Southeast Solar Summit

R&D Track #1

Summary of Outcomes/Actions

R&D Session 1: Photovoltaics

- Dr. Ron Ott (ORNL)
- Dr. Vijay Yelundur (GA Tech)
- Goal: Improve Solar Cell Efficiency
  - Reduce # of defects
  - Improve electrical contacts
- Within next 3 years
  - Mono-crystalline silicon efficiency → 20%
  - Cost below 10 c/kWh

Keynote Speaker (lunch): Buildings Integrated PV

- BIPV – Steve Coonen
- Replace building skin materials with PV
- Meet architects vision, building codes, and provide energy
- Replacing architectural glass with PV laminates makes sense
- Use existing contractors and familiar practices
- Tax credits good for growth of industry but we should not become dependent on them

R&D Session 2: Buildings Integrated PV

- Steve Coonen, Vice President (Open Energy)
- Dr. Lew Fraas, President (JX Crystals)
- Goal: Achieve 7 c / kWh (from present 28c/kWh)
  - Reducing Solar Tracking Price by 1.4x
  - Lowering cost optics by 2x
  - Increasing efficiency by 1.5x
- Approach: Use Sun Tracking Carousel for Building Flat Roofs
- NREL Web-based Tools for Estimating Costs / Savings
- Tradeoff of reducing costs vs increasing efficiency

R&D Session 3: Concentrator PVs

- Dr. Lew Fraas, President (JX Crystals)
- Substitute lower cost optics for expensive single crystal material
- Dependence on subsidies could lead to market instability
  - Currently at $8/W
  - Subsidy is $3/W
  - Tipping Point is $4-5/W
- National Real Estate Appraisal value for solar has been established

R&D Session 3: Concentrator PVs (cont'd)

- Rik Hurt (UNLV)
- Several CPV and Solar Projects
  - Amonix CPV Systems
    - multi-junction, Nevada Power Company
  - Solar Dish Stirling
  - Concentrated Solar Thermal
  - Hybrid Solar Lighting
  - Energy Efficient Homes
  - Building Technologies
  - Photo Electrochemical Hydrogen Generation
  - Modeling and Computational Methods
- More info: www.cer.unlv.edu

R&D Session 3: Concentrator PVs (cont'd)

- Bob Conner (Semprius)
- Photovoltaic Microtransfer Printing Technology
- Allows for very small cell size (.1 x .1 mm – compared with present 10 x 10 mm)
  - Easier to get uniform illumination, extract current, and remove heat
  - High concentration ratios
  - Multiple prints of small cells off of parent wafer
- Enables use of microlens arrays and very thin modules
- Prototype expected in early 2008

R&D Session 4: Buildings and Grid Integration

- Burak Ozpineci (ORNL)
- Tom Jahns (UW - Madison)
- Long-term success of PV requires system level development in addition to cell and module development
- Multidisciplinary work between industry, academia, and labs required in the context of building integration
- Ultimate Goal: Net “zero energy” buildings
- Microgrid Concept: Combo of local sources and loads in single or multiple buildings

R&D Session 4: Buildings and Grid Integration

- Center for Power Electronic Systems (CPES)
  - Seek major advances in power electronics technology using integration as a key technique to achieve major improvements in performance, reliability, and cost
  - Sustainable building testbed at Virginia Tech
  - Begin operation at CPES demo sustainable building at UW-Madison 2009
- Successful demonstrations needed to improve sales
- Energy storage is a challenge for both solar PV and solar thermal

R&D Session 5: Direct Use Solar Technologies

- Jeff Muhs, Engineering Science & Technology (ORNL)
- Looking outside the box:
  - Paradigm: capture → convert → store
  - Alternative: capture → distribute → use
- Direct use of light (UV, VIS, IR)
  - Biomass production
  - Decontamination
  - Photodynamic therapy
- Direct heating
  - Solar clothes drier
  - Radiant heating of office buildings
- Conversion
  - Photoelectric production of hydrogen
  - UV phosphors for interior lighting