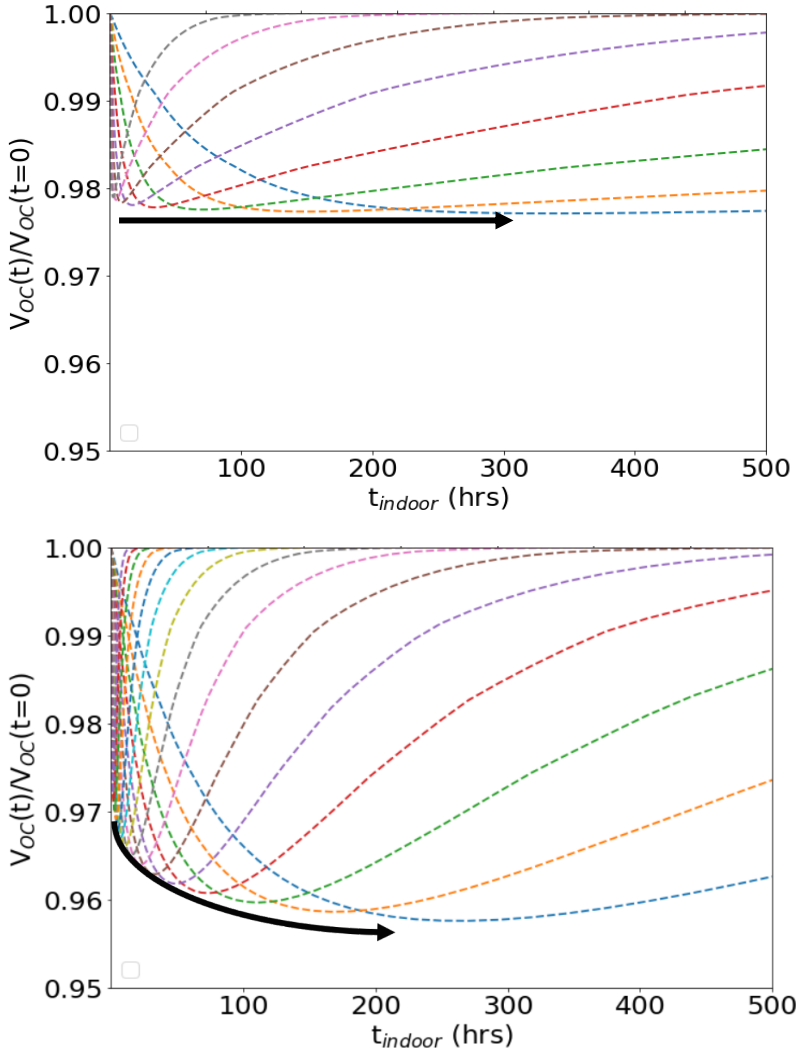
Variability due to different conditions





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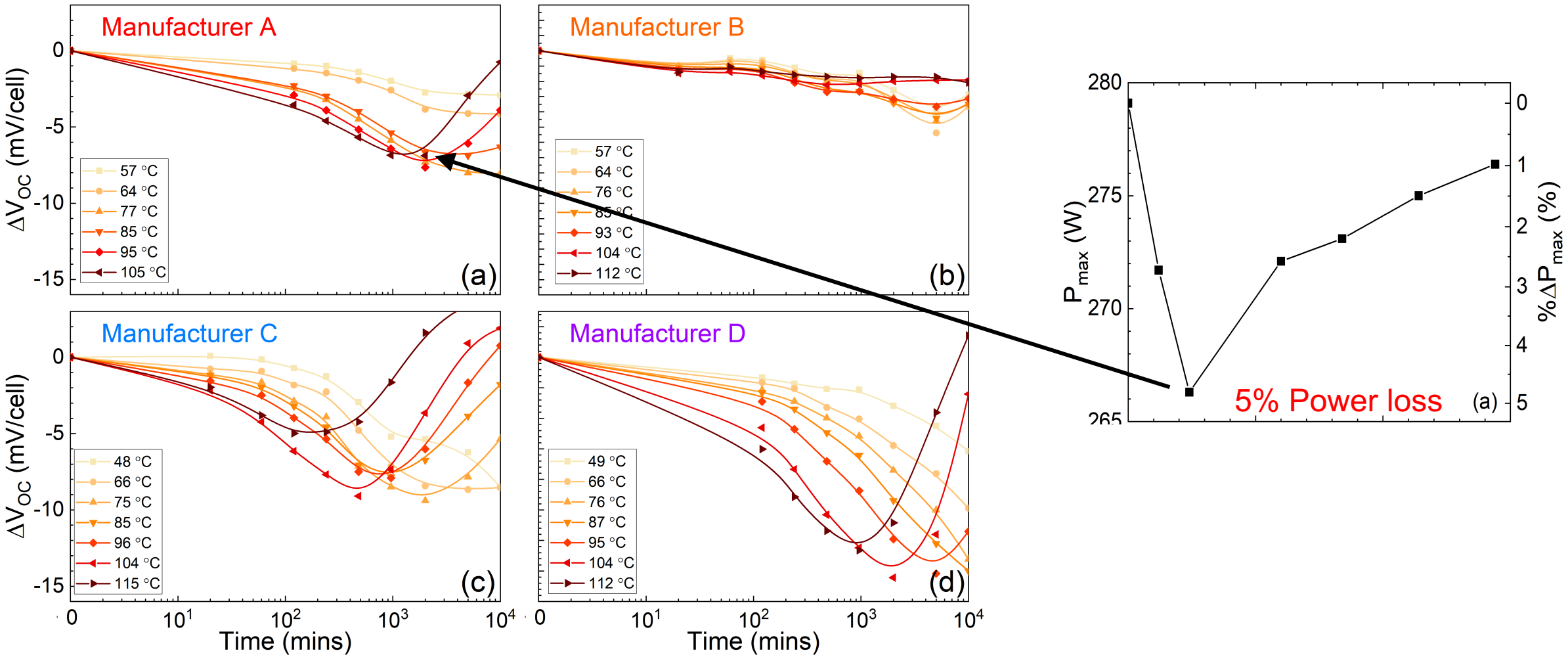

What impact will we see in the field?

Power loss: Current, Voltage, Fill Factor are all affected

Sub-tropical (~QLD): maximum degradation ~5-6 yrs. [5]

Cool/temperate (~TAS): may degrade slowly over whole life, never recover

Mid-Atlantic USA (sub-tropical) [6]

6 arrays: same model

5 out of 6 degrade at 1-1.5% p.a.

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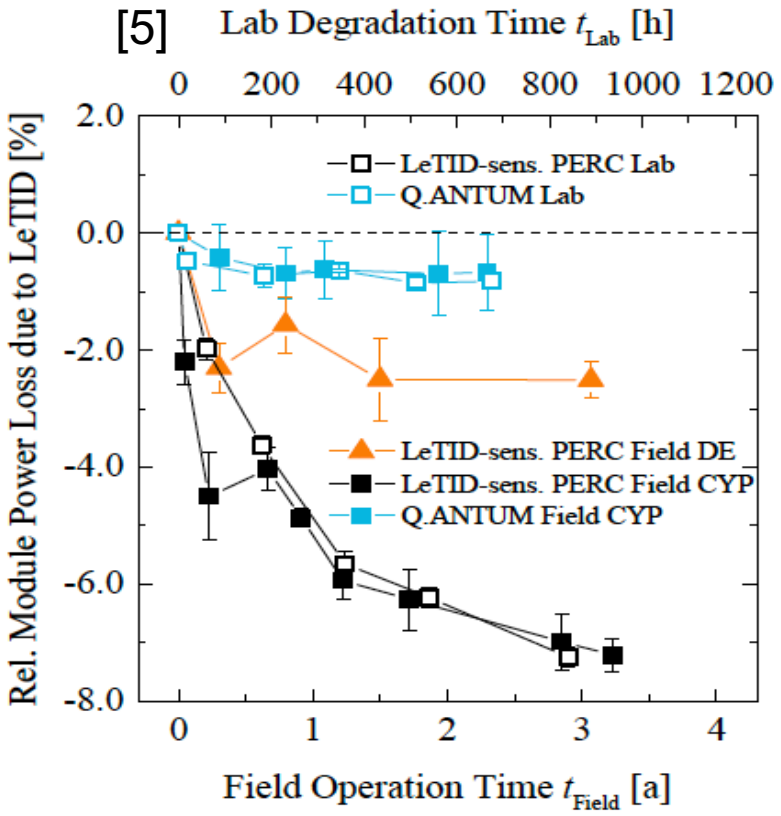
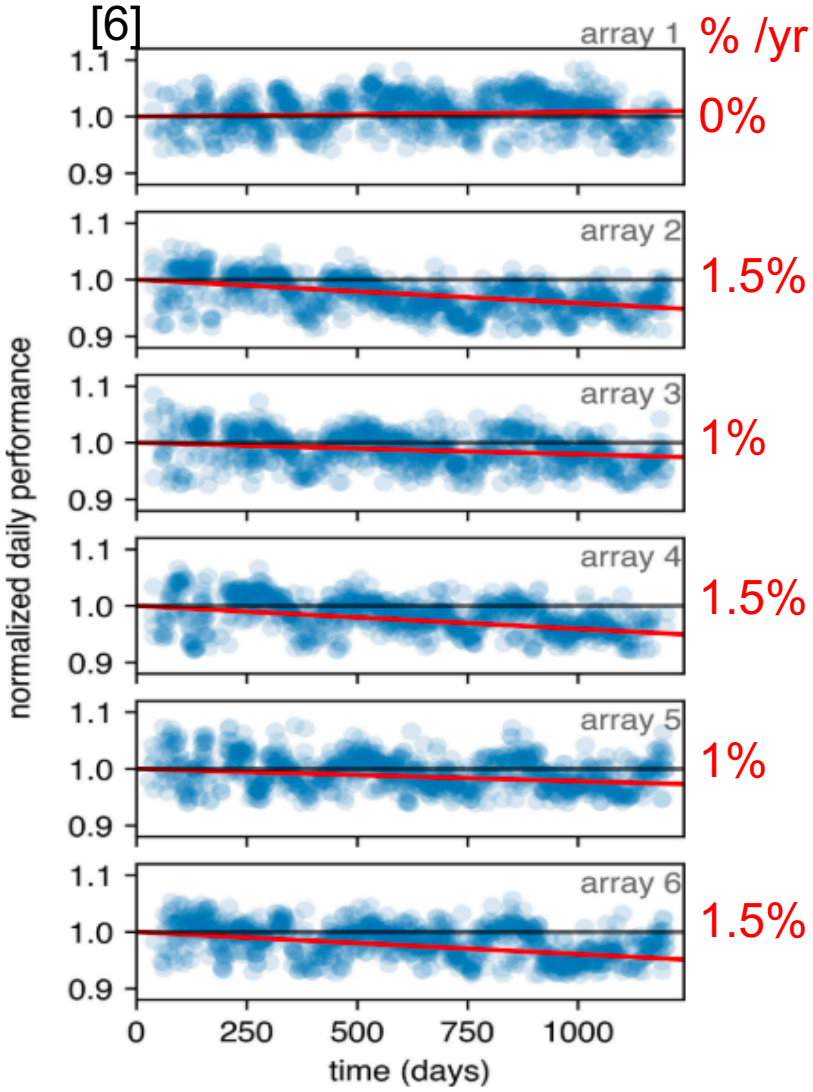


[6]



[5] F. Kersten et al., in Energy Procedia, vol. 124, pp. 540–546 (2017).
[6] M. G. Deceglie et al., IEEE J. Photovoltaics. 10, 1084–1092 (2020).

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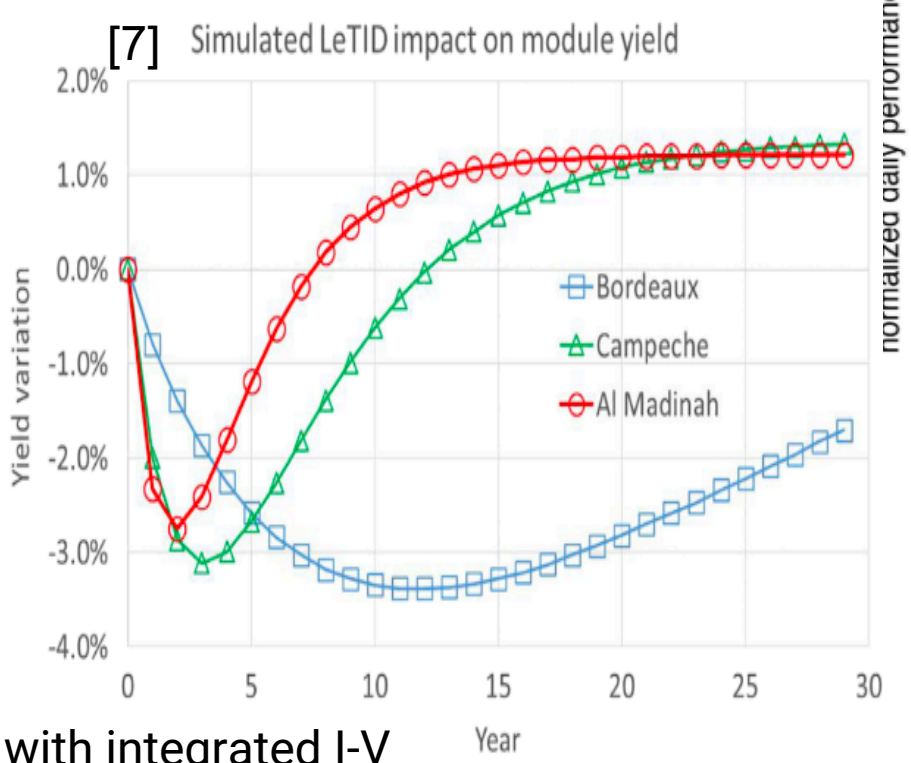
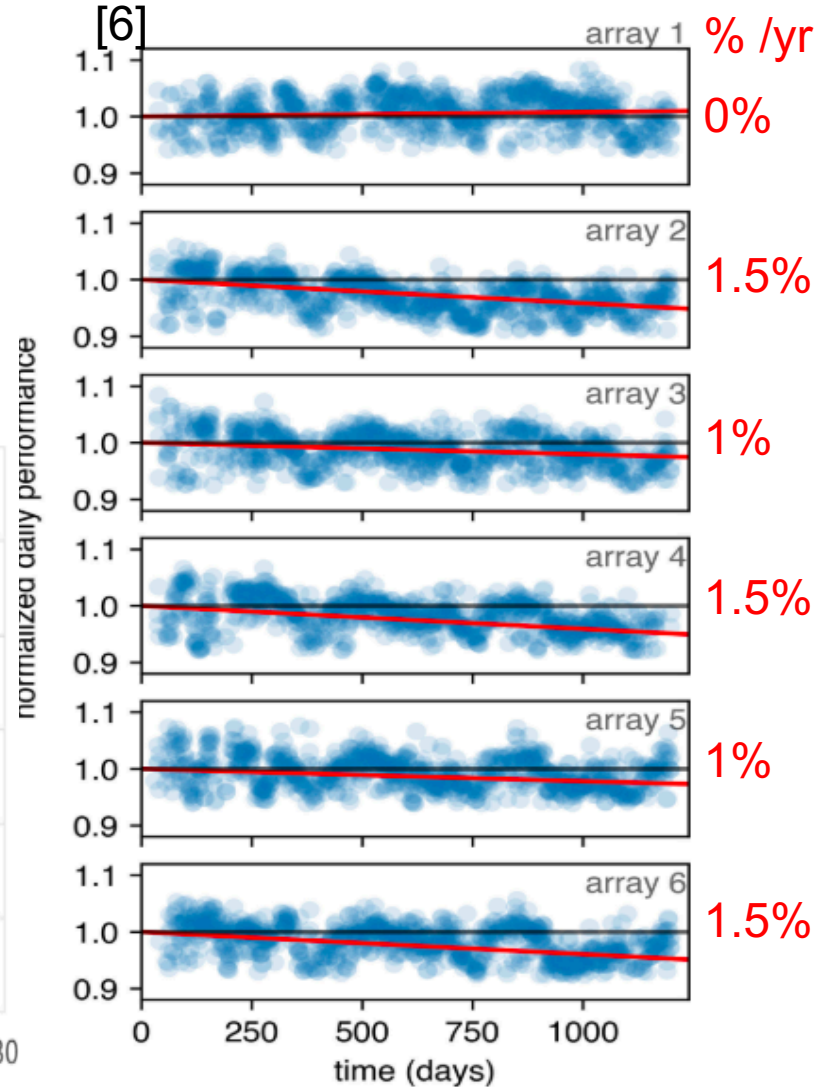


[6]



<u>Testing</u>

IEC 61215 (modules)

IEC 63202 (cells)

<u>UNSW module capabilities:</u>

New Eternal Sun climate chamber with integrated I-V

[5] F. Kersten et al., in Energy Procedia, vol. 124, pp. 540–546 (2017).
[6] M. G. Deceglie et al., IEEE J. Photovoltaics. 10, 1084–1092 (2020).
[7] J. Dupuis et al., Prog. Photovoltaics Res. Appl., 1–11 (2020)

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Thank You

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