Ian Crecelius — Sr. Reliability Engineer

TECSI Solar

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EXECUTIVE SUMMARY

I am a mechanical engineer with a passion for making renewable energy a safe and reliable form of energy to power the future. I have over 12 years of solar R&D experience, testing, certifying and performing reliability analyses on a diversity of systems. I have been instrumental in bringing over two dozen solar products to market from concept to mass manufacturing, and I am familiar with the challenges of startups as well as working with multi-billion-dollar companies. My strengths are in finding faults early in the product design lifecycle, thus reducing time to market. I have a pragmatic approach to reliability that focuses on reducing risk and saving money. I have deep experience evaluating field failures and quantifying the risk and cost to a company, determining warranty reserves, performing pre-compliance testing, and overseeing a multitude of innovative products through certification, both nationally and internationally. I love working with cross-functional teams to solve problems quickly and efficiently.

CENTERS OF EXCELLENCE

Solar Products
- Residential pitched roof
  - Composition shingle
  - Standing seam metal
  - Exposed fastener metal
  - Metal shingle
  - Fiber cement
  - Tile
- Residential and commercial flat roof
- Commercial pitched roof
- Ground mount
- Single axis trackers
- BIPV
- Rapid shutdown devices
- Arc Fault
- Connectors
- Wire position devices
- PV module construction
- Fall protection
- Material hoist
- Line side taps
- Meter socket adapters
- Adhesive selection/testing
- Polymer selection/testing

Program Management
- Scheduling - Gantt chart
- Waterfall and Agile
- Jira/Confluence
- Task tracking
- Critical path analysis
- NPI, ECR/ECO process
- Stage/Phase Gate review

Quality & Reliability
- Failure analysis
- Non-destructive testing
- Root cause analysis
- FMEA
- Design of Experiments (DOE)
- Lifetime distribution modeling
- Warranty analysis
- Reliability forecasting
- Regression analysis
- Accelerated Life Testing (ALT)
- HALT
- Demonstrated Reliability Testing

Testing & Design Validation
- Humidity exposure & freeze
- Thermal cycling
- Water ingress
- Structural testing
- Material characterization
- UV exposure
- Test plans development
- Writing detailed test reports
- Test fixture design
- Data acquisition & analysis

Applications Engineering
- Fit, form, and function testing
- Time and motion analysis
- Ergonomics during installation

Product Development
- Brainstorming
- Technical design tradeoffs
- Innovation in product design
- Patents
- Manufacturing processes
  - Die casting
  - Injection & blow molding
  - Investment casting
  - Extrusion
  - Lamination
  - Machining
  - Roll forming
  - Sheet metal forming
- Machine shop tools
- Prototyping

Codes & Standards
- UL 2703 (former voting member of STP)
  - Fire testing
  - Bonding and grounding
  - Mechanical loading
- ASCE-7, ASCE-49
- Wind tunnel testing
- Wind averaging area
- UL 1703, UL 2703, UL 3703, UL 1741, UL 790, UL 441, UL 486A-B, UL 1897
- ICC AC 13, AC 428, AC 365
- IEC 61215
- MCS 12 (UK)
- NEC, I-Codes
- SEAOC PV-2

RELEVANT EXPERIENCE

Sunfolding, San Francisco, California
Director of Reliability and Testing (2019-2020)

- Developed budget, design, and quotes for new $1M+ state of the art reliability lab.
- Demonstrated reliability test plan development and sample size calculations.
- Helped implement stage gate review process previously lacking in startup environment.
- Managed failure analysis of field issues; oversaw labs conducting GCMS, FTIR, DSC, SEM, and microscopy.
- Reviewed supplier quality data to determine size of quality defect released.
- Conducted design of experiments (DOE) analyses to understand how process parameters affected part reliability.
- Executed regression analysis of dynamic excitation testing to determine damping and natural frequency.
- Performed accelerated Life Testing (ALT) for hydrolysis and heat aging (Peck, Arrhenius).
- Modelled fatigue, pressure, heat, and creep acceleration behavior of polymers using JMP (Norris-Landzberg, Coffin-Manson, Voigt, and Maxwell).
- Modelled lifetime distribution with censored data (Weibull, etc.).
- Forecasted reliability using JMP to determine expected cost estimates in warranty period.

Tesla, San Rafael, California
Manager, Energy Product Testing (2017-2019)

- Directed team of seven engineers conducting electrical, mechanical, chamber aging, custom mechanical load, weathering, waterproofing, and UV exposure testing.
- Collaborated with cross-functional team to brainstorm product concepts, evaluate 3D printed prototypes, and qualify first-article parts and high-volume components.
- Supported reliability team in developing robust test plans and calculating sample sizes to show high degree of reliability of products deployed in harsh environments to last 30+ years.
- Scheduled (MS Project) and prioritized hundreds of tests to efficiently de-risk the launch and rollout of Solar Roof (a building-integrated photovoltaic system comprised of both mechanical and electrical components) in a fast and dynamic environment.
- Compiled and analyzed data from demonstrated reliability, process window, risk mitigation, and quality escape testing.
- Participated in standards development for International Building Code and Underwriters Laboratory (UL). Voting member of the UL 2703 Standards Technical Panel.
- Oversaw R&D testing for first three versions of Solar Roof during product development cycle.
- Oversaw testing that found a critical flaw in product prior to launch, saving Tesla $2M+.

SolarCity, San Rafael, California
Director, Product Testing (2014-2017)

- Supervised team of ten engineers developing Failure Mode Effective Analyses (FMEAs), test plans, and test reports for products from concept qualification to verification of high-volume manufactured parts.
- Coordinated test schedule for over 25 concurrent products in development.
- Oversaw building of 4,000 sq. ft reliability lab with environmental chambers and one of the largest mechanical photovoltaic load testers in the world.
- Developed Failure Mode Effect Analysis (FMEA) training for company of ~12,000 employees.
- Led FMEA and test plans development for a wide variety of products including solar mounting hardware, electrical connectors, and safety anchors for fall protection.
- Member of UL 2730 Task Group for solar racking; co-developed fire testing standard for UL 1703.
- Designed pre-compliance tests to ensure products met codes and standards (UL 1703, UL 2703, UL 486A-B, UL 1897, UL 441, UL 790, UL 1741, MCS 012, ICC AC 365, ICC AC 13).
- Risk analysis using fragility curves – Weibull analyses of load capacity versus wind-induced demand.
- Built design calculator to measure wind load forces on solar array and mounting attachments based off geographic location in compliance with the UK structural standards.

Zep Solar, San Rafael, California
Manager, Test Engineering (2010-2014)

- Led testing of most highly-deployed residential solar product in the United States (300,000+ systems installed).
- Managed team of three engineers performing structural testing of solar mounting attachments in compliance with building codes and UL standards.
- Researched national and international codes and standards to develop product requirements and specifications.
- Oversaw pre-compliance testing to UL standards to ensure successful product certification.
- Designed and built custom mechanical and pneumatic test fixtures and systems.

EDUCATION

Bachelor of Science, Mechanical Engineering
University of California, Santa Barbara

- Graduated with *Honors* and *Distinction in the Major*

Certifications

- Engineer in Training (EIT)

PATENTS

- Atchley, B., et al. East-west photovoltaic array with spaced apart photovoltaic modules for improved aerodynamic efficiency. U.S. Patent 9,548,696. January 17, 2017.

SKILLS

- Project scheduling with Microsoft Project
- Project management and task tracking with Jira, Confluence, Smartsheets and Wrike
- Accelerated Life Testing (ALT), Highly Accelerated Life Test (HALT), and Highly Accelerated Stress Test (HAST)
- Statistical analysis with JMP and Excel
- Failure analysis: tear downs, non-destructive testing, GCMS, FTIR, DSC, SEM, and microscopy
- Test fixture design with Solidworks
- Data acquisition with Labview, Arduino, and Agilent DAQ
- Familiar with use of oscilloscope, DMM, and soldering
- Basic Python programing