PV-magazine webinar

Quality assurance in PV module sourcing

October 27th – Jan Vedde

Agenda

- About European Energy
- PV module sourcing – previous focus
- Quality requirements:
  - *Product properties*
  - *Production process*
- Contract negotiation
- Transparency

Focus on Quality Assurance and Quality Control

No commercial issues

No legal/contractual details

EUROPEAN ENERGY

European Energy

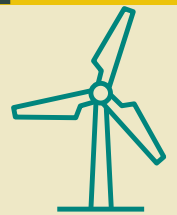
A Danish based energy company…

Business sectors

Solar Power

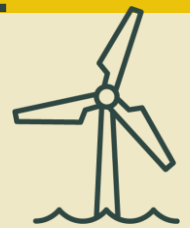
Europe, Americas Australia

Onshore Wind



Europe and Brazil

Offshore Wind

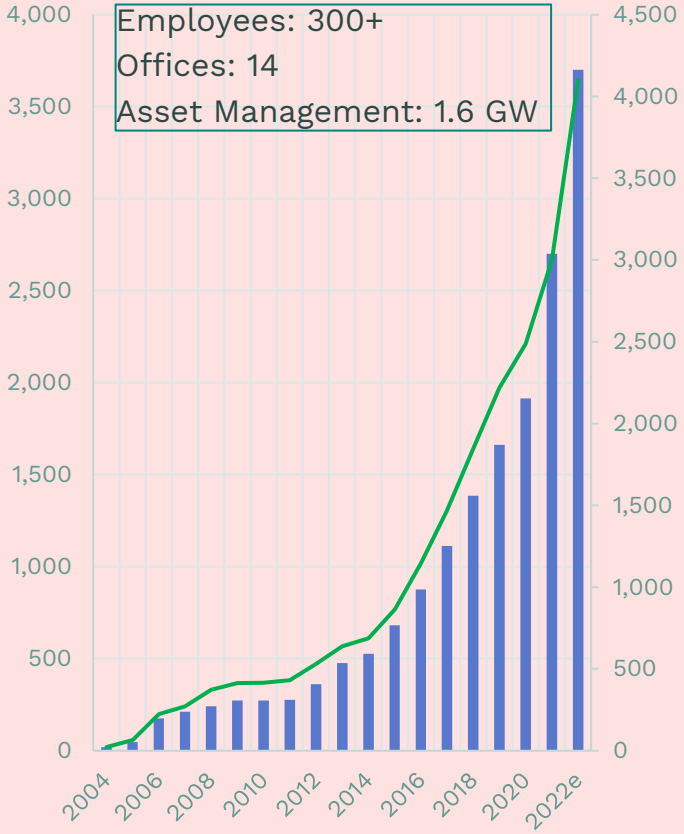


Europe

PtX (e-methanol & heat)

Europe

Business growth



Business model

Greenfield screening → Planning, dialog & permitting → EPC & financing → O&M + AM → Divestment (partly/full) → Ownership & IPP → Power Purchase Agreements (PPA)

Active with PV projects since 2008. Current focus on large format mono-PERC double-glass modules imported from China.

PV module sourcing topics 5-10 years ago…

How did EPC's address their concerns?

- **Does the product carry the required certificates?**

Mitigation: ask for copies of the certificates. Mostly just IEC61215

- **Does the supplier qualify for exemption from the EU Minimum-Import-Price scheme?**

Mitigation: legal status of supplier/importer. Check of shipping and labeling documentation

- **Do we get the power we pay for?**

Mitigation: mobile on-site flash testing

- **Does the module have microcracks?**

Mitigation: samples tested at authorized EL-labs or on-site inspection by IR

- **How to adapt quality requirements to non-standard technologies?**

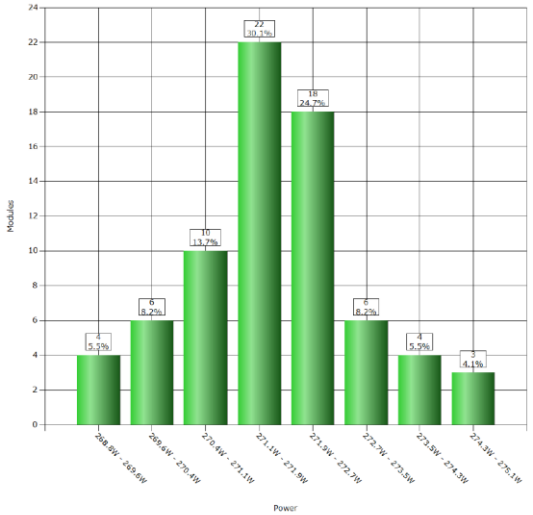
Mitigation: often no adaptation even for thin-films (a-Si, CIGS, CdTe) and EFG-, multi-, castmono-wafers etc.

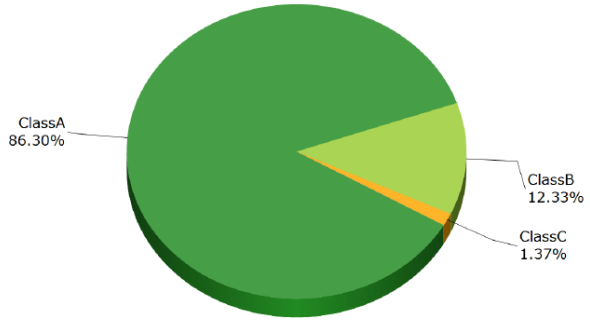
- **How to address LID and PID?**

Mitigation: additional certificates and 3rd party test requested. Insurance backed warranties.

- NOW: **How to cover a full scope Quality Assurance/Quality Control focus?**

Mitigation: Elaborated Quality Assurance chapters included in contract and 3rd party inspection during manufacturing





Number of Modules: 73
Average: 271.8W
Min: 268.8W
Max: 275.1W

		Average	Min	Max
ClassA:	63	271.8W	268.8W	275.1W
ClassB:	9	271.4W	269.6W	274.0W
ClassC:	1	273.7W	273.7W	273.7W
ClassD:	0	-	-	-
NOTSET:	0	-	-	-
Total:	73	271.8W	268.8W	275.1W

Quality focus has shifted from power to defects and manufacturing excellence

Current quality focus: Product parameters

What product features are important?

- **Which standards are relevant?**

Additional snow-load, salt-mist, ammonia, ARC-durability, PID-test, …

(depending on site and project type)

- **What specifications should be strengthened?**

Power tolerance, solder strength, polymer cross-linking, damp-heat, thresher testing, warranty conditions, BOM-compliance/change request

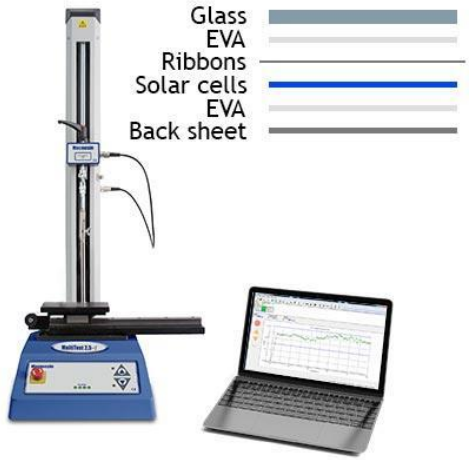
- **Reference to manufacturer SOP**

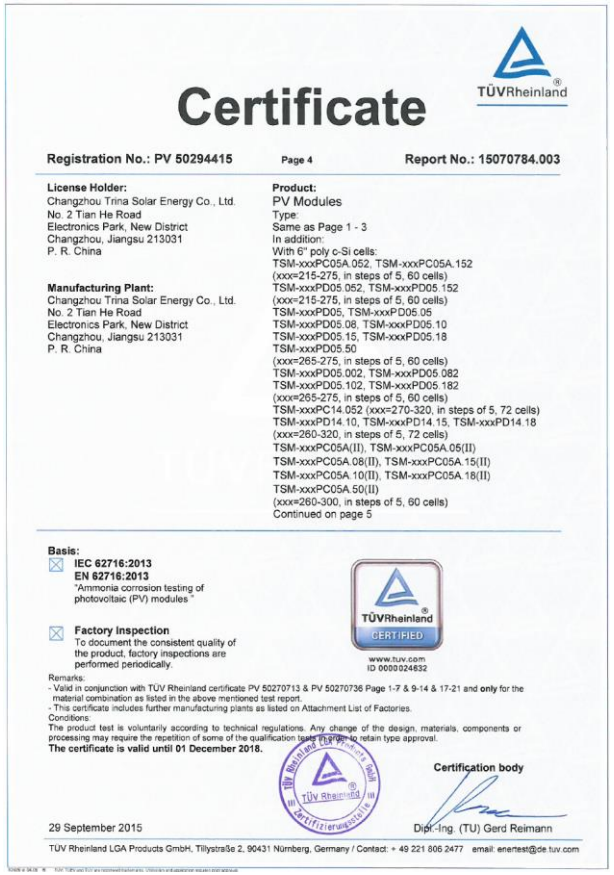
Acceptance/reject criteria for EL-defects, peel-off strength, critical defects for visual inspection, rework/repair

- **Additional inspection & testing**

In-house and/or external inspection of nameplate power, PID and LID susceptibility etc. Based on agreed sampling plan and acceptance criteria.

Access to 3rd party inspection during manufacturing.





Certificate

TÜVRheinland

Registration No.: PV 50294415 Page 4 **Report No.: 15070784.003**

License Holder:
Changzhou Trina Solar Energy Co., Ltd.
No. 2 Tian He Road
Electronics Park, New District
Changzhou, Jiangsu 213031
P. R. China

Manufacturing Plant:
Changzhou Trina Solar Energy Co., Ltd.
No. 2 Tian He Road
Electronics Park, New District
Changzhou, Jiangsu 213031
P. R. China

Product:
PV Modules
Type:
Same as Page 1 - 3
In addition:
With 6" poly c-Si cells:
TSM-xxxPC05A.052, TSM-xxxPC05A.152
(xxx=215-275, in steps of 5, 60 cells)
TSM-xxxPD05.052, TSM-xxxPD05.152
(xxx=215-275, in steps of 5, 60 cells)
TSM-xxxPD05, TSM-xxxPD05.05
TSM-xxxPD05.08, TSM-xxxPD05.10
TSM-xxxPD05.15, TSM-xxxPD05.18
TSM-xxxPD05.50
(xxx=265-275, in steps of 5, 60 cells)
TSM-xxxPD05.002, TSM-xxxPD05.082
TSM-xxxPD05.102, TSM-xxxPD05.182
(xxx=265-275, in steps of 5, 60 cells)
TSM-xxxPC14.052 (xxx=270-320, in steps of 5, 72 cells)
TSM-xxxPD14.10, TSM-xxxPD14.15, TSM-xxxPD14.18
(xxx=260-320, in steps of 5, 72 cells)
TSM-xxxPC05A(II), TSM-xxxPC05A.05(II)
TSM-xxxPC05A.08(II), TSM-xxxPC05A.15(II)
TSM-xxxPC05A.10(II), TSM-xxxPC05A.18(II)
TSM-xxxPC05A.50(II)
(xxx=260-300, in steps of 5, 60 cells)
Continued on page 5

Basis:
☒ **IEC 62716:2013**
EN 62716:2013
"Ammonia corrosion testing of photovoltaic (PV) modules"

☒ **Factory Inspection**
To document the consistent quality of the product, factory inspections are performed periodically.

TÜVRheinland CERTIFIED
www.tuv.com
ID 0000024832

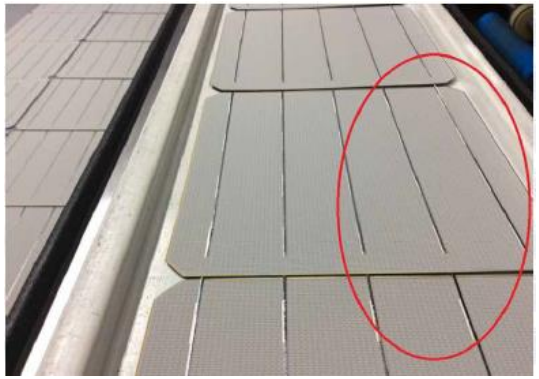
Remarks:
- Valid in conjunction with TÜV Rheinland certificate PV 50270713 & PV 50270736 Page 1-7 & 9-14 & 17-21 and **only** for the material combination as listed in the above mentioned test report.
- This certificate includes further manufacturing plants as listed on Attachment List of Factories.

Conditions:
The product test is voluntarily according to technical regulations. Any change of the design, materials, components or processing may require the repetition of some of the qualification tests in order to retain type approval.
The certificate is valid until 01 December 2018.

Certification body

29 September 2015 Dipl.-Ing. (TU) Gerd Reimann

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg, Germany / Contact: + 49 221 806 2477 email: enertest@de.tuv.com



EUROPEAN ENERGY

Many items to address. The contract must specify the agreed requirements and test methods/acceptance criteria.

Current quality focus: Production facility

Are the manufacturing facility qualified for the intended production?

- **Focus on pre-production audit/qualification**

Mitigation: request ISO 9001, 14001 and OHSAS 18001 certification. Production readiness, Manufacturing excellence, SPC, continuous improvement, training of personnel, etc.

- **Does the facility have in-house approved lab-facilities?**

Calibration and traceability, accredited lab for a few specific tests.

- **In-process inspection**

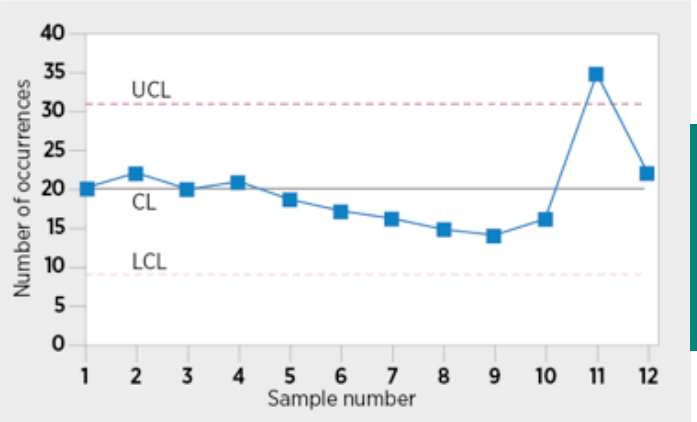
inspection permit and Inspector mandate, non-conformance actions/consequences

- **Pre-shipment inspection**

Rework, In-house and/or external inspection of nameplate power, PID and LID susceptibility etc. agreed sampling plan and acceptance criteria.

Access by 3rd party inspection during manufacturing.

Container Loading Step



Contract must address specific agreed requirements for the manufacturing process and production facility incl. inspection and release/approval/certification of final goods.

Contract negotiation

How do we address all important topics incl those where our own knowledge is insufficient?

- **General conditions**

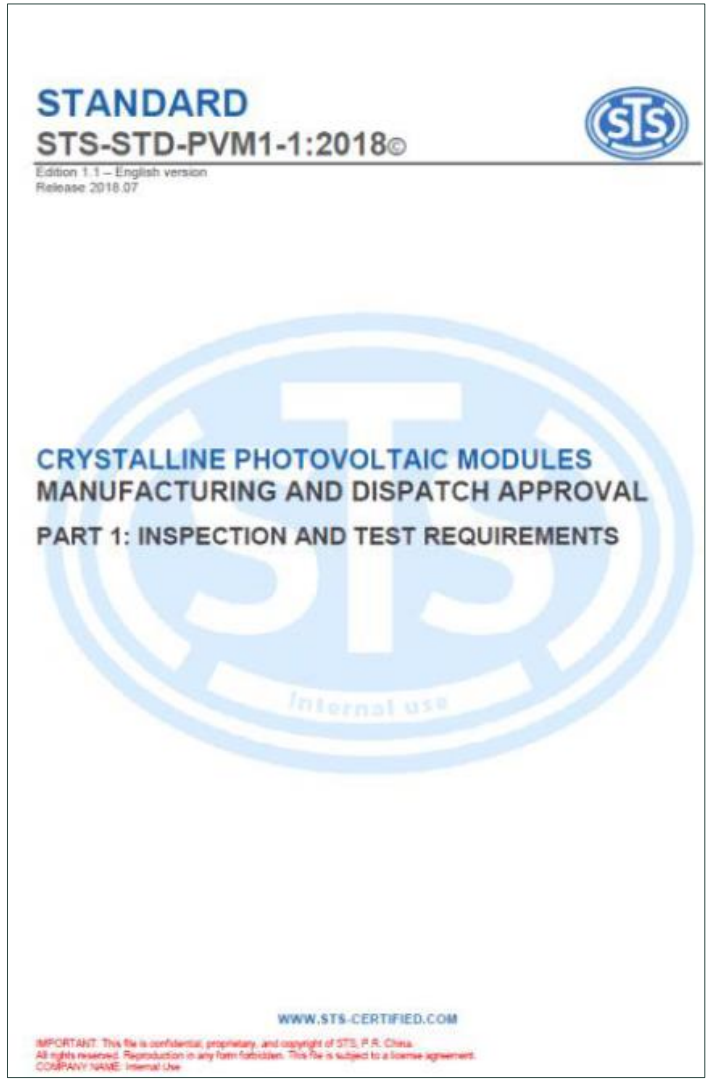
Product specification, BOM, access of 3rd party inspectors, non-conformance actions, sampling procedures must be detailed in the contract

- **Specific details**

Reference to a standard like the STS-STD-PVM1 provide a great framework but does not close the discussion.

The standard may not be accepted in full but will require negotiation of deviations between EPC and supplier.

Negotiations require some insight into PV-module manufacturing processes, manufacturing in general and quality assurance in general



STANDARD

STS-STD-PVM1-1:2018©

Edition 1.1 – English version
Release 2018.07

CRYSTALLINE PHOTOVOLTAIC MODULES
MANUFACTURING AND DISPATCH APPROVAL

PART 1: INSPECTION AND TEST REQUIREMENTS

WWW.STS-CERTIFIED.COM

Lot size		Special inspection levels				General inspection levels		
		S-1	S-2	S-3	S-4	I	II	III
2 to	8	A	A	A	A	A	A	B
9 to	15	A	A	A	A	A	B	C
16 to	25	A	A	B	B	B	C	D
26 to	50	A	B	B	C	C	D	E
51 to	90	B	B	C	C	C	E	F
91 to	150	B	B	C	D	D	F	G
151 to	280	B	C	D	E	E	G	H
281 to	500	B	C	D	E	F	H	J
501 to	1 200	C	C	E	F	G	J	K
1 201 to	3 200	C	D	E	G	H	K	L
3 201 to	10 000	C	D	F	G	J	L	M
10 001 to	35 000	C	D	F	H	K	M	N
35 001 to	150 000	D	E	G	J	L	N	P
150 001 to	500 000	D	E	G	J	M	P	Q
500 001 and over		D	E	H	K	N	Q	R

IPQC.55 Final Testing & Inspection - Ground Continuity Test

As negotiating parties does not know all items, references to a standard like STS-STD-PVM1 is very helpful, even if not all elements will be accepted by the manufacturer.

Transparency – an old topic and new focus area

Does it matter where the manufacturer source materials and parts?

- **Traceability**
  - *Traceability is key to all professional manufacturing systems. MES, inventory management and supplier qualification must be in place.*
  - *Actions and results that ensure environmental sustainability and social responsibility in the full value-chain is required*
  - *Currently transparency is limited when going beyond polysilicon.*
- **Value chain sustainability**

How to ensure that sub-sub-sub-supplier sustainability claims can be assured and guaranteed.

Validation of supply chain assumptions requires a new set of social responsibility criteria, self-assesment surveys and 3rd party verification.

EUROPEAN ENERGY

Manufacturing traceability is important to demonstrate manufacturing excellence but also to ensure environmental sustainability and social responsibility in the sourcing process.

EUROPEAN ENERGY

Jan Vedde
Senior Project Manager
jve@europeanenergy.dk