GLOBAL APPROACH TO MODULE CERTIFICATION
at Intertek

Sunny Rai
Program Director
Photovoltaic & Semiconductor
PV Industry Services – Manufacturing to Installation

- PV Manufacturing Equipment Evaluations
- Factory Performance Inspections
- PV Module evaluations & certifications
- Inverters, converters and other connectors
- System Support Equipment & component evaluations
Photovoltaic History at Intertek

- NRTL & SCC accreditations for UL 1703 prior to 2006
- Performed ETL Listings in conjunction with FSEC
  - GE, Evergreen, BP Solar
- Opened Californian & Shanghai Labs in October 2008
  - CBTL Status March 2009
- Partnership agreement in Europe since April/May 2009
  - PI Berlin and AT4, Spain
- Performed Manufacturing Equipment Evaluations, 2005
- One of the Largest Inverter Testing network of labs
  - Cortland, NY; Germany; Taipei, Taiwan
- Component evaluation & testing
  - Stockholm, Sweden; Cortland, NY
Photovoltaic (PV) Program
The Most Comprehensive
PV Manufacturing to Installation

• PV Manufacturing Equipment Evaluation
  – Semiconductor Processing Equipment
    • CVD, PVD, Lasers etc.
    • Electrical & Mechanical Hazards
    • Chemical & Radiation Hazards
    • SEMI S2, S6, S8 and S10 type evaluations
    • Machinery Directive, Low Voltage Directive
    • EMC Directive
  – Glass Materials
    • Coating, cutting & handling
  – Automation equipment
    • ANSI RIA 15.06
    • IEC 705
  – North American Field Labeling
    • AHJ Requirements
PV Manufacturing to Installation

• Factory Performance Inspections (FAT)
  – Contractual agreements between the buyer and seller
  – Generate checklist
  – Define acceptance criteria
  – Perform Panel Testing (i.e. LID)
  – Verify performance
  – Issue certification

• Local Code Compliance
  – Field Labeling
  – Tracer Gas testing
  – Risk Assessment and IH testing

• Fast Track Listing Program
  – Factory Layout documentation
  – New Factory inspection & Audit
  – Multiple Listing and Manufacturing Locations
PV Manufacturing to Installation

• PV Module Testing
  – IEC Performance Testing (61215, 61646 etc)
  – UL/IEC Certifications for Safety (NRTL/CBTL)
    • UL1703, IEC 61730-1, -2
  – Independent performance tests
    • LID
    • Dielectric
    • Wet Leakage test
    • Chamber conditioning
  – California Energy Commission (CEC) & FSEC
  – SCC, Canadian certification
  – Fully operational Facilities in
    • Los Angeles, California
    • Shanghai, China
Global Standards

• US Certifications
  – UL 1703 - Standard for Flat-Plate Photovoltaic Modules and Panels
  – UL 1741 - Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
  – UL 8703 - PV Concentrator Requirements
  – Building Integrated Photovoltaic (BIPV) Module Requirements (AC 365)
Global Standards

- IEC Standards, European Certifications
  - IEC 61730, Photovoltaic module safety qualification
    Part 1: Requirements for construction
    Part 2: Requirements for testing
  - IEC 61215, Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
    - Design Qualification and Type Approval
  - IEC 61646, Thin-film terrestrial photovoltaic (PV) modules
    - Design qualification and type approval
  - IEC 61218, Concentrator photovoltaic (CPV) modules and assemblies
    - Design qualification and type approval
  - IEC 60904-X, PV Devices – measurement procedures and requirements
Certification Challenges

- **Time to Market**
  - Lengthy test requirements
  - Long wait at Testing Laboratories
  - Non-harmonized test procedures between Labs
  - Region specific certification requirements

- **Technology Limiting**
  - Standard development lags technology
  - Small pool of experts & test laboratories

- **Modifications & technology advancements**
  - Component Certifications
Overcoming Certification Challenges

• Internationally Accredited Laboratories
  – Multiple accreditation & Test Locations
    • US, Europe & Asia
  – Participants in the CB Scheme
    • Data acceptable to other CBTLs Globally
  – Commercial organization
    • Value time to market

• Take Advantage of the overlap
  – Test Plan to combine Safety & Performance requirements
  – Perform US & European certifications concurrently
Overcoming Certification Challenges

• Retest guidelines
  – IEC published retest guidelines
  – Test for changes only

• Industry Experts
  – Designers and Manufacturers

• Data acceptance Programs (Satellite Program)
  – Set up your own labs
  – Perform your own testing
  – Get into an accredited Test Labs DAP
  – Manage your Time to Market
<table>
<thead>
<tr>
<th>TEST</th>
<th>IEC METHOD from 61730</th>
<th>IEC method from 61215 or 61646</th>
<th>US equivalent from UL 1703</th>
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<td>Hot Spot Endurance (same 10.9)</td>
<td>Hot Spot Endurance</td>
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<td>Outdoor Exposure 10.8</td>
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Regional Certification Requirements

- **California Energy Commission (CEC)**
  - CEC-300-2008-006, New Solar Homes Partnership Guidebook
  - Listed by NRTL (UL 1703)
  - Maximum Power Determination
  - Measurement of Temperature Coefficients
  - Measurement of NOCT
  - Performance at STC and NOCT
  - Performance at Low Irradiance
  - STC – Standard Test Condition
    - Temp 25°C, Irradiance 1000 Watt / m²
  - PTC – Performance USA Test Conditions
    - Calculated by CEC
    - Used to classify modules for rebate program
  - IEC 61215 / 61646

- **Florida Solar Energy Center (FSEC)**
  - PV Certification Application Form (FSEC Form PVSD-001)
  - NRTL Listed by ETL, UL to UL 1703
  - FSEC Test Method for Power Ratings (FSEC Standard 202-05)
  - PV Module Performance Certification Program (FSEC Standard 201-05)
Regional Certification Requirements

• Building Integrated Photovoltaic (BIPV)
    • Fire Classification Test (UL 790)
    • UL 1897 Uniform Load Tests (UL 1897) for each installation condition
    • Wind Driven Rain Resistance
    • Durability
  – ICC-ES AC 07 - Acceptance Criteria for Special Roofing Systems
    • Weatherometer Test
    • Wind Resistance
    • Penetration Test
Regional Certification Requirements

• Miami Dade County, Florida
  – Miami Dade Checklist # 0443 for the Approval of: Solar Collectors (Photovoltaic Devices)
    • UL 1703 – NRTL Listing
    • TAS 202 Uplift Load Test
    • ASTM E108 or UL 790 Fire Ratings
    • TAS 100 Wind Driven Rain Resistance
  – Miami Dade Checklist # 0445 for the Approval of: Plastic or Foam Plastic
    • ASTM G155 Xenon Arc Accelerated Weathering
    • ASTM D638 Tensile Testing Before and After Weathering
    • ASTM D1929 Self-Ignition Temperature
    • ASTM E84 Flame Spread Test
    • ASTM D635 Rate of Burning
Our Accreditation For PV

- **CBTL** by IECEE in USA & China
- **NRTL** by OSHA in USA
- **Notify** Body in EU
- **CNAS** in China
- **SCC Accredited** in Canada
MCS – The Microgeneration Certification Scheme

MCS:005 Issue 2.3 dated 25/02/09 – Product Certification Scheme Requirements: Solar Photovoltaic Modules
- BS EN 61215: 2005
- BS EN 61646: 1997

MCS 010 “Generic Factory Production Control Requirements” Issue 1.5 dated 25/02/09

FPC audit and Product audit
<table>
<thead>
<tr>
<th>Country</th>
<th>Standard</th>
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Japan – JET PVm

- MoU signed in Dec 2008 between JET and Intertek on PV Module Certification Cooperation.
- TDAS A Lab certificate issued to Intertek PV Laboratory by JET on April 20, 2010.
PV Manufacturing to Installation

• Inverters, AC/DC Converters and other components
  – NRTL Listing
  – Field Labeling
  – Grid inter-Connection testing
  – EMC testing
  – Functional Safety tests
  – Design Reviews
Component Testing (New Service Offering)

- Manufacturing Materials
  - Back Sheet
  - Glass coating
  - Junction boxes
  - Adhesives
  - Potting compounds
  - Interconnect cables
  - Labeling Systems
Performance and Benchmark Testing

- Product Comparison
- Claims Verification
- Product Quality & Performance Certification
- Failure Analysis
- Warranty and Returns Analyses
- Accelerated Life
- Energy Efficiency
- RoHS, Reach, PROP 65
Laboratories & Equipment
Fire Testing Lab In Middleton, WI

Burning brand

Spread-of flame
Intertek Advantage – Fastest time to Market

• Intertek will provide the fastest turnaround time in the industry, while providing superior project management and optimum communication before, during and after the evaluation project.

• Multiple Locations with Global Accreditations

• The best value and A True one Stop Shop

• All aspects of the program geared to quickly get your product to the market
Thank you!

Strong Globally. Strong Locally.