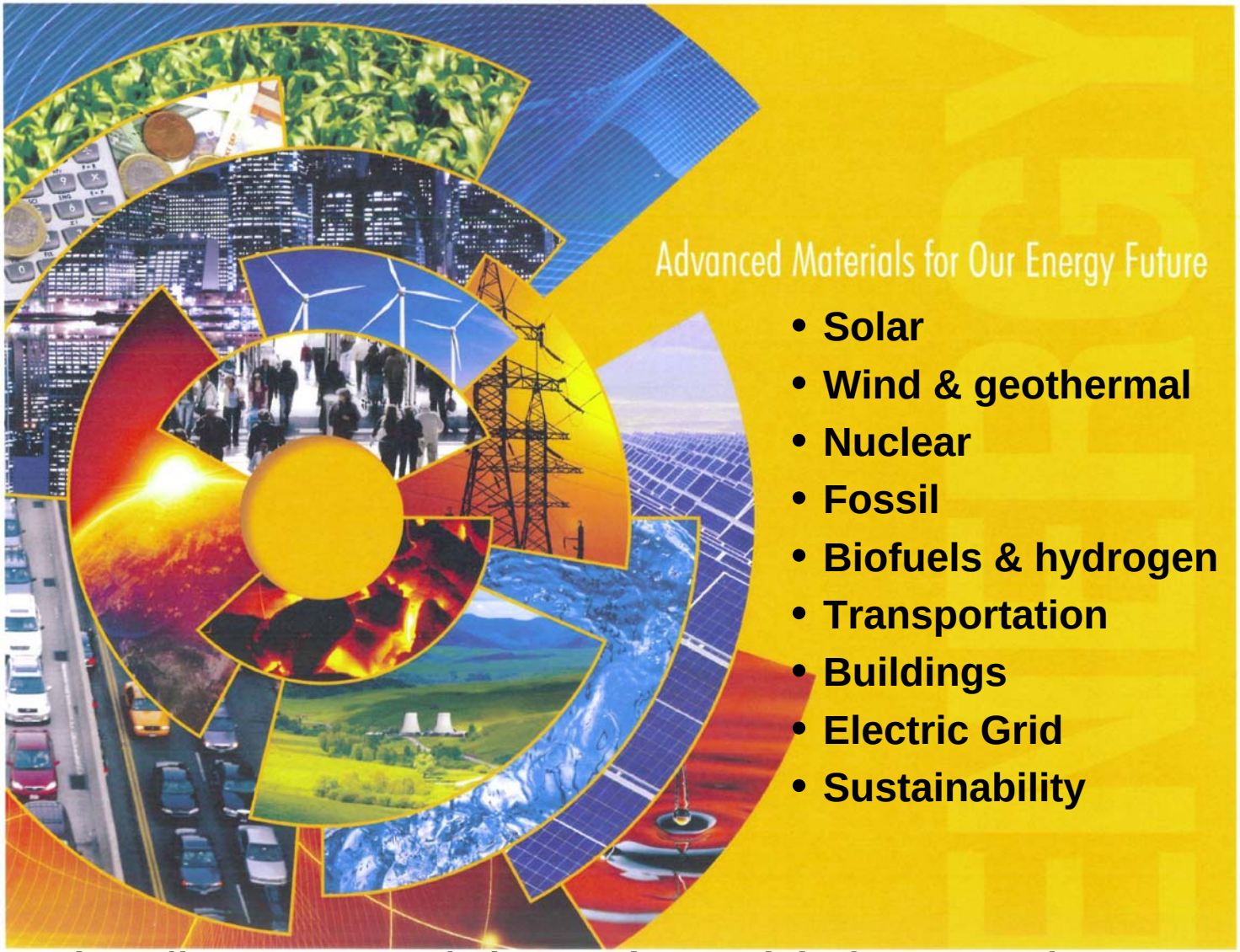
The opportunities for materials innovations for energy applications are enormous

Sandia National Laboratories



Five professional material societies

The American Ceramic Society www.ceramics.org

AIST Association for Iron & Steel Technology

ASM International The Materials Information Society

MRS

TMS

http://www.mrs.org/advanced-materials-for-energy/

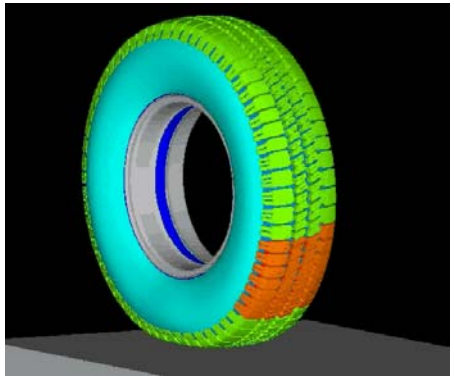
Chairs: Duane Dimos (dbdimos@sandia.gov) and Len Brillson (brillson1@osu.edu)

Goodyear – A long-term, win-win partnership

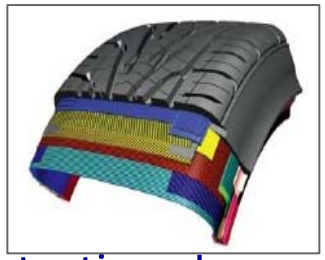
18 year Sandia/Goodyear collaboration:

- Mutual commitment to maturing computation mechanics & structural dynamics modeling for improving design to product cycle
- Sandia-based engineering codes and uncertainty quantification algorithms are at the heart of Goodyear's production computational simulation capability
- Sandia improved our understanding of the experimental validation cycle through the aggressive product timeframe of commercial tires

Path forward: Multistage Analysis & Constitutive Equation project – use improved constitutive property understanding to enhance design models



Today 100% of the tire molds designed in Goodyear are modeled *before* being ordered.



We bet a lot on predictive modeling and predictive testing. I don't think I've ever made a better bet; … that investment in research was a huge payoff." **Joe Gingo**, Chief Technical Officer, Goodyear.

POC: Joe Jung (jjung@sandia.gov)

PV system reliability – materials & process

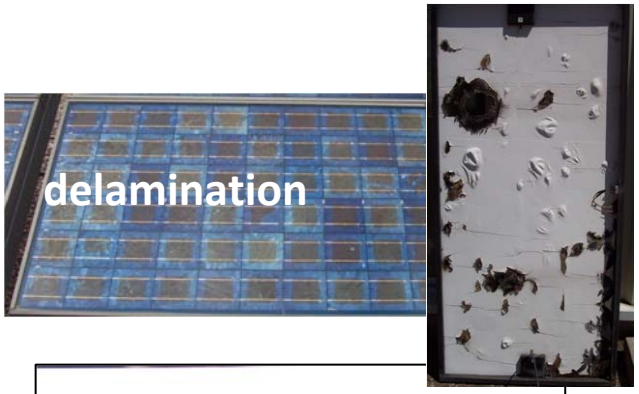
Sandia National Laboratories

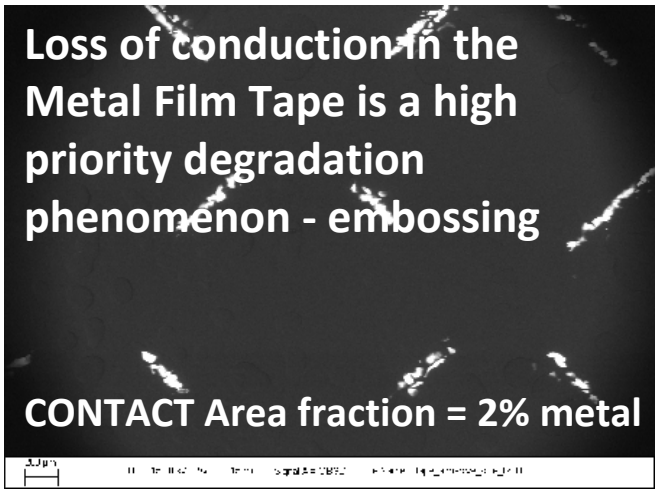
Objective: Develop a process to predict, detect, and mitigate material reliability issues in PV systems

Approach: Failure Modes and Effects Analysis with failure identification & testing

(system approach for nuclear weapon reliability)

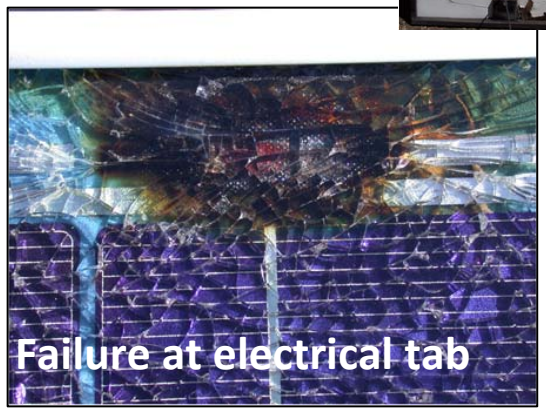
Outcome: Improved design and fabrication processes for improved field performance & reliability





Partnerships

- NREL
- PV manufacturers (SunPower, Abound, Schott, …)
- System installers
- Integrators
- Utilities



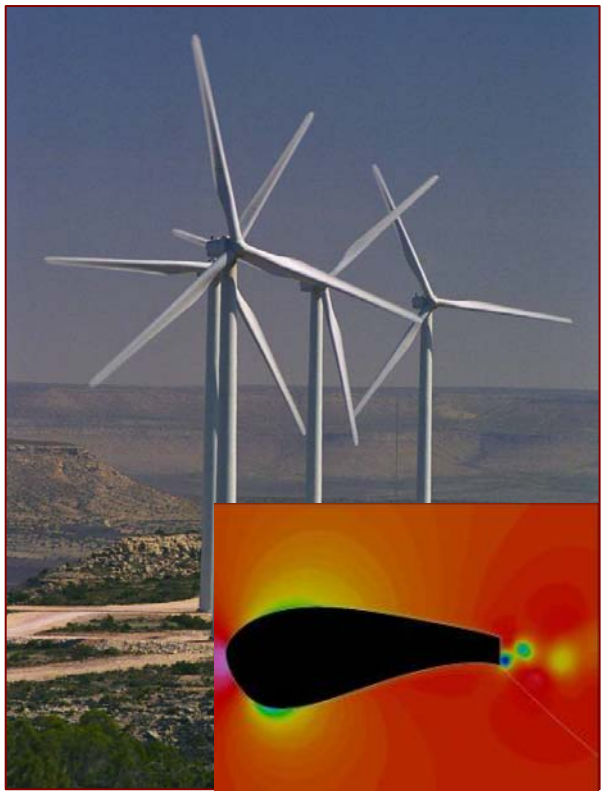
POC: Rob Sorensen (nrsoren@sandia.gov)

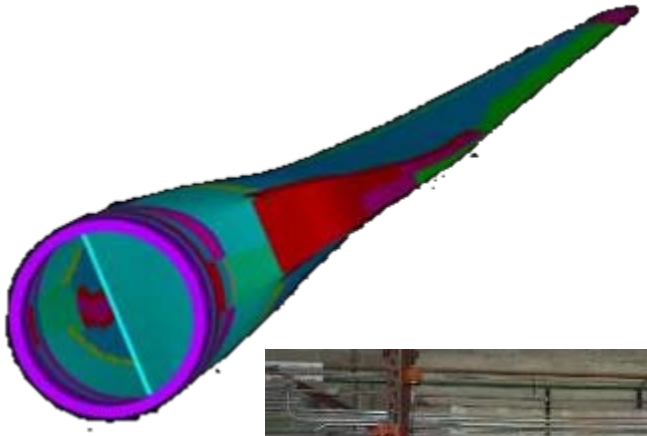
Wind energy – system engineering at multiple levels

Sandia National Laboratories

Technology gaps for wind energy materials:

- Blade materials: size, weight, stiffness
  - Material selection
  - Improved fabrication process
  - Sensor incorporation into blades
- Gear trains – Achilles heal
- Off shore use – corrosion, ..
- Power electronics





DOE/SNL Wind Energy Materials Program - Collaboration with Montana State University. PPG, Owens-Corning, Reichold, Arkema, GE, Clipper

POC: Daniel Laird (dllaird@sandia.gov)

Enabling process reproducibility for performance

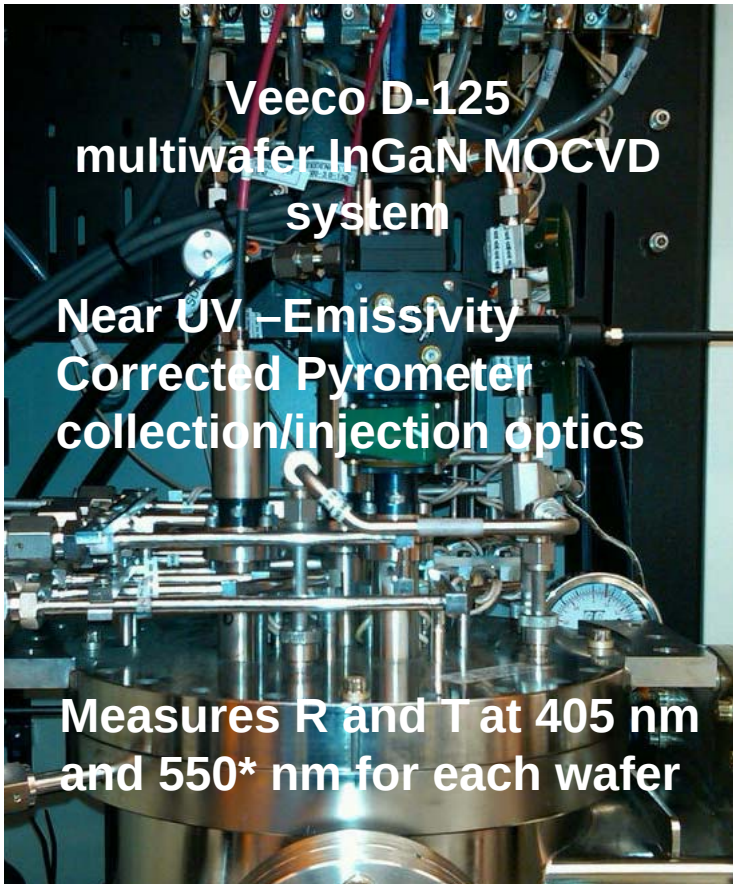
Sandia National Laboratories

Objective: Improve temperature control of InGaN deposition - LED emission (bandgap) is sensitive to process Temp. - 1.5 nm/^{o}C

Approach: Develop a pyrometer (near UV - 405 nm) to measure the temperature of growing films of GaN & InGaN

Outcome: < 0.8°C @ 750 ± 5 °C over 3" wafer average (< 2.5 nm variation)
Phillips Lumileds is evaluating the pyrometer

Solid State Lighting



Bill Quinn, CTO of Veeco:
In collaboration with Sandia, Veeco has developed a near UV pyrometer that can measure the temperature of the film as it grows. Using this pyrometer, we have demonstrated a reduction in run to run variability of 30%, which provides higher yield for our customers.

POC: Bob Biefeld (rmbiefe@sandia.gov)