

Overview of IEC TS 62941 Guideline for Manufacturing Quality Assurance

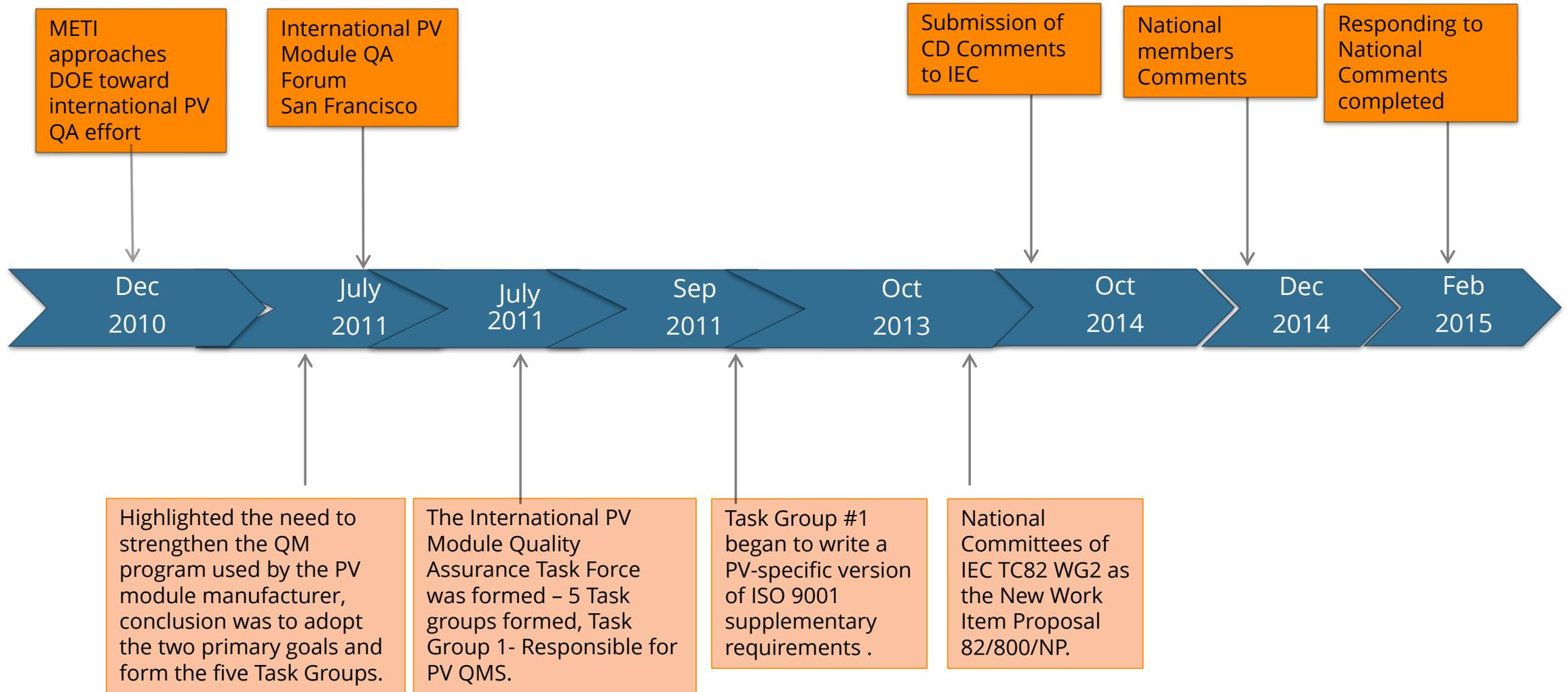
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2015 International PV Quality Assurance Task Force (PVQAT) Workshop

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PV QMS Standard Development Timeline



ISO 9001



IEC TS 62941

		82/875/CD
COMMITTEE DRAFT (CD)		
IEC/TC or SC: TC82	Project number IEC 62941 TS Ed.1	
Title of TC/SC: Solar photovoltaic energy systems	Date of circulation 2014-07-25	Closing date for comments 2014-10-31
Also of interest to the following committees	Supersedes document 82/800/NP, 82/857/RVN	
Proposed horizontal standard <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CD to the TC/SC secretary		
Functions concerned: <input type="checkbox"/> Safety <input type="checkbox"/> EMC <input type="checkbox"/> Environment <input checked="" type="checkbox"/> Quality assurance		
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Title: IEC 62941 TS: Guideline for increased confidence in PV module design qualification and type approval		
(Title) :		
Introductory note This document is based on extensive preparatory work by Task Group 1 of the International PV Quality Assurance Task Force (PVQAT). Comments submitted in response to 82/800/NP (see 82/857/RVN) have all been considered and incorporated into this draft. This draft was also presented and reviewed at the WG 2 meeting in Busan, Korea, on 16-18 June 2014. Establishment of consensus for this document is very important, as it is expected to become the basis for future conformity assessment activities under the IECRE system. National committees are requested to review the draft carefully and provide comments to be addressed during the preparation of the subsequent DTS (final voting stage).		

Supplementary
requirements to
ISO 9001:2008

PV QMS Key Requirements '

- PV module's design to align the expected lifetime
- Product realization that includes appropriate certification, qualification, including both type approval and safety testing
- Product traceability through the entire supply and delivery chain
- Ongoing, periodic monitoring program to ensure consistency of aspects of manufacturing
- Special Process controls
- Power rating tolerance
- Resource Management
- Closed loop learning from field information
- Supplier Management
- Manufacturing and testing
- Process auditing
- Use Statistical methods, sampling

PV QMS Requirement – Design Controls '

- Focus on the organization's control of the PV module's design to align the expected lifetime with its relationship to the organization's warranty
- Controls:
 - Design related records retention policy to support warranty serving
 - Design Failure Mode Effects Analysis (FMEA)
 - Reliability testing, periodic testing, Long term outdoor testing, etc.
 - Lessons learned from previous designs (Closed loop learning)
 - Customer communication- Application notes detailing specific attention and/or care needed

PV QMS Requirements – Process Controls '

- Use of appropriate statistical tools and statistically significant sample sizes to make decisions that affect quality of process and products at all stages of the lifecycle
- Use of appropriate quality engineering tools to build PV modules with consistent quality and reliability
- Controls:
 - Measurement System Analysis (MSA) e.g. Gauge Repeatability & Reproducibility (GR &R) and more
 - Process FMEA
 - Poke Yoke (error proofing)
 - Control Plan
 - Statistical Process Control (SPC)
 - 8D methodology for problem solving

PV QMS – Special Processes '

- Control of Special Processes* (e.g. soldering, lamination)
- Control of processes for ESD protection
- ESD- Electrostatic Discharge (ESD) safe environment at the raw material storage, processing, assembly areas, as appropriate
- Controls:
 - Process qualification, critical controls identification, operator qualifications
 - Software validation
 - ESD Program audit
 - Certification and periodic recertification process for qualified personnel
- *"Where the resulting output cannot be verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent only after the product is in use or the service has been delivered" – ISO 9001:2008.

PV QMS Requirements – Supplier Controls '

- Receiving inspection and/or testing such as statistical sampling based on performance.
- Supplier notify and seek approval when there is any change of products, process, manufacturing location or significant process excursion that may affect form, fit, function, reliability or performance
- Controls:
 - Periodic supplier audits
 - Performance monitoring
 - Traceability requirements
 - Process Change management
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PV QMS Requirements - Reliability '

- An ongoing, periodic monitoring program to ensure consistency of aspects of manufacturing that may affect safety, performance, and reliability
- Controls:
 - Reliability test plan
 - Design and development change control
 - Supplier material change control
 - Control Plan (Manufacturing impact on reliability)
 - Statistically adequate sampling plan
 - Reliability Monitoring Program (RMP)

PV QMS Requirements - Traceability

- Requirement to improve product traceability through the entire supply and delivery chain to enact positive control of the product for recalls and warranty claims
- Controls:
 - Traceability to requirements arising from all previous failure information, customer complaints, competitive analysis, supplier feedback
 - Traceability to design and development changes
 - Traceability at supplier's end for changes made
 - constituent key materials and components
 - lot/batch level
 - Traceable to supplier, date, Mfg. location
 - Traceable to Internal processes, process conditions, equipment
 - Traceable to operators (manual processes)
 - Reworked/repaired products
 - Product traceability information outside of packaging

PV QMS – Resource Management '

- Resources needed to maintain the product warranty system, product reliability measurements, provision of after-sales service
- Succession planning for key functions that affect customer, quality reliability, safety and performance
- Controls:
 - Product warranty database management system
 - Technical support resources
 - Succession planning, periodic review

PV QMS Requirements - Certification '

- A product realization that includes appropriate certification (e.g. IEC qualification, including both type approval and safety testing), a design lifetime that enables alignment with warranty
- Controls:
 - Design FMEA/ Risk assessment
 - Internal/external qualifications
 - External Certification (e.g. IEC/TS 62915)
 - Design Changes that may require certification/recertification
 - Any applicable supplier certifications
 - Reference modules certified/traceable to recognized certification body
 - Warranty modeling
 - Customer return Failure Analysis

PV QMS Requirements – Manufacturing and Testing '

- Manufacturing feasibility at the necessary scale, including risk analysis during contract review
- Out of control process- containment of product and 100% inspection (as appropriate)
- Tests performed on 100% of the products for validation of performance and safety
- Control plan for solar simulators and how they are used in the performance rating of modules
- Controls:
 - Process FMEA
 - Control Plan
 - Measurement System Analysis – uncertainty calculations

PV QMS Requirements - Inputs

- Information incorporated into the requirements of the QMS
- Inputs:
 - Previous failure information database management
 - Customer complaints
 - Competitive analysis
 - Supplier feedback
 - Closed loop learning

PV QMS – Power Rating '

- Assignment of PV module power rating with allowed tolerance including measurement uncertainty
- Controls:
 - Nameplate power of a module with an allowed tolerance at standard test condition
 - Statement of the tolerance of power measurement in the label of the produced module-IEC61215, IEC61646 , or IEC 62108
 - Communication with customer – Power Warranty
 - Control program IEC 60891 and IEC 60904 – Power measurement
 - Determine parameter sets for the acceptance tolerance
 - Determine measurement uncertainty

PV QMS future Possibilities (Brainstorm ideas) '



- Expansion of IEC 62941 audit checklist by asking more rigorous questions (e.g. Special processes)
- PV design, manufacturing and service metrics periodic submission to a vetted third party for analysis and publication of Best in class, top decile, median values (with anonymity- double blind process) for industry benchmarking
- PV QMS extended to suppliers of “key materials” (Similar to PPAP from Automotive industry)
- PV QMS transition to PV IMS “Integrated Management system” to include Environmental, occupation health and safety requirements for PV manufacturing
- Graded approach to PV QMS audit outcome based on maturity levels. Audits go beyond compliance
- Exchange of epidemic failure information by PV technology
- Benchmark QMS practices with other well established industry sectors (e.g. Automotive, Telecom, Aerospace)

References, Bibliography & Acknowledgements '

- **References:**

- ISO 9001:2008 Quality Management System requirements
- IEC TS 62941- Guideline for increased confidence in PV module design qualification and type approval (Draft)
- JIS Q 8901:2012- Terrestrial photovoltaic (PV) modules -- Requirement for reliability assurance system (design, production and product warranty)

- **Bibliography:**

- ISO 19011:2011 Guidelines for auditing management systems
- ISO 9001:2015 Quality Management System requirement (Draft standard)

- **Acknowledgement:**

- Ms. Sarah Kurtz, Reliability Group Manager, Principal Scientist, PhD, National Renewable Energy Laboratory, Golden, CO 80401
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