Solar Keymark Network

Experience exchange circle of test labs and certifiers
working according to the Solar Keymark scheme rules

Minutes
4. Solar Keymark Network Meeting
June 10th, 2008 - Munich

Item 1: Opening of the meeting

The chairman of the Solar Keymark Network, Harald Drück, opened the meeting and welcomed the participants. He thanked Solar Promotion for providing the meeting room and SWT for the catering. As introduction he gave a short explanation about the Solar Keymark Network. The main task of the SK-Network is to agree on uniform procedures between the different institutions (accredited solar thermal test labs, certifiers, inspectors and manufacturers) working according to the Solar Keymark scheme rules.

The meeting took place on Tuesday, June 10th, 2008 from 14.00 till 19:00 hrs at the International Congress Center Munich (ICM), Room 2.160 "Königssee".

The first invitation and the draft agenda of the meeting was sent out by email dated March 22th, 2008. In the following weeks updated versions of the agenda were send out. The latest version of the agenda was send out by email on June 9th, 2008 and named "3. Draft Agenda" (File: SK_NW_AG4C 09/06/2008). Based on remarks from the participants minor modifications were performed. The final agenda that was agreed on at the beginning of the meeting is included as Annex B.

Harald Drück mentioned that the minutes of the 3rd Solar Keymark Network meeting (File: SK_NW_MIN3A.PDF 07/10/2007) sent out by email dated October 7th , 2007 can be considered as approved. This is due to the fact that no objections were mentioned within 3 weeks after sending out the minutes. (Note: At the last meeting held on October 2nd, 2007 it was agreed on that procedure)

Item 2: Introduction of participants

The participants introduced themselves. The list of participants is attached as Annex A.

Item 3: Short presentation of the Solar Keymark II Project

A short presentation about the results of the Solar Keymark II project was given by Jan Erik Nielsen.

The presentation related to this topic is attached as Annex C.

For further information see: www.solarkeymark.org

Item 4: Revised scheme rules

Jan Erik Nielsen mentioned that the existing Solar Keymark scheme rules were revised during the Solar Keymark II project. The resulting draft proposal for new Solar Keymark scheme rules was presented to CCB (CEN Certification Board) in spring this year.

The most important changes are:

- Use of existing / old test reports is not allowed any more (§ 4.4 deleted).
- All tests have to be performed by accredited test labs.
- Possibility for temporary subsidies for operating bodies is extended to 2010.
- Obligatory use of harmonised date sheets and inspection procedures.
- Certification bodies, test labs and inspectors shall be active in the Solar Keymark Network.
- Certification bodies shall collect fees for the Solar Keymark Network.
- License number has to be shown together with Keymark.
- New type and subtype definitions (in accordance with definitions in other scheme rules).

CCB did not accept the new proposal for the definition of types and subtypes. This topic will be discussed again at the next meeting of CCB on September 23rd, 2008.

Since CCB was not willing to accept all changes it was decided by Jan Erik Nielsen to present the “complete package” with all the changes once more to CCB for approval because he wants to avoid that the Solar Keymark scheme rules are changed too often.

Since the new scheme rules were not completely accepted by CCB the original Solar Keymark Scheme rules are still the empowered ones.

In the context of this topic also the aspect originally planed to be treated in item 7 (new definition of types and subtypes) was discussed. Due to the fact that the definition of types and subtypes strongly influences the fees to be paid by the manufacturers it was not possible to find a consensus related to this topic. The most critical aspect in the discussion was that approximately 80 % of the licence fees paid by the manufacturers is going to the national standardisation bodies. According to the opinion of most participants present, Solar Keymark certification is not benefiting from that fact.

It was agreed that Jan Erik Nielsen will prepare a new draft version of the Solar Keymark Scheme rules, also containing a modified definition of types and subtypes, and send this out for commenting by beginning of July 2008. Furthermore he should make a proposal how to finance the Solar Keymark Secretariat and the Solar Keymark Network.

Item 5: Test reference years

With regard to the performance prediction according to EN 12976 it is essential that all labs use the same weather data. In order to ensure this a common procedure was agreed on during the 1st Solar Keymark Network Meeting in June 2006.

Weather data:

It was agreed that with regard to the weather data for specific countries the persons listed below will act as a contact point. On request these persons shall supply weather data that are not protected with any copyright.

Sweden:	Ulrik Petterson (SP)
Germany:	Henner Kerskes (ITW)
Denmark:	Jan Erik Nielsen (SolarKey)
Spain:	Pilar Navarro Rivero (ITC)
Austria:	Josef Buchinger (arsenal)
Greece:	Emmanouil Mathioulakis, Giorgos Panaras (Demokritos)
Italy:	Giacobbe Braccio (ENEA)
Poland:	Stanisław Gołębiowski (ECBREC)
Portugal:	Maria Carvalho (INETI)
France:	Dominique Caccavelli (CSTB)
Switzerland:	Sebastian Laipple (SPF)

Up to June 2008 check-sum figures for the following weather data have been sent to Harald Drück.

Sweden:	Stockholm 1996-2005
Germany:	Würzburg
Denmark:	Copenhagen
Austria:	Vienna, Graz
Greece:	Athens
Italy:	Rome, Catania
Poland:	Warsaw
Portugal:	Porto, Lisboa, Faro
Switzerland:	Sebastian Laipple

Note: The list with the check sum figures is attached as Annex D.

Harald Drück pointed out the importance of this activity and reminded the participants to send him the missing check-sum figures for their weather data.
New deadline: July 31st, 2008.

Item 6: Flexible Solar Keymark certification

Related to this Jan Erik Nielsen presented the following approach:

A: DWHScale: The software tool prepared by ITW with the Solar Keymark II project. The tool is at present only available for thermosiphon systems and one location and three daily loads.

B: System test according to EN 12976 combined with component calculation procedure acc. CEN/TS 12977.

C: System test according to DST procedure (EN 12976) combined with extrapolation procedure by using the DST software. This approach is already used in The Netherlands.

D: System testing and fitting parameter(s) in EN 1636-4-3 (the EBPD method). This approach will most probably be used for Eco-Labelling / Energy Labelling

Further information related to the different approaches can be found in Annex E.

The different approaches were discussed and it was decided that the most promising approach is “D”. Participants from ISE, INETI, ITW and SPF are interested in investigating the method based on already existing system test results. Bouzid Khebchache offered to co-ordinate the activities related to this and to prepare a short report on the outcome. The aim is to have this short report with the results presented by Bouzid until the end of July 2008.

Item 7: New definitions of types and subtypes

This subject was already discussed in the context of item 5.

Item 8: Presentation of the energy output calculation tool for collectors

Ulrik Petterson gave a presentation about the output calculation tool for collectors developed by SP. This presentation is attached as Annex F.
The calculation tool is based on Microsoft Excel.

The tool was discussed by the participants and some proposals for improvements were made.

It was agreed that the remarks from the participants during this meeting will be incorporated by Ulrik Petterson. The modified version will be send out by Ulrik Petterson for commenting by the end of September 2008. In this context it is especially essential that in addition to the locations of Würzburg and Stockholm the results obtained for all other locations implemented in the tool are validated.

It was agreed that after a successful validation the tool should be integrated in the Solar Keymark scheme rules.

Item 9: Financing of the Secretariat of the Solar Keymark Network

This subject was already discussed in the context of item 5.

Item 10: Data sheets (collectors & systems) and publication of test results

Jan Erik Nielsen presented the new harmonised data sheet for **collectors** that were elaborated within the Solar Keymark II project.
With regard to **systems** there is no harmonised data sheet available up to now. Jan Erik will send out a further elaborated draft and ask for comments.

The new data sheets are available via http://www.estif.org/solarkeymark/schemerules.php

Item 11: Illegal use of Solar Keymark labels

Rob Meesters reported about his visit in spring this year of a fair in Italy. He had the impression that there were Solar Keymark label presented on products that are not certified according to the Solar Keymark scheme rules. This is especially relevant for OEM products.

Sören Scholz mentioned that from July 2006 until now 7 misuses of Solar Keymark were registered. 5 of them are already solved. In order to try to avoid such problems in the future DIN CERTCO informed their customers by a mailing.

The kind of misuse are according to Sören Scholz:
– Using the Solar Keymark without certifcation
– Using of Solar Keymark by OEM customers without certification
– Wrong use of mark and / or registration number.

João Santos (Certif) and Premoli Pierluigi (ICM) as representatives from certifiers were not confronted with any misuse of Solar Keymark up to now. However Premoli Pierluigi reported about the misuse of the CE-mark.

It was agreed that Sören Scholz will send the certification procedure for OEM customers to the Solar Keymark Network. The participants of the Solar Keymark should use this procedure as a basis to deliver more detailed information to their customers. In addition to this it was agreed that Jan Erik should forward this information to ESTIF in order to be distributed to the members of ESTIF.

In case that the problem can not solved in this way, Mr. Hoang Liauw (email: hoang.Liauw@cen.eu) form CEN should be contacted and CEN will take legal action.

Item 12: Difference between nominal & actual store volume / capacity

Due to the fact that Rob Meesters had to leave the meeting before the discussion came to this topic, the subject will be discussed at the next meeting.

Item 13: Definition of vacuum tubular collector families

Based on an email send out by Maria João Carvalho dated 09.06.2008 10:30 the topic to be discussed is described as follows

> “In the Solar Keymark rules we have the definition of collector type (family) that allows performing a complete test of the largest collector and an efficiency test of the smallest collector, if the only difference is lengths and/or widths.
>
> In the case of vacuum tubular collectors this means that the family can have a different number of tubes.
>
> The question is: Can we consider tubes also with different diameter if everything else is similar, e.g. manifold height is the same?

The topic was discussed and it was agreed that vacuum tubular collectors with different diameter do not belong to the same collector family.

Item 14: Relevance of high temperature resistance test of solar collectors according to EN 12975-2, chapter 5.3 and exposure test according to chapter 5.4

João Santos mentioned that he received an application for Solar Keymark certification of a collector that is designed to avoid stagnation conditions.

Barry Johnston named this type of collector permanently wet collector (PCW) and gave a presentation related to this type of collectors. This presentation is attached as Annex G.

The participants present discussed if it is possible to certify such a collector according to the Solar Keymark scheme rules even if not all tests required for Solar Keymark certification were successfully passed. The discussion did not result in a consensus.

Item 15: New “Solar Keymark Project”

Josef Buchinger presented the outline of a Solar Keymark II follow-up project named “ Quality assurance in solar thermal heating and cooling technology – keeping track with recent developments (QAiST)”.

It was decided that the preparation of the proposal will be discussed separately directly after this Solar Keymark Network meeting by the potential participants.

Item 16: Any other business

No any other business.

Item 17: Date and place of next meeting

It was decided that the next Solar Keymark Network Meeting will take place on

October 1st, 2008; 12:00 hrs - October 2nd, 2008; 13:00 hrs
at the Renewable Energy House in Brussels

The spring 2009 meeting is scheduled March 23rd 14:00 hrs to 24th 13:00 hrs

Item 18: End of meeting

Harald Drück thanked the participants for attending the meeting and for their constructive contributions. He closed the meeting at 19:50 hrs.

The minutes were prepared by Harald Drück (Chairman of the Solar Keymark Network) Stuttgart, September 3rd, 2008.

Contact address:
Harald Drück
ITW, Stuttgart University
Pfaffenwaldring 6
70550 Stuttgart, Germany
Email: **drueck@itw.uni-stuttgart.de**

Annex A: List of participants

SOLAR KEYMARK NETWORK

4th MEETING, MUNICH JUNE 10TH 2008

NAME	ORGANISATION
Premoli Pierluigi	ICIM (Italy)
Josef Buchinger	arsenal (Austria)
Jan Erik Nielsen	SolarKey (Denmark)
Andreas Bohren	SPF (Switzerland)
Bouzid Khebchache	CSTB (France)
Maria Carvalho	INETI (Portugal)
Sören Scholz	DINCERTCO (Germany)
Vinod Sharma	ENEA (Italy)
João Santos	CERTIF (Portugal)
Sebastian Laipple	SPF
Peter Kovacs	SP (Sweden)
Ulrik Pettersson	SP (Sweden)

Stephan Fischer	ITW (Germany)
Harald Drück	ITW (Germany)
Claudia Haaf	ITW (Germany)
Hoang Liauw	CEN
Korbinian Kramer	ISE (Germany)
Alberto Garcia de Jalon	Cener (Spain)
Fabienne Salaberry	Cener (Spain)
María Ezcurra	Cener (Spain)
Julien Heintz	CETIAT (France)
Nele Rumler	ISFH (Germany)
Rob Meesters	Solahart
Danjana Theis	IZES
Christian Buchbauer	Bramac
Ulrich Fritzsche	TÜV Rheinland, Germany
Patrick Davis	Kingspan Renewables Ltd.

Barry Johnston	Solar Twin (UK)
Leendert van der Marel	Kiwa Gastec (NL)
Bruce Kemmis	Solahart (Australia)
Matthias Rommel	ISE (Germany)
Nadine Hanke	Schüco International (Germany)
Roland Sterrer	arsenal research (Austria)

Annex B: Final agenda

Solar Keymark Network

Experience exchange circle of test labs and certifiers
working according to the Solar Keymark scheme rules

4. Solar Keymark Network Meeting

Tuesday, June 10th, 2008 14:00 - 18:00 hrs

Munich, Germany – ICM, Room 2.160 “Königssee”

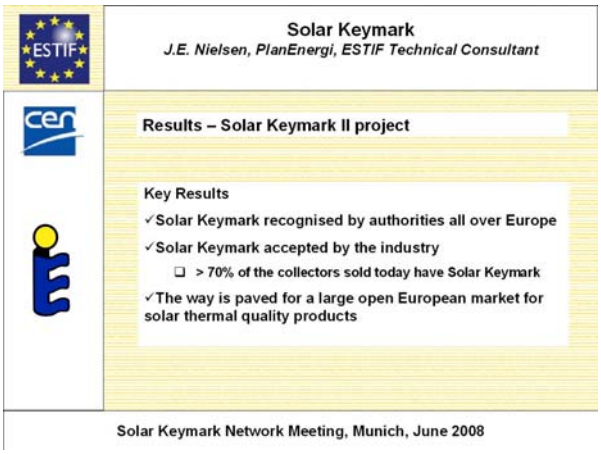
for details see: www.icm-muenchen.de

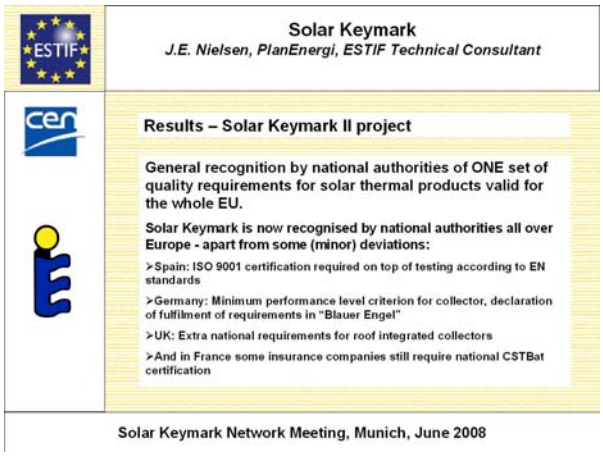
Final Agenda

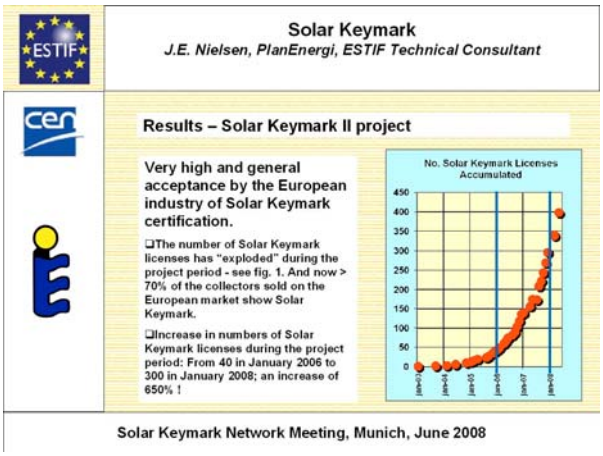
Item	Content
1	Opening of the meeting (HD)
2	Introduction of participants (HD)
3	Short presentation of the results of the Solar Keymark II Project (JEN)
4	Revised scheme rules (JEN)
5	Test reference years for performance prediction acc. to EN 12976 (HD)
6	Flexible Solar Keymark certification for factory made systems (JEN)
7	New definitions of types and subtypes (JEN)
8	Presentation of the energy output calculation tool for collectors *Who from SP can do this?*
9	Financing of the Secretariat of the Solar Keymark Network (JEN)
10	Data sheets (collectors & systems) and publication of test results (JEN)
11	Illegal use of Solar Keymark labels (Rob Meesters and certification bodies)
12	Difference between nominal & actual store volume / capacity (R. Meesters)
13	Definition of vacuum tubular collector families (Maria João Carvalho)
14	Relevance of High temperature resistance test of solar collectors according to EN 12975-2, chapter 5.3 and exposure test according to chapter 5.4 (João Santos, Barry Johnston)
15	New “Solar Keymark Project” (Fabienne Sallaberry, Josef Buchinger)
16	Any other business (HD)
17	Date and place of next meeting(s) (HD)
18	End of meeting (HD)

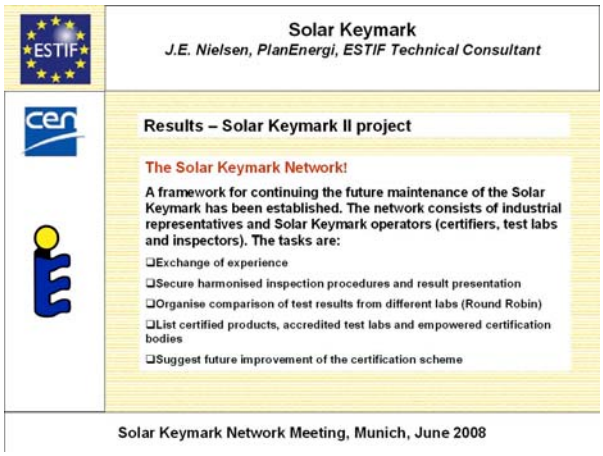
JEN: Jan Erik Nielsen, PlanEnergi, ESTIF Technical Consultant

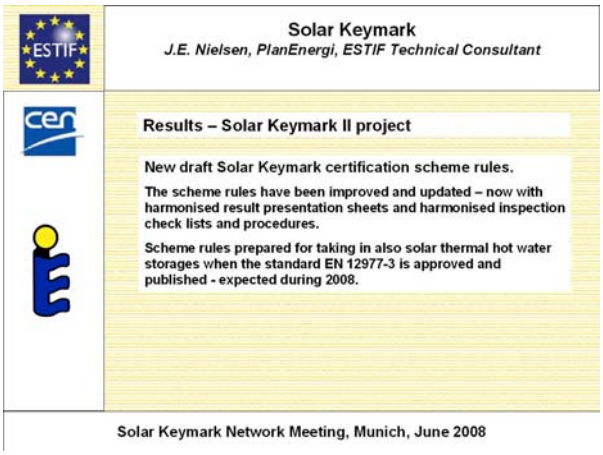
Annex C:
Presentation of results of the Solar Keymark II Project

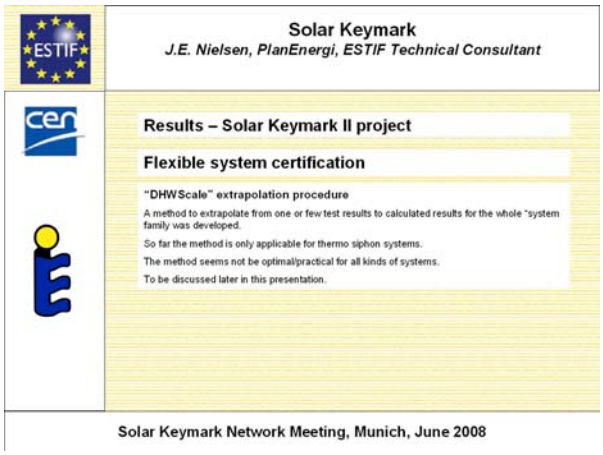












Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant

Results – Solar Keymark II project

EPBD calculation standard: EN 15316-4-3

- Simple tool made in the SKII project: SOLEN
- ftp://ftp.cstb.fr/SOLARKEYMARK II

Solar Keymark Network Meeting, Munich, June 2008

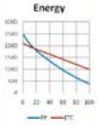
Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant

Results – Solar Keymark II project

Improved standards & test methods proposed & recommended to CEN TC312.

✓Improved test methods, especially concerning evacuated tube collectors have been developed.

✓A new general and simple method estimating the annual output of a collector based on the collector test results only – a related simple software tool. The method/procedure is proposed to be included in the next version of EN 12975 – presentation of results could be like shown in table below:



Collector mean temperature [°C]		10	30	50	70	90
Annual Collector Output [kWh]	Athens	...	...	...	...	...
	Davos	...	...	...	...	...
	Stockholm	...	...	...	...	...
	Würtzburg	2093	1574	1166	809	511
	Optional location 1	...	...	...	...	...
	Optional location 2	...	...	...	...	...
	...	...	...	...	...	...

Solar Keymark Network Meeting, Munich, June 2008

Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant

Results – Solar Keymark II project

Very large export activities in the solar thermal sector

Solar Keymark Network Meeting, Munich, June 2008

Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant

Results – Solar Keymark II project

Solar Keymark for systems is - so far - not very popular

➢Solar Keymark is by far most popular for solar collectors

➢Only a very small number of solar systems show the Keymark – stagnation

Reason:

➢Keymarking of systems is rather costly as each system configuration has to be tested and certified

Solar Keymark Network Meeting, Munich, June 2008

Annex D: Test reference years – check sums

In the following the check sums for specific test reference years are listed. Theses check sums were determined according the procedure agreed on during the 1st Solar Keymark Network Meeting in June 2006.

Austria **Location Vienna**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	448	0.0	662919
diffuse radiation (on 45° tilt angle) [W/m^2]	730	0.0	444514
ambient temperature [°C]	31.5	-9.7	94327.2
wind speed (optional) [m/s]	13.4	0,0	27141.6
Contact: Josef Buchinger (email: Josef.Buchinger@arsenal.ac.at)			

Austria **Location Graz**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	463	0.0	659403
diffuse radiation (on 45° tilt angle) [W/m^2]	806	0.0	483336
ambient temperature [°C]	29.0	-14.8	71201.3
wind speed (optional) [m/s]	14.9	0.0	13159.5
Contact: Josef Buchinger (email: Josef.Buchinger@arsenal.ac.at)			

Greece **Location Athens**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	805	0.0	896210
diffuse radiation on 45° tilt angle) [W/m^2]	456	0.0	822104
ambient temperature [°C]	36.9	1.7	161979
wind speed (optional) [m/s]	19.7	0.0	40218
Contact: Giorgos Panaras (email: petpan@mail.ntua.gr)			

Poland **Location Warsaw**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	503.2	0.0	308798.0
diffuse radiation on 45° tilt angle) [W/m^2]	389.8	0.0	629439.4
ambient temperature [°C]	28.0	-7.5	68109.8
wind speed (optional) [m/s]	7.8	0.0	22252.5
Contact: Stanisław Gołębiowski (email: sgolebiowski@ecbrec.pl)			

Portugal **Location Porto**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	943.6	0.0	1010849.6
diffuse radiation on 45° tilt angle) [W/m^2]	423.9	0.0	586284.6
ambient temperature [°C]	32.9	-0.3	119676.7
wind speed (optional) [m/s]	-	-	-
Contact: Maria Carvalho (email: mjoao.carvalho@ineti.pt)			

Portugal **Location Lisboa**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	946.8	0.0	1130822.2
diffuse radiation on 45° tilt angle) [W/m^2]	421.5	0.0	582399.5
ambient temperature [°C]	35.4	1.7	144875.8
wind speed (optional) [m/s]	-	-	-
Contact: Maria Carvalho (email: mjoao.carvalho@ineti.pt)			

Portugal **Location Faro**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	961.5	0.0	1394718.7
diffuse radiation on 45° tilt angle) [W/m^2]	393.0	0.0	510632.9
ambient temperature [°C]	36.2	3.4	153112.3
wind speed (optional) [m/s]	-	-	-
Contact: Maria Carvalho (email: mjoao.carvalho@ineti.pt)			

Germany **Location Würzburg**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	763	0.0	667215.1
diffuse radiation on 45° tilt angle) [W/m^2]	383	0.0	562373,1
ambient temperature [°C]	32.6	-16.9	78744.7
wind speed (optional) [m/s]	23	0,0	26824.7
Contact: Henner Kerskes (email: kerskes@itw.uni-stuttgart.de)			

Italy **Location Rome**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	951	0.0	1096410.0
diffuse radiation on 45° tilt angle) [W/m^2]	486	0.0	517475.0
ambient temperature [°C]	38.2	-2.3	135506.0
wind speed (optional) [m/s]	-	-	-
Contact: Giacobbe Braccio (email: braccio@trisaia.enea.it)			

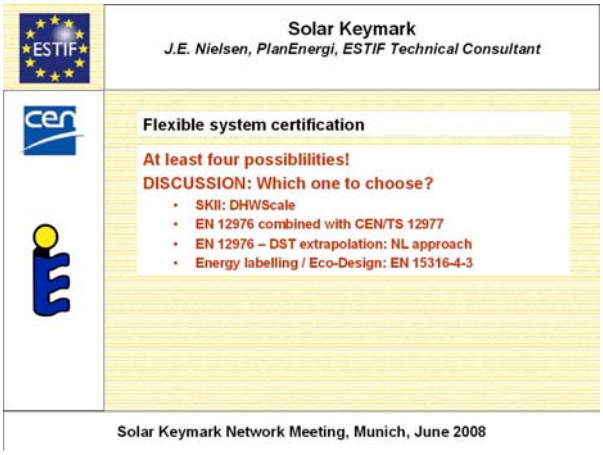
Italy **Location Catania**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	1011	0.0	1306251.0
diffuse radiation on 45° tilt angle) [W/m^2]	478	0.0	490209.0
ambient temperature [°C]	39.8	2.8	159218.0
wind speed (optional) [m/s]	9.8	0.0	21133.0
Contact: Giacobbe Braccio (email: braccio@trisaia.enea.it)			

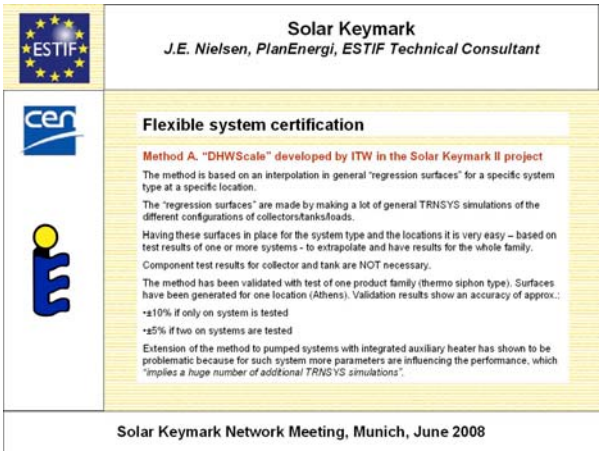
Denmark **Location Copenhagen** **(Long.:12.34°; Lat.: 55.43°; Alt.: 19 m)**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	926	0.0	611375.0
diffuse radiation on 45° tilt angle) [W/m^2]	423	0.0	577580.0
ambient temperature [°C]	26.1	-10.2	69785.3
wind speed (optional) [m/s]	19.5	0.1	49889.4
Contact: Jan Erik Nielsen (email: jen@planenergi.dk)			

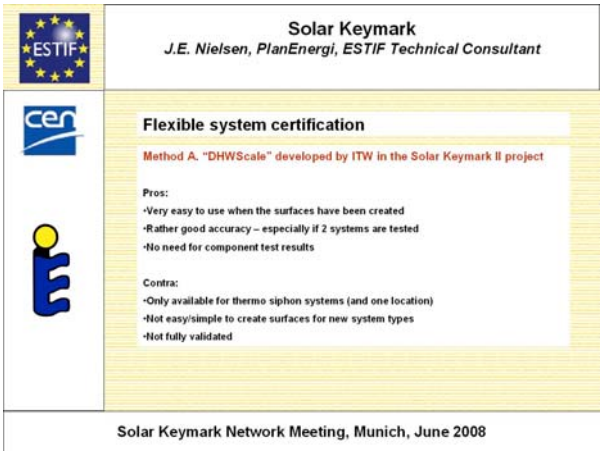
Sweden **Location Stockholm 1996-2005**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	933	0.0	693756.0
diffuse radiation on 45° tilt angle) [W/m^2]	423	0.0	534174.0
ambient temperature [°C]	30.3	-18.2	66011.0
wind speed (optional) [m/s]	-	-	-
Contact: Ulrik Pettersson (email: ulrik.pettersson@sp.se)			

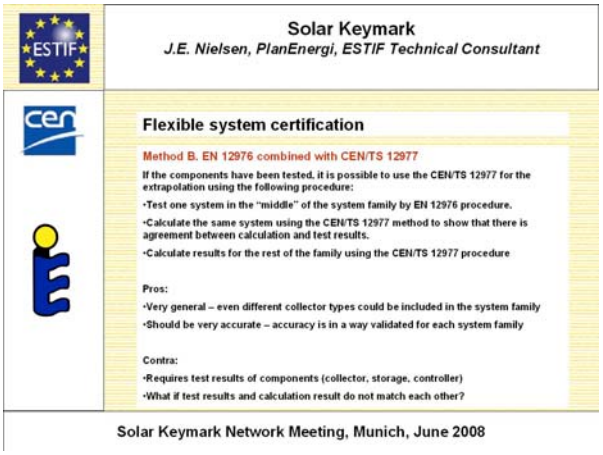
Switzerland **Location Davos**	maximum value	minimum value	sum over the year
direct radiation (on 45° tilt angle) [W/m^2]	1060	0.0	1000788
diffuse radiation on 45° tilt angle) [W/m^2]	406	0.0	682810.0
ambient temperature [°C]	27.8	-26.5	28200.5
wind speed (optional) [m/s]	10.9	0.0	20569.4
Contact: Sebastian Laipple			

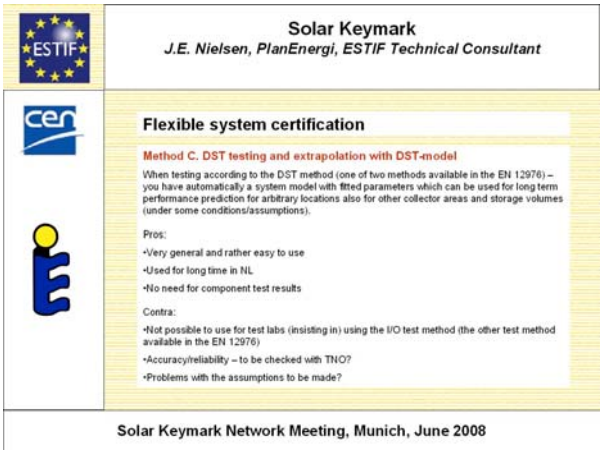
Annex E:
Flexible Solar Keymark Certification

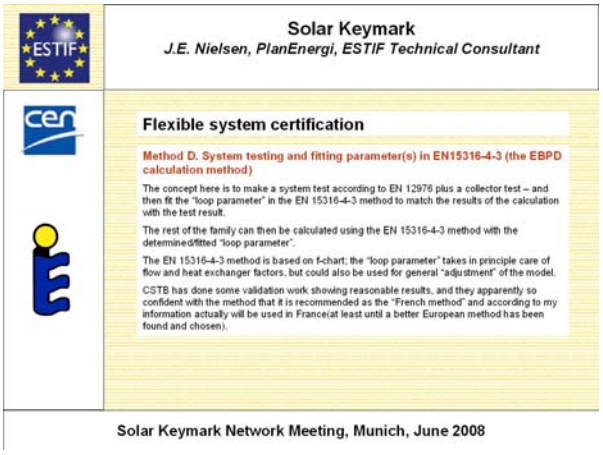


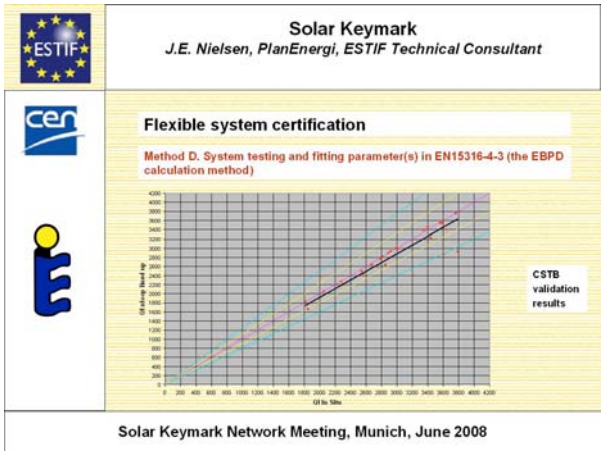


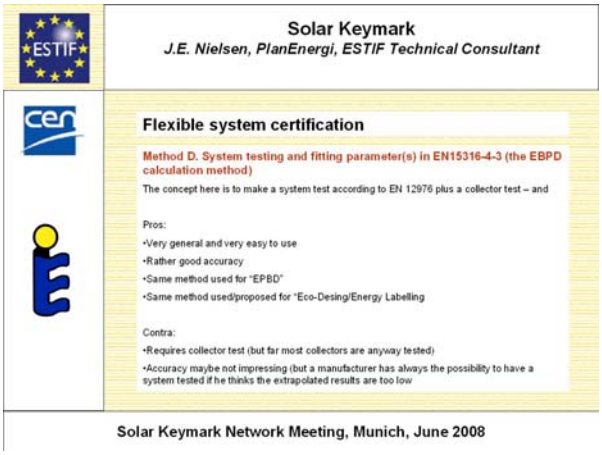


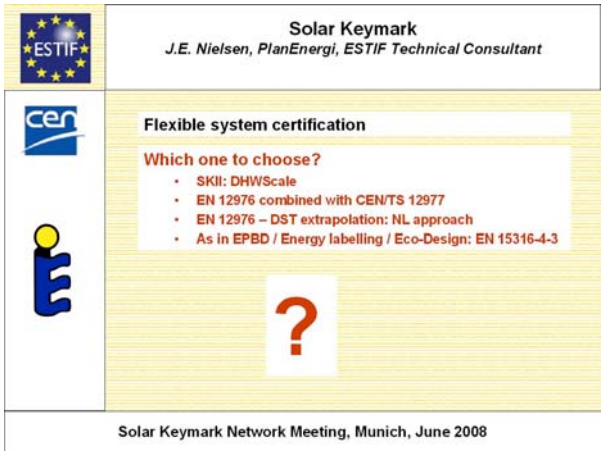







Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant
Flexible system certification
Method D. System testing and fitting parameter(s) in EN15316-4-3 (the EBPD calculation method)
CSTB validation results
Solar Keymark Network Meeting, Munich, June 2008


Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant
Flexible system certification
Method D. System testing and fitting parameter(s) in EN15316-4-3 (the EBPD calculation method)
The concept here is to make a system test according to EN 12976 plus a collector test – and
Pros:
•Very general and very easy to use
•Rather good accuracy
•Same method used for "EPBD"
•Same method used/proposed for "Eco-Desing/Energy Labelling
Contra:
•Requires collector test (but far most collectors are anyway tested)
•Accuracy maybe not impressing (but a manufacturer has always the possibility to have a system tested if he thinks the extrapolated results are too low
Solar Keymark Network Meeting, Munich, June 2008


Solar Keymark
J.E. Nielsen, PlanEnergi, ESTIF Technical Consultant
Flexible system certification
Which one to choose?
SKII: DHWScale
EN 12976 combined with CEN/TS 12977
EN 12976 – DST extrapolation: NL approach
As in EPBD / Energy labelling / Eco-Design: EN 15316-4-3
?
Solar Keymark Network Meeting, Munich, June 2008

Annex F:
Energy output calculation tool for collectors

Energy output calculation tool for collectors

The aim for the development of the tool was:

•Should be a part of EN 12975 as an informative annex

•Easy to perform but enough sophisticated to take into account specific features of most common collectors in the market

•Based on weather data from 4 reference locations in Europe

•Relating to the standard for EPBD ? (EN 15316)

•Relating to the procedure for m2 to kWh conversion and IEA world statistics ?

SP Technical Research Institute of Sweden

Energy output calculation tool for collectors

The equation:

$Q/Aa = \eta_0 * K\theta_{(\theta)} * G_b + \eta_0 * K\theta_d * G_d - a_1(t_m - t_a) - a_2(t_m - t_a)^2$ [kWh/m²]

Where $\eta_0 = F'(\tau\alpha)_{en} * K\theta_b(\theta=15) * 0.85 + F'(\tau\alpha)_{en} * K\theta_d * 0.15$

(compare to eq. 32 in EN 12975-2 but without c_3, c_4, c_5, c_6 i.e. no wind, sky temperature or thermal capacity dependence)

SP Technical Research Institute of Sweden

Energy output calculation tool for collectors

The weather:

•Locations: Athens, Davos, Stockholm and Wurzburg. It is possible for the user to add more locations.

•The azimuth is fixed to south and at tilt 0, 30, 45, 60 or 90 degrees

•All weather data from METEONORM Version 6.0

SP Technical Research Institute of Sweden

Energy output calculation tool for collectors

The inputs:

•Collector: *η_0 (weighted as 85% beam (at θ=15°) and 15% diffuse), a_1, a_2 and $K\theta_d$*

•IAM type: Simple, one direction (e.g. flat plate collector)

Simple, two directions (e.g. flat plate collector with dependence in two directions and some collectors with reflectors)

User defined: multi axially, four directions, east-west and upper-lower side of collector, every 10 degrees (e.g. vacuum tubes and some collectors with reflectors)

•Both types of simple IAM is based on $K\theta_{b(\theta)} = 1 - b0 * (1/\cos(\theta) - 1)$ (eq. 33 in EN 12975)

•Desired collector mean temperature

SP Technical Research Institute of Sweden

Energy output calculation tool for collectors

The output sheet:

•Monthly and annual irradiance [kWh/m²]

•Monthly and annual energy output per m² at desired collector mean temperatures [kWh/m²,apertur]

•Collector information entered by the user

•Location, longitude, latitude and time period for the climate data

SP Technical Research Institute of Sweden

Energy output calculation tool for collectors

Effects in not using c_3, c_4, c_5, c_6:

•Wind dependence (c_3 and c_6): (wind is available in Meteonorm)	Flat plate collector: About 5-15% lower energy output with wind dependence
	Vacuum tubes: approx none
•Sky temperature (c_4): (is possible to add)	The Excel-sheet is not suitable for unglazed collectors
•Thermal capacitance (c_5): (is possible to add?)	Flat plate collector: About 1% lower energy output without c_5
	Vacuum tubes: About 15 % lower output for a mean temperature at 50 degrees when MCe=50 kJ/K/m² (high value)

SP Technical Research Institute of Sweden

Energy output calculation tool for collectors

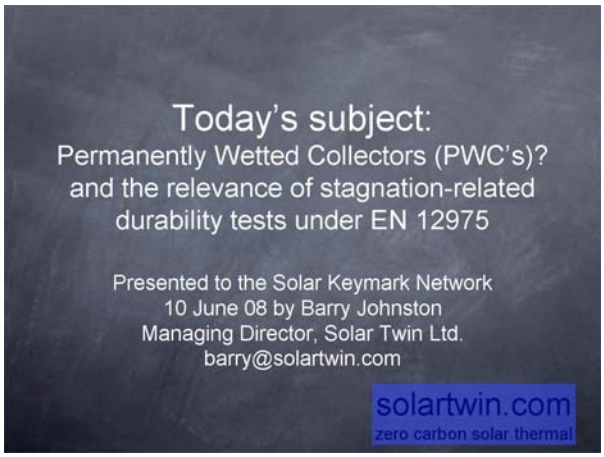
The Excel-sheet compared to other calculation tools:

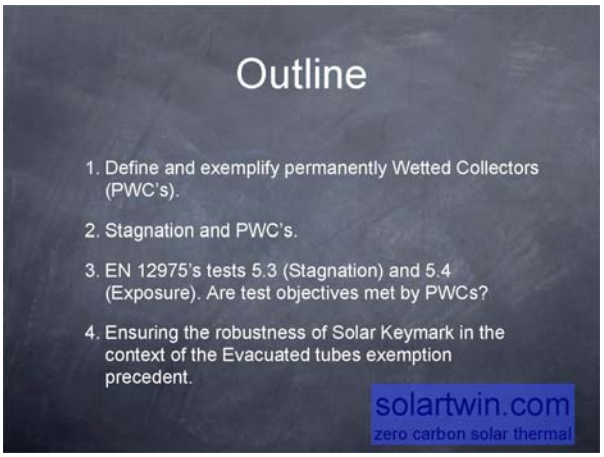
(Stockholm, south, tilt 45 degrees, mean temperature in collector: 25 to 75ºC. The output has been adjusted regarding to differences in global irradiance and ambient temperature. No wind or thermal capacitance)

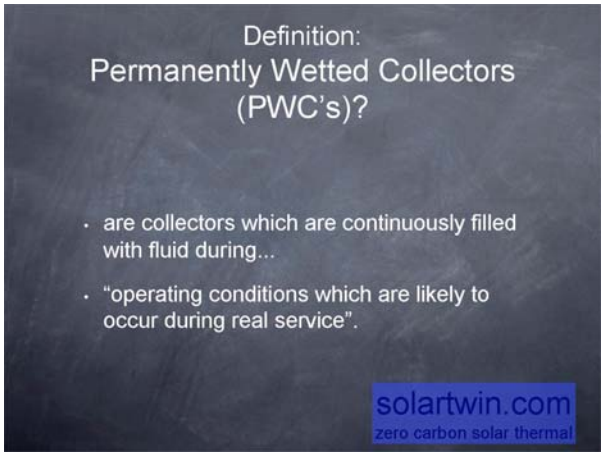
•Polysun 3.3:	Flat plate collector:	± 1 %
	Vacuum tubes (cyl.abs.):	up to +10 % at 75ºC (Excel gives higher output)
•Minsun:	Flat plate collector :	up to +4 % at 75ºC (Excel gives higher output)
	Vacuum tubes (cyl.abs.):	up to +10 % at 75ºC (Excel gives higher output)

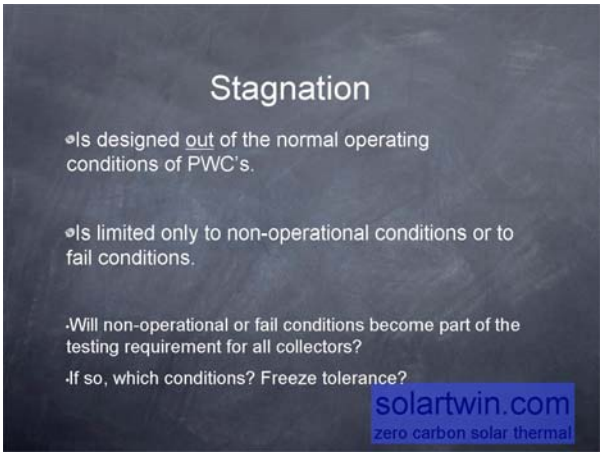
SP Technical Research Institute of Sweden

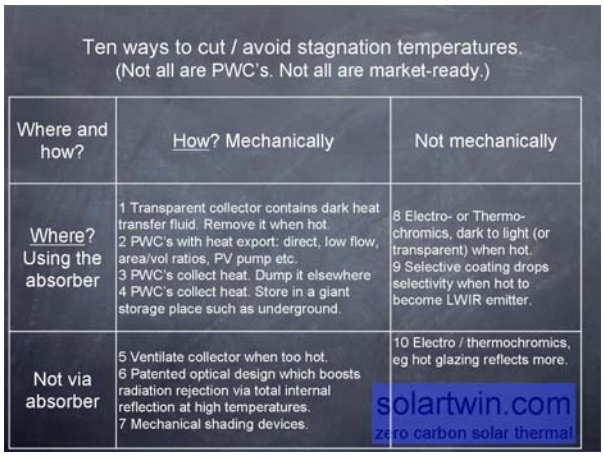
Annex G:
Presentation related to permanently wet collectors (PCW)

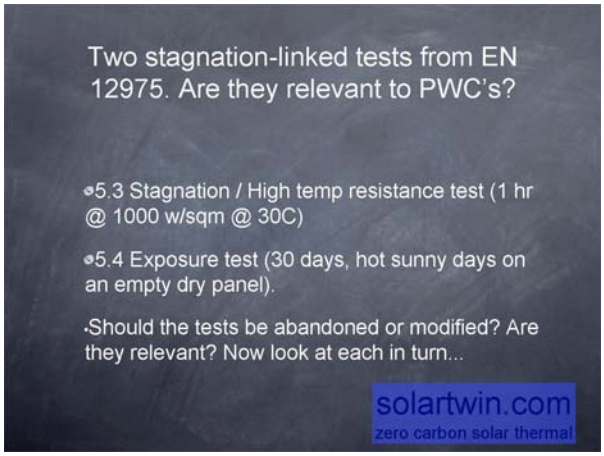


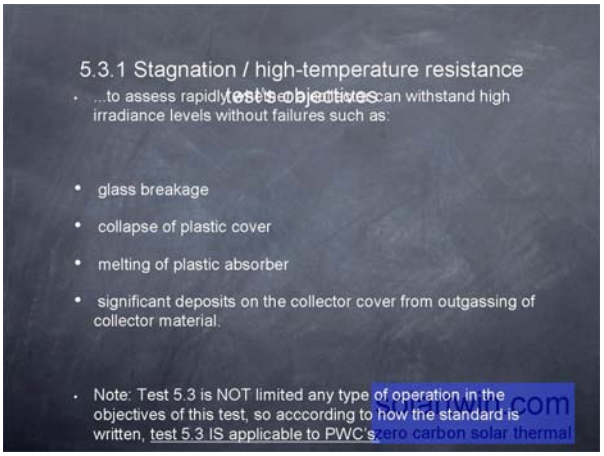


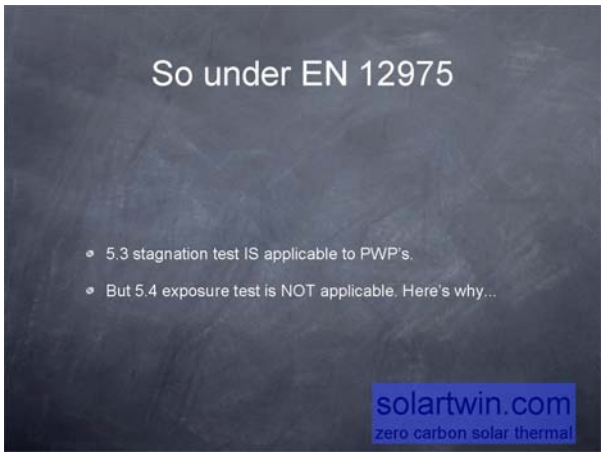


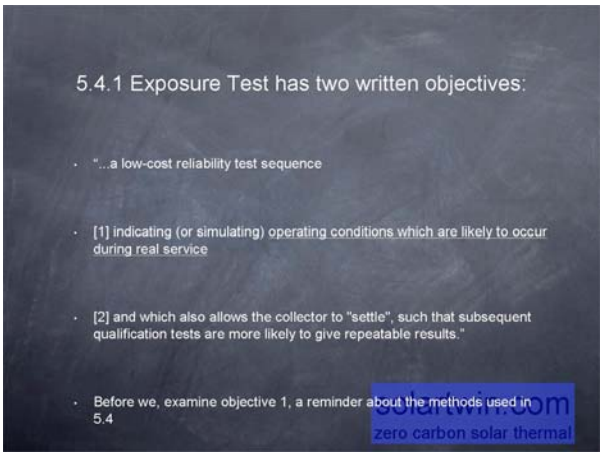


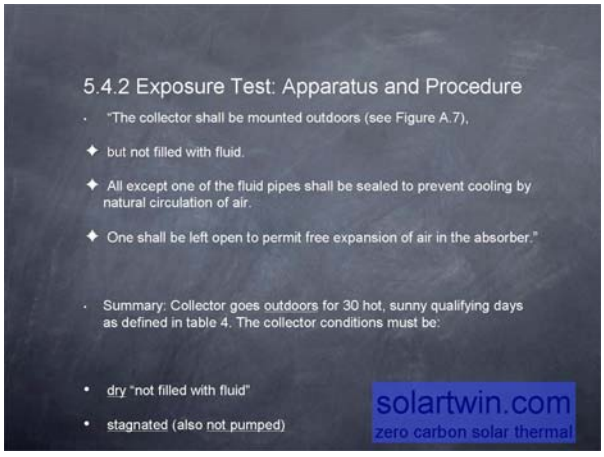


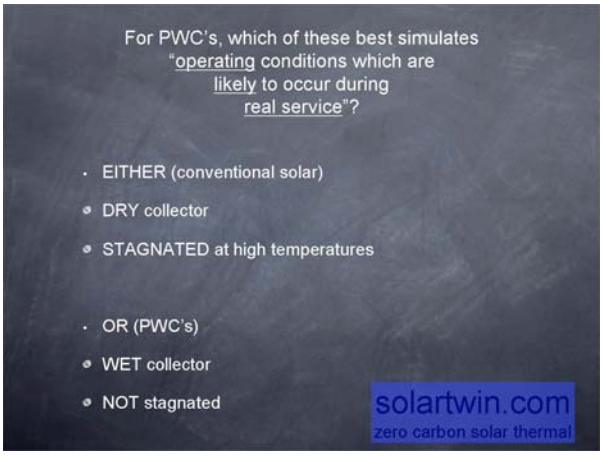

Two stagnation-linked tests from EN 12975. Are they relevant to PWC's?
5.3 Stagnation / High temp resistance test (1 hr @ 1000 w/sqm @ 30C)
5.4 Exposure test (30 days, hot sunny days on an empty dry panel).
Should the tests be abandoned or modified? Are they relevant? Now look at each in turn...
solartwin.com
zero carbon solar thermal

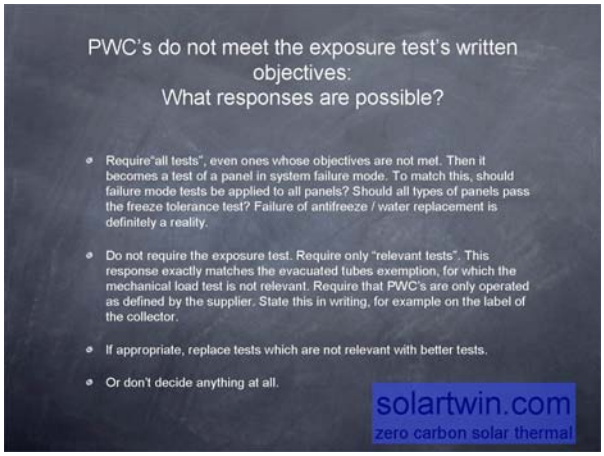

5.3.1 Stagnation / high-temperature resistance
test's objectives
...to assess rapidly whether collectors can withstand high irradiance levels without failures such as:
glass breakage
collapse of plastic cover
melting of plastic absorber
significant deposits on the collector cover from outgassing of collector material.
Note: Test 5.3 is NOT limited any type of operation in the objectives of this test, so acccording to how the standard is written, test 5.3 IS applicable to PWC's
solartwin.com
zero carbon solar thermal

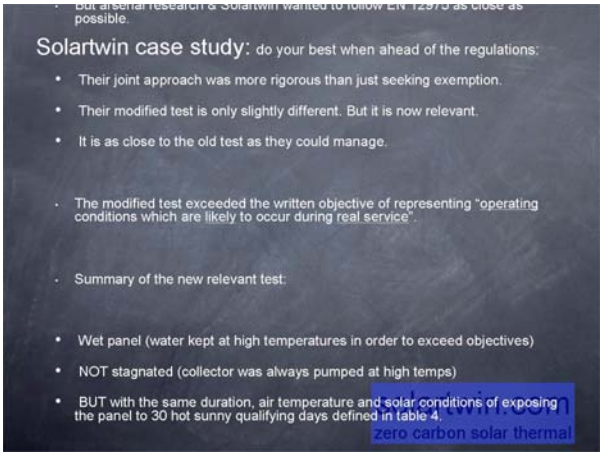

So under EN 12975
5.3 stagnation test IS applicable to PWP's.
But 5.4 exposure test is NOT applicable. Here's why...
solartwin.com
zero carbon solar thermal

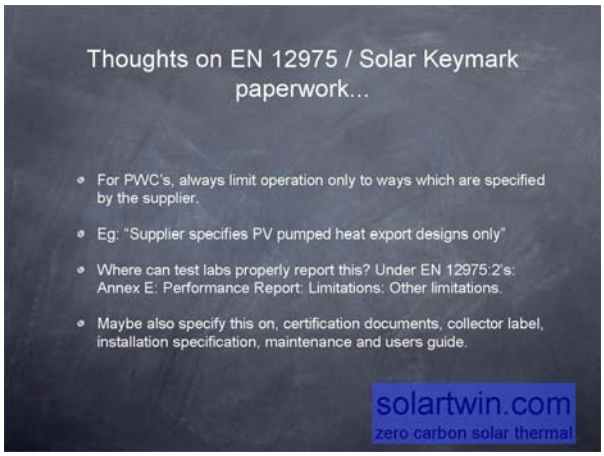

5.4.1 Exposure Test has two written objectives:
"...a low-cost reliability test sequence
[1] indicating (or simulating) operating conditions which are likely to occur during real service
[2] and which also allows the collector to "settle", such that subsequent qualification tests are more likely to give repeatable results."
Before we, examine objective 1, a reminder about the methods used in 5.4
solartwin.com
zero carbon solar thermal


5.4.2 Exposure Test: Apparatus and Procedure
"The collector shall be mounted outdoors (see Figure A.7),
but not filled with fluid.
All except one of the fluid pipes shall be sealed to prevent cooling by natural circulation of air.
One shall be left open to permit free expansion of air in the absorber."
Summary: Collector goes outdoors for 30 hot, sunny qualifying days as defined in table 4. The collector conditions must be:
dry "not filled with fluid"
stagnated (also not pumped)
solartwin.com
zero carbon solar thermal


For PWC's, which of these best simulates "operating conditions which are likely to occur during real service"?
EITHER (conventional solar)
DRY collector
STAGNATED at high temperatures
OR (PWC's)
WET collector
NOT stagnated
solartwin.com
zero carbon solar thermal


PWC's do not meet the exposure test's written objectives:
What responses are possible?
Require"all tests", even ones whose objectives are not met. Then it becomes a test of a panel in system failure mode. To match this, should failure mode tests be applied to all panels? Should all types of panels pass the freeze tolerance test? Failure of antifreeze / water replacement is definitely a reality.
Do not require the exposure test. Require only "relevant tests". This response exactly matches the evacuated tubes exemption, for which the mechanical load test is not relevant. Require that PWC's are only operated as defined by the supplier. State this in writing, for example on the label of the collector.
If appropriate, replace tests which are not relevant with better tests.
Or don't decide anything at all.
solartwin.com
zero carbon solar thermal


possible.
Solartwin case study: do your best when ahead of the regulations:
Their joint approach was more rigorous than just seeking exemption.
Their modified test is only slightly different. But it is now relevant.
It is as close to the old test as they could manage.
The modified test exceeded the written objective of representing "operating conditions which are likely to occur during real service".
Summary of the new relevant test:
Wet panel (water kept at high temperatures in order to exceed objectives)
NOT stagnated (collector was always pumped at high temps)
BUT with the same duration, air temperature and solar conditions of exposing the panel to 30 hot sunny qualifying days defined in table 4.
zero carbon solar thermal


Thoughts on EN 12975 / Solar Keymark paperwork...
For PWC's, always limit operation only to ways which are specified by the supplier.
Eg: "Supplier specifies PV pumped heat export designs only"
Where can test labs properly report this? Under EN 12975:2's: Annex E: Performance Report: Limitations: Other limitations.
Maybe also specify this on, certification documents, collector label, installation specification, maintenance and users guide.
solartwin.com
zero carbon solar thermal


Thank you!
from Barry Johnston
barry@solartwin.com
solartwin.com
zero carbon solar thermal