Proposal:
- Process and Performance driven R&D should be integrated with Reliability
- Device level changes are a big part of module reliability. Greater attention to device issues at the process stage is needed and can only help the big picture.

Status/ Gaps:
- Device fabrication and understanding is now more mature than a decade ago.
- Many reported effects such as metastability can be understood and described by models.
- Lab and industry devices are reaching same level performance in spite of vastly different processing approaches.
- Lab – industry cooperation is now stronger (F-PACE).
- Cell level stability has been neglected. This is a good time to pick up the pace.

Impact:
- It is possible the drivers of cell and module performance also drive stability.
- Examples provided here illustrate the ability of scientists in Lab and academia to solve industry issues.
- Continued cooperation can provide clarity to seemingly complex issues.
- Assurance of reliability is necessary to gain consumer acceptance.

Past collaboration with Shell Solar, Thin Film Partnership, 1998-2003:
SSI approaches National Team with “transient effect” problem.
Change under light soaking was a problem for testing and certification, not a performance issue.
Wanted to understand root cause.

NREL process interleaving work was done on 10x10 cm mini-circuits and small area devices. Special substrates were provided by SSI.
NREL process: thicker CdS, different recipe. Led to higher V_{oc}
Led to process change and improved stability (2003)

Problem statement

Similar work for Stion (F-PACE) shows performance gain

Process to Measurements to Root Cause Identification:
Methodology to sort out observed effects

- Initial device characterization
- Decide test/ stress to answer specific question
- Decide relevant packaging
- Conduct tests