Ecodesign and Energy label for solar thermal related products

Part 1: Introduction in the methodology

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FOREWORD

At the publishing date of this document, the European solar thermal industry is struggling with the implementation of the Ecodesign and energy labelling regulations. The matter is new, complex and confronts industry with a different marketing view on their products.

Although the industry is already known with European regulations through the CE-marking of components, this regulation has its own merits. It is extensive and complicated. The regulations not only confront us with technical issue, but also the primary business processes are affected and need to be adjusted to reflect the new needs.

It is noted that the struggling is not only a burden. If the marketing model is adapted to the new needs, there are also benefits to be gained That would mean a shift from marketing a solar device towards marketing a combination heater or a water heater with solar thermal technology as added value. This implies not only new brochures, but could also mean a revised setting of the distribution chain to benefit the most.

This document is meant to assist industry in the implementation of the regulations. Unfortunately, at the publication date not much experience is available on implementation issues. That will change in the coming months and years. This document will therefore not be the last words said on the subject. Let us regard this document as a starting point to build on with new experiences in the near future.

Ultimately the solar thermal industry will become stronger due to the benefits of the energy label. I wish you all much success in this enterprise.

Gerard van Amerongen

Director

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1 Introduction

1.1 Ecodesign and energy labelling

Reducing greenhouse gas emissions is one of the main challenges the European Union is trying to address. Together with other measures, one of the goals is to encourage lower energy consumption by placing better performing products on the market. Two complementary ways for reducing the energy consumed by products are: setting energy efficiency requirements for products at the design stage (**ecodesign**) and raising consumer awareness about the energy efficiency of such products (**energy labelling**). This combination of ecodesign and energy labelling is considered as one of the most effective policy tools in the area of energy efficiency.

	Energy Labelling	**Ecodesign**
Directives	Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related product	Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products ***(Framework Directive)***

The **Ecodesign Directive** sets a framework for performance criteria, which manufacturers must meet to legally place their product on the market. The revised Directive, which entered into force in November 2009, extends the scope of the existing Directive by covering, in principle, **all energy-related products** (ErPs). This means that, in future, products such as windows, insulation materials, and certain water using products such as showerheads or taps could also be covered.

The **Energy Labelling Directive** aims at providing better information to consumers about different products by using energy labels, so that they have the energy and environmental information to help them choose between products on the market. The recast Energy Labelling Directive 2010/30/EU was adopted in May 2010 and it extended the energy labelling system from consumer-related products to energy-related products in the commercial and industrial sectors – i.e.: cold storage rooms and vending machines. The Directive covers all energy-using products sold in the domestic, commercial and industrial sectors (with the exception of all means of transport).

Requirements for energy labelling of products are adopted alongside Ecodesign implementing measures. These are introduced by the European Commission following a discussion process with key stakeholders, including detailed actions. Manufacturers who begin marketing an energy-related product covered by an implementing measure in the EU area have to ensure that it conforms to the energy and environmental standards set out by the measure.

1.2 Lot 1 and Lot 2

Regularly, the European Commission sets indicative lists of prioritised product groups. These product groups are assessed in terms of potential for a meaningful impact in terms of energy savings. They are identified as “lots” and implementation is delimited by dedicated regulations.

	Implementing Regulations	
	Energy Labelling Directive 2010/30/EU	Ecodesign Directive 2009/125/EC
Lot 1	811/2013 Space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device	813/2013 space heaters and combination heaters
Lot 2	812/2013 water heaters, hot water storage tanks and packages of water heater and solar device	814/2013 Water heaters and hot water storage tanks

Both Regulations have a common goal, but aim at different market sectors and scopes (see table 1).

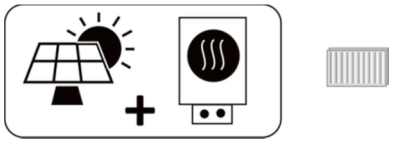
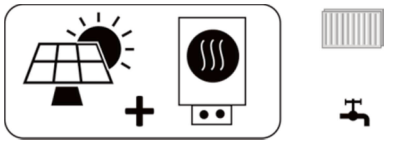
Table 1: Differences and similarities between the Ecodesign and Energy labelling regulations

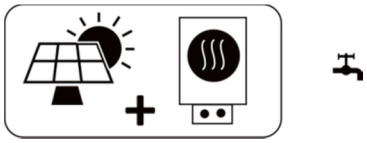
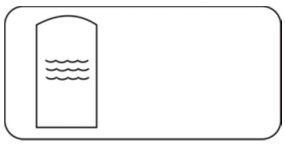
	Ecodesign		Energy labelling	
Addressing:	Supply side of the market		Demand side of the market	
Scope:	Space heaters	≤ 400 kW	Space heaters	≤ 70 kW
	Combi heaters	≤ 400 kW	Combi heaters	≤ 70 kW
	Water heaters	≤ 400 kW	Water heaters	≤ 70 kW
	Heat storage tanks	≤ 2 000 litres	Heat storage tanks	≤ 500 litres
Goal:	Prevent non-efficient products to enter the European market.		Promotion of efficient products in the European markets.	
Methods:	The methods to establish the product efficiencies are applied to both regulations.			
Criteria:	– Minimum efficiency – Maximum heat losses		– Minimum label class – Minimum label class	

All products within the scope of both directives must comply with the requirements. Products, within this scope not complying, are not allowed on the European market.

1.3 Scope of this document

This document is focusing on the energy labelling of solar thermal products. The scope of this document is limited to:

solar thermal space heaters;		A water-based central heating system in order to reach and maintain the indoor temperature of an enclosed space such as a building, a dwelling or a room, with one or more heat generators and a solar thermal system.
solar thermal combination heaters;		A space heater that is designed to also provide heat to deliver hot drinking or sanitary water and is connected to an external supply of drinking or sanitary water and equiped with a solar thermal system.

solar thermal water heaters;		A device, connected to an external supply of drinking or sanitary water that generates and transfers heat to deliber drinking or sanitary water and is equiped with one or more heat generators and a solar thermal system.
solar thermal hot water storage tanks;		A vessel for storing hot water for water and / or space heating purposes, which is not equiped with any heat generator, except possibly one or more backup immersion heaters

falling within the scope of Energy labelling (see table 1).

1.4 Target groups in this document

The first company in the marketing chain that "places" a product or package on the European "market" is responsible for the energy label and its required supporting documentation.

- For a simple product the European supplier to a wholesaler or dealer is responsible for the label. In terms of the regulation this is the 'supplier'.
- For a package the company that assembles the package from its components to a functional system and sells it to a wholesaler, dealer of end customer is responsible for the label. In terms of the regulation this could be the 'supplier' or the 'dealer'.

The regulation refers to a 'dealer' but this could also be read as an 'installer' that sells a product or package with an energy label.

1.5 The status of this document

This document is based on the regulations as published in February and August of 2013 and the transitional document, describing the details of the measurements and calculations, as published in July 2014. This set of documentation is the first official and broadly distributed version of the extensive methodology.

This document describes in detail how to use the regulations for solar thermal applications. However, one should be aware that the official documentation of the regulations is ultimately always the reference.

Although the author is well informed, because of his contributions to the process of developing the regulations, the interpretations in the document are merely his opinion and mistaken interpretations may have been made. In case of doubt always refer to the text of the regulations.

The draft document has been published for comments by ESTIF[1] members during the period November and December 2014. Moreover the main points have been presented and discussed during an ESTIF workshop in Brussels attended by representatives of ESTIF and ESTESC[2].

It should be noted that there are:

- many errors in this official regulation and related documents already identified and communicated to the European Commission (this is the case for all technologies and also for solar thermal applications).
- many ambiguous issues are expected to arise, in particular in the period preceding the entry into force of the regulations, as market operators implement the regulation (the regulation will meet everyday reality on a large scale and people will find issues that do not fit).
- the transitional documents must be 'transcribed into harmonized standards. Considering the time required, the harmonized standards may not be published before the implementation date of September 2015 and the transitional documents will remain as *de facto* 'legislation.

[1] European Solar Thermal Industry Federation (ESTIF)
[2] Solar Thermal Energy Standardisation & Certification Working Group is a collaboration of ESTIF and the Association of the European Heating Industry (=EHI).

We may assume that we are now entering a period of uncertainty in the interpretation of the requirements and this document will not be the last interpretation of the regulation.

Since we cannot explain how to work with the regulation when there are errors and ambiguous issues, we have opted for providing a preferred interpretation and marking it clearly as such in the document.

1.6 Help for the readers

Chapter 2 “The labels”

The chapter describes all the available types of labels and should be of interest to all parties involved in solar thermal energy applications.

Chapter 3 “The procedures”

The chapter is dedicated to the procedural issues involved with labelling and is a ‘must read’ for all companies that are responsible for the energy label.

Chapter 4 “Parties concerned”

The chapter describes what is expected from the different target groups.

Chapter 5 “How to make optimal use of the labels”

The chapter describes strategies to obtain the highest possible label classes and should be useful for product designers, system assemblers and dealers / installers.

Chapter 6 “Future developments”

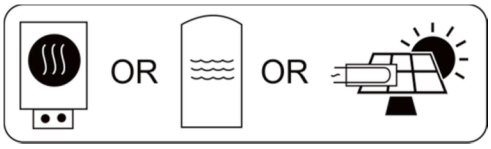
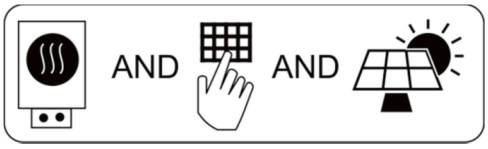
The chapter describes what can be expected in the near future.

2 The labels

2.1 Main groups of energy labels

There are two main groups of labels:

- product labels;
- package labels.

Product label	Package label
Products from one supplier, fully functional in its context as a whole.	Systems fully functional in its context, consisting of different products (components) that are assembled by a dealer / installer.
The suppliers are responsible for the label.	The dealers / installers are responsible for the label. Currently it is not clear whether suppliers may also be responsible.
Example of products:	*Example of a package:*
	
Boiler or heat storage or solar water heater with integrated electrical backup heater	Combination of conventional water heater and a solar thermal system

2.2 Sub groups of energy labels

Within the two main groups there areseven sub groups of labels (see figure 1).

For each sub group of labels a specific range of label classes is prescibed for phase 1 of the introduction (September 2015) and for the next phase 2 to be implemented two years later. In the first phase, it should be noted that **the best label class** for water heaters and storage tanks is limited to 'A', while space heaters can go up to 'A^{++}'. All package labels span the complete range of label classes.

In phase two the label class ranges will be adjusted so that the lower classes are omitted and (if relevant) additional classes at the top are added. Effectively, this reflects the aim of the regulation to phase out less efficient products from the European market.

Combination heaters need a label class for the function 'space heating' and the function 'water heating'.

For solar thermal applications the energy labels within the main group 'Product labels' and the sub groups 'Space heaters' and 'Combination heaters' are not applicable.

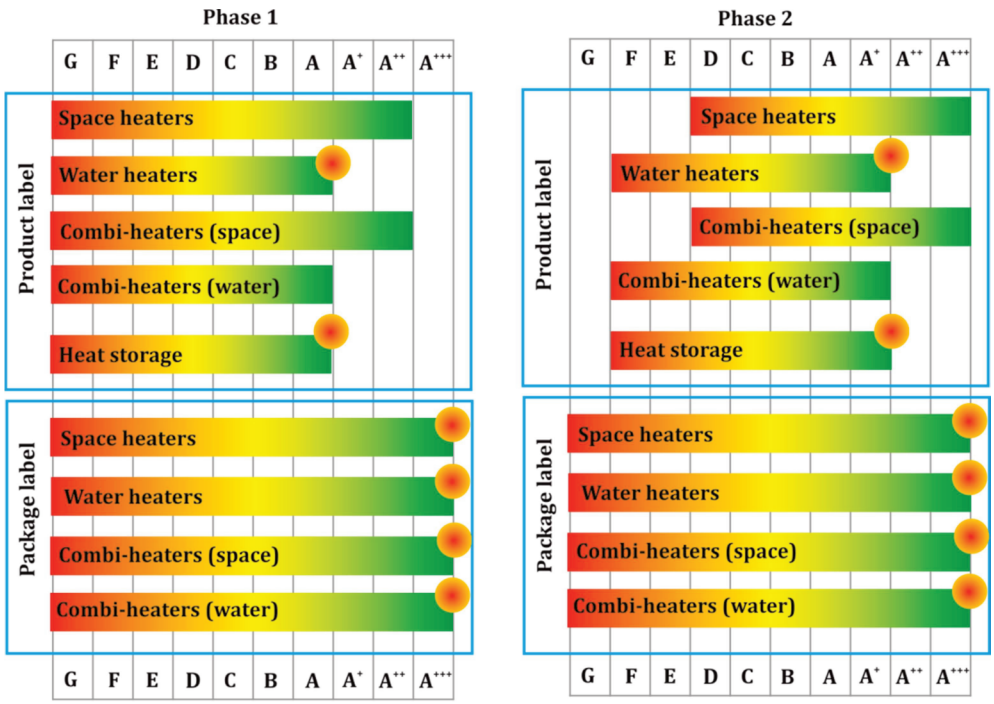


Figure 1 - the two main groups and seven sub groups of labels and the corresponding defined range of label classes. The applicability of a sub group for solar thermal applications is marked with a sun icon.

2.3 The defined labels

For phase 1 and phase 2 a total of 36 labels are defined (2x18). Each label is specific in its application, its design and the information on the label (see table 1).

It should be noted that for the package labels the labels are identified by the preferred heat source.

Table 2 - all the labels for phase 1, ranked under each sub group and main group, with the relevance for solar applications marked with a sun icon.

Product labels				Package labels		
Space heater	Water heater	Combi-heater	Heat storage	Space heater	Water heater	Combi-heater
Boiler	Conventional	Combi heater	✹All types	✹Boiler	✹Conventional	✹Combi heater
Co-generator	✹ Solar			✹Co-generator		
Heat pump	Heat pump	Heat pump		✹Heat pump	✹Heat pump	✹Heat pump
Heat pump LT				✹Heat pump LT		

2.4 Components of a package label

Each of the package labels may consist of a specified range of supplementary devices as indicated in table 3. It should be noted that combination heaters and water heaters are exclusively combined with a solar device.

Table 3 - allowed combinations in the package labels with supplementary devices.

		Temperature control	Supplementary boiler	Solar device	Heat pump	
Space heaters	Boiler	✓	✓	✓	✓	
	Cogenerator	✓	✓	✓	⊘	
	Heat pump	✓	✓	✓	⊘	
	LT heat pump	✓	✓	✓	⊘	
Combination heaters	Boiler	✓	✓	✓	⊘	
	Cogenerator	✓	✓	✓	⊘	
	Heat pump	✓	✓	✓	⊘	
	LT heat pump	✓	✓	✓	⊘	
Water heaters	Conventional	⊘	⊘	✓	⊘	
	Heat pumps	⊘	⊘	✓	⊘	

Note: LT stands for low temperature.

2.5 Concluding remarks on label classes

The regulation distinguishes between a product label for a solar water heater and a package label for a water heater equipped with a 'solar device'. This may be confusing. According to the regulation the distinction between both is as follows:

> *"A solar water heater is placed on the market as one unit, with integrated solar collectors, solar hot water storage tanks, heat generators and other parts. Solar water heaters typically have about two collectors and are widely used in southern Europe.*
>
> *On the other hand, solar devices are typically larger devices consisting of a number of solar collectors, solar hot water storage tanks and other products, either placed on the market individually or as one unit (solar-only systems)."*

This definition might be ambiguous, since it lacks a clear definition of 'integrated'.

> **Assumption:**
>
> *It seems a reasonable interpretation to assume that the product label for a solar water heater is limited to systems with an **integrated conventional heater** in the hot water storage tank. An example of this is a commonly applied thermo syphon system.*

It should be noted that the best label class for such a solar water heater is limited to 'A' and in phase 2 to 'A+'. When the solar water heater is equipped with an electrical immersion heater, this could prove to be acceptable. The efficiency of an electrical heater is always less than 40% (predefined by the regulation) and will have a label class between C and D for the solar thermal relevant load profiles from M to XXL. Adding solar thermal will give such systems the opportunity to reach 'A' or 'A+' in phase 2.

However, when other types of conventional more efficient heaters are integrated, the best label class is a serious limitation.

2.6 Label efficiencies

The relation between the label class and efficiency is defined for space heaters, water heaters and hot water storage tanks.

For all of these, the efficiency is determined under the following conditions:

- a conventional heater will not go beyond 'A' label class. Higher label classes are reserved for renewable technologies;
- classes A^{+}, A^{++} and A^{+++} are distinct enough to rate solar devices for their performance.

2.6.1.1 Label class efficiencies for space heaters

The relation between label class and efficiency is given in figure 2.

A common relation between label class and seasonal space heating efficiency is defined for all types of heaters, except for low temperature heat pumps. The latter shows a higher threshold to reach a label class.

It should be noted that solar thermal devices when combined with the best currently available space heaters will usually reach 'A^{+}'. Higher label classes can be obtained ('very low energy houses') only when a space heater has a very low declared thermal output,.

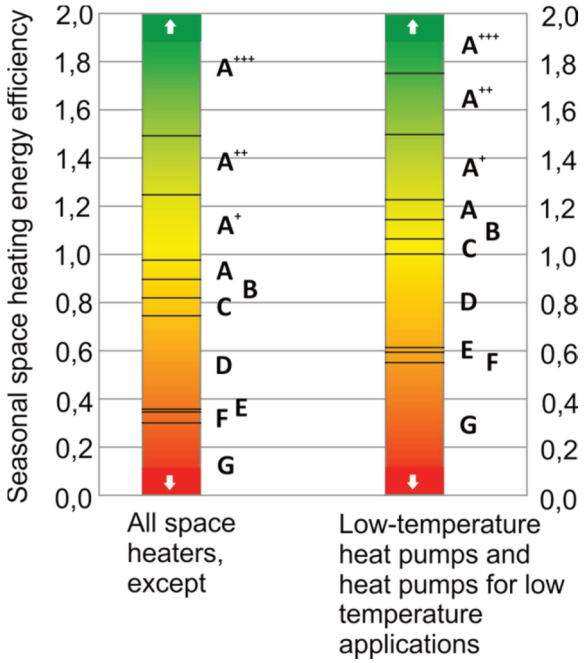


Figure 2 - seasonal space heating efficiency for each label class

2.6.1.2 Label class efficiencies for water heaters

The relation between label class and efficiency is given in figure 3.

The relation between label class and water heating efficiency is given for each of the 10 defined load profiles. A load profile is a typical daily pattern of heat withdrawal, ranging from 3XS to XXL with an increasing daily total heat demand (see table 4).

A load profile is commonly used for water heaters to establish their efficiency. The methods use the load profile to determine an annual heat demand with the following formula:

Annual heat demand = 0.6 x (Qref(load profile) + 1.09) in kWh per year

Table 4 - load profiles for water heaters. The square indicates the relevant range for solar thermal applications.

Load profile:	3XS	XXS	XS	S	M	L	XL	XXL	
Qref:	0.345	2.1	2.1	2.1	5.845	11.655	19.07	24.53	kWh/day

It should be noted that the regulation limits the applicable load profiles for solar water heaters from M to XXL.

A solar thermal device can reach up to a label class of 'A+++', when a large enough collector area is applied with excellent thermal properties.

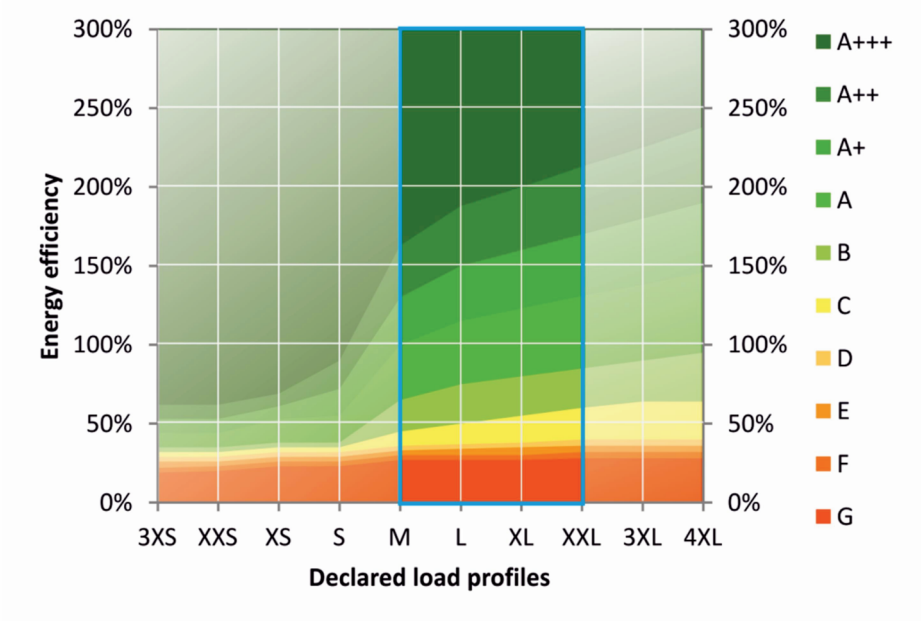


Figure 3 - minimum water heating energy efficiency for each class and load profile classes.

Note: The relevant load profile range for solar applications is delimited by the blue box.

2.6.1.3 Label classes for hot water storage tanks

The relation between label class and efficiency is given in figure 4.

It should be noted that a typical tank will reach a label class of 'C'. For a label class of 'A' or above innovative insulation technologies need to be applied.

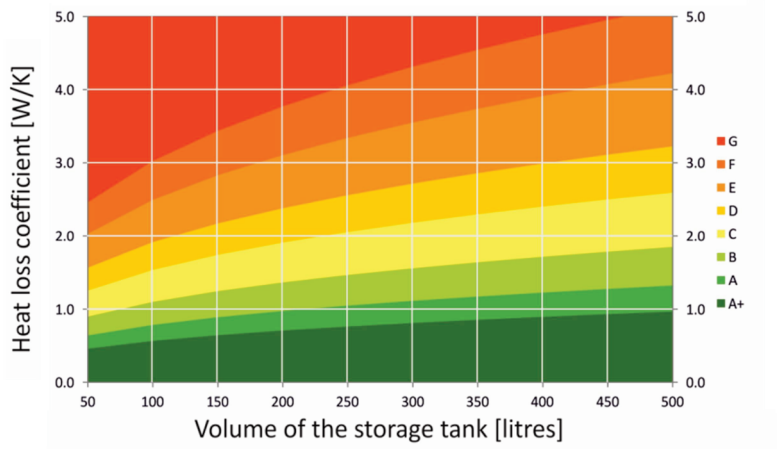


Figure 4 -energy efficiency classes of hot water storage tanks

3 The procedures for drafting the label

3.1 Introduction

Each product concerned by the Ecodesign and / or energy labelling regulations needs a ***technical document*** that specifies the product, shows the source of the specifications and gives the energy performance.

Each product concerned by the energy labelling regulation also needs a ***product fiche*** that shows a selection of the specifications and the **energy label** class.

Each product within the scope of the energy labelling regulation needs an ***energy label***.

Some products are not included in the scope of the regulation as products but are considered **components of a package** and are therefore relevant for the 'package label'. The following components of a package do not require an energy label:

- a solar device for space and combination heating,
- a solar device for water heating as part of a package,
- a temperature control.

For packages the rules are similar. A package needs a technical document, a product fiche and an energy label. This could mean that a package requires a label, while components may also have their own product label.

In the following sections, the elements for an energy label are further discussed. In part 2 of the publication [3] the procedures are developed in more detail.

3.1.1 Technical documents

The technical document is a formal document laying down a broad spectrum of relevant product specifications and the source of that information. Normally tests and calculations are required to draft the technical document.

The items to be included in the technical document are indicated in the regulation. However, the format of the technical document is not specified.

Main elements of the technical document are:

- identification of the product;
- identification of the supplier;
- identification of the responsible person;
- technical parameters;
- advice for assembly.

For packages the technical document is usually a collection of the technical documents for the components.

The supplier or dealer is required to draft the technical document. The technical document is not required to be publicly available but has to be provided upon request to the authorities in the Member States and to the European Commission.

3.1.2 Product fiche

A product fiche is a formal document laying down a relevant selection of product specifications, the energy performance and label class. As such, the product fiche can be seen as a 'bridge' between the technical document and the label.

The items that must be included on the fiche, and their order sequence, are specified in the regulation. Other aspects of the product fiche format are not mandatory.

[3] Ecodesign and Energy label for solar thermal related products
- Part 2: Details on the procedures -

For packages the product fiche is designed as a spread sheet to simplify the calculation procedure for a dealer.

The supplier or dealer is required to draft the product fiche and to provide the fiche on request. The product fiche is a publicly available document.

Specific to backup heaters, intended for use in a package, the supplier of that heater should also provide the product fiche for the package.

3.1.3 Label

The label presents to the public the main data on the product fiche. The format of a label is strictly specified. The label is drafted based on the information of the corresponding product fiche.

4 Parties concerned

4.1 Supplier of a product, component of a package or package

The first company in the marketing chain that "places" a product, a component for a package or a package on the European "market" has the following procedural responsibilities:

1. draft a technical document,
2. draft a product fiche (*only for products or components that need an energy label*),
3. draft an energy label (only for products that need an energy label).

These requirements are summarized in table 5.

Table 5 – required documents for each product or component of a packages

Product / component:	Technical document	Product fiche	Package fiche	Energy label
Boiler	X	X 1)	X 2)	X 1)
Cogenerator	X	X 1)	X 2)	X 1)
Heat pump	X	X 1)	X 2)	X 1)
Low temperature heat pump	X	X 1)	X 2)	X 1)
Solar device for space or combination heating	X	X 1)		
Temperature control	X	X 1)		
Water heater	X	X 1)	X 2)	X 1)
Solar device for water heating in a package	X	X 1)		
Package space heater	X	4.2	X 2)	X 1)
Package water heater	X	4.3	X 2)	X 1)
Package combination heater	X	4.4	X 2)	X 1)

1) Only if the product falls within the scope of the energy labelling regulation

2) Only if intended for use in a package

The technical documents should be available and produced when requested by authorities.

The product fiche should be distributed on request.

The label should be shipped in the package with the product. The energy label class should be mentioned in:

- advertisements for the product that includes energy performance or price information,
- technical promotional material for the product that includes specific technical parameters.

4.5 Dealer (Installer)

The dealer is the company that brings the product or package to the end user. A dealer that assembles a package with components from more than one supplier, has additional responsibilities as discussed in 4.1.

The main responsibility of the dealer is to communicate the energy label class to the end customer in the following manners:

- display the label on the product,
- advertisements for the product that includes energy performance or price information,
- technical promotional material for the product that includes specific technical parameters,
- Include the energy label class in the offer (packages only).

4.6 Test institutes

There is no third party test requirement included in the regulations. As a result, there are no specific requirements for test institutes. But there are requirements for the tests.

It should be noted that the tests will be performed in accordance with the requirements set in the harmonized standards. The requirements following the harmonization are specified in the so called "Annex B" of the CEN mandate 495 and cover aspects of accuracy, quality control and reporting formats.

Two types of clients can make use of the services of the test institutes:

- the suppliers of products: to perform the necessary tests on their products,

  The requirements for the test methods are strict and often complicated. It may be expected that many suppliers prefer to contract a test institute for the tests.
- member states: for control purposes.

Each regulation contains a clause (annex) describing the "verification procedure for market control purposes". This procedure compels member states to perform tests in order to check the accuracy of the results presented by suppliers and installers / dealers.

4.7 CEN technical committees

A standardisation request (mandate) is a request from the European Commission to the European standardisation organisations (ESOs) to draw up and adopt European standards in support of European policies and legislation. In the framework of Ecodesign and energy labelling such a mandate has been issued:

Number:	495 (21/7/2011)
Aimed at:	CEN, CENELEC and ETSI
Directive:	2009/125/EC relating to harmonised standards in the field of Ecodesign,

The mandate 495 has a so-called Annex B that is updated when a new regulation in the framework of the Ecodesign directive has been issued. For the relevant solar thermal applications, two of these annex B have been published:

Date:	15/7/2014
Title:	Lot ENER 1 – Boilers and combi-boilers (gas/oil/electric) . Standardisation request with regard to Ecodesign requirements Interservice consultation (ISC)

and

Date:	15/7/2014
Title:	Lot ENER 2 – Water heaters (gas, electric, oil). Standardisation request with regard to Ecodesign requirements Interservice consultation (ISC)

The involved CEN technical committees are:

TC312 – WG1	Solar collectors
TC312 – WG2	Factory made systems
TC312 – WG3	Thermal solar systems and components, Custom built systems
TC228 – WG4	Calculation methods and system performance and evaluation

The technical committees should revise the standards on relevant parts as described in the aforementioned annex B documents. As a result (part of these) standards are harmonized.

Compliance with harmonised standards implies a presumption of conformity with the corresponding requirements of harmonisation legislation. Manufacturers, other economic operators or conformity assessment bodies can use harmonised standards to demonstrate that products, services or processes comply with relevant EU legislation.

Ultimately, the harmonized standards are published in the Official Journal of the European Union to replace the current transitional documents or parts of it.

4.8 Certification bodies

No third party testing is required and as a result no certification of products is required.

5 How to make optimal use of labels

5.1 Approaches for high label classes

5.1.1 Space heaters package

The energy efficiency of the package for space heating, limited to a package of a space heater and a solar thermal device only, is calculated by

$$\eta_{package} = \eta_{backup} + \left(\frac{26{,}75}{P_{rated}} \cdot A_{col} + \frac{10{,}45}{P_{rated}} \cdot V_{sto}\right) \cdot c \cdot \eta_{col} \cdot f(Tank\ class) \quad (1)$$

where

η_{backup}	[%]	is the backup space heater,
P_{rated}	[kW]	is the rated heat output of the backup space heater,
A_{col}	[m²]	is the collector aperture area,
V_{sto}	[m³]	is the storage volume,
η_{col}	[%]	is the collector efficiency at 40K and 1000 W/m²,
F(Class)	[-]	is a value in defense of the tank label class (A⁺=0,95, A=0,91, B=0,86, C=0,83 and D..G=0,81)
c	[-]	is a value defined for a boiler (=0,9), a cogenerator (=0,7) and a heat pump (0,45).

The solar system adds to the energy efficiency of the backup space heater. The applied method is a rough estimation of the added solar value, based on components performance data, without taking into account any details of the system engineering. The most effective way to look for the best added value is looking at the formula itself.

Looking at formula (1) the following is noted.

1) The main influencing parameter is the 'P_{rated}'. An infinitely large P_{rated} will results in no added value of the solar device, while a (theoretical) P_{rated} = 0 will result in an infinitely high energy efficiency of the package.

2) The type of backup space heater is through the factor 'c' (0,9 – 0,7 – 0,45) of strong influence. However, it should be noted that the space heaters with a low value of 'c', usually start with a relative high backup heater energy efficiency.

3) The influence of the type of collector and the performance of the collector is taken into account by the factor η_{col} representing one point on the collector efficiency curve. The added value of a solar device with an unglazed collector is significantly smaller than for a glazed or evacuated collector (see figure 5).

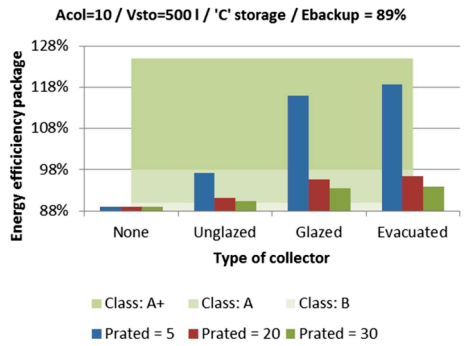
4) The influence of the storage heat losses is taken into account by a factor defined by the energy class of that storage. Storage tanks with a label class lower then 'C' are seen as 'equal'. The effect of the storage heat losses is only minor (see figure 6).

5) The influence of the size of the solar device, defined by the collector area and / or the storage volume, can be significant, as it should be.

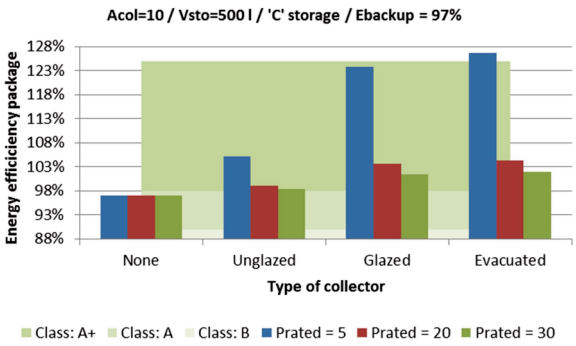
6) Starting with best condensing boiler, as a rule of thumb,
   a) an A⁺ level is certainly feasible by adding a solar device,
   b) an A⁺⁺ level is feasible, but only with a small rated output of the boiler ('low energy house')
   c) an A⁺⁺⁺ level is feasible, but only with a small rated output of the boiler ('low energy house') and a large solar device.

7) Starting with a 'B' class boiler makes a label class above 'A' more difficult to reach since an 8% threshold has be compensated. However, a B-class boiler can improved to an A-class boiler package by adding a solar device.

8) In order to reach high label classes for the package, the following recommendations apply:
   a) combine the solar device with a space heater with a low rated heat output,
   b) combine a large solar device (collector area and storage volume),
   c) combine a glazed or evacuated collector,
   d) combine a storage tank with a B or C label class.

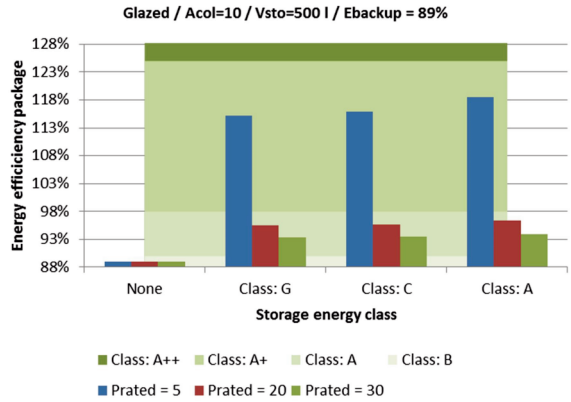


Start: Backup space heater efficiency = 89% (top B class)

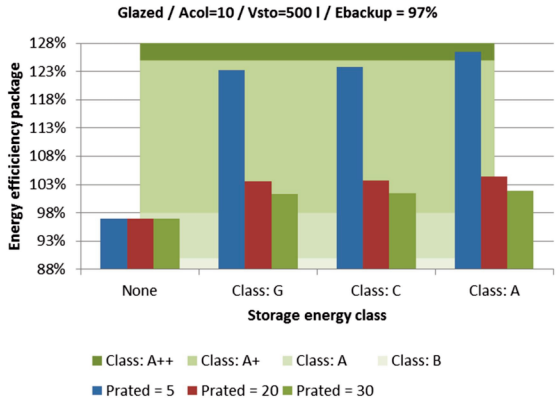


Start: Backup space heater efficiency = 97% (top A class)

Figure 5 - sensibility for the collector type (η_o=0,8, a_2=0. Unglazed: a_1=15, glazed: a_1=3,5 and evacuated:a_2=1,8).

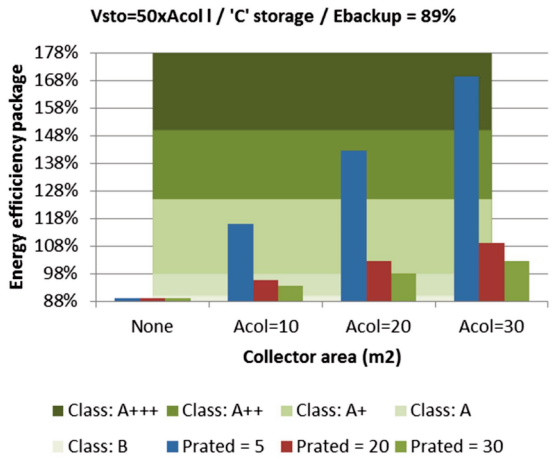


Start: Backup space heater efficiency = 89% (top B class)

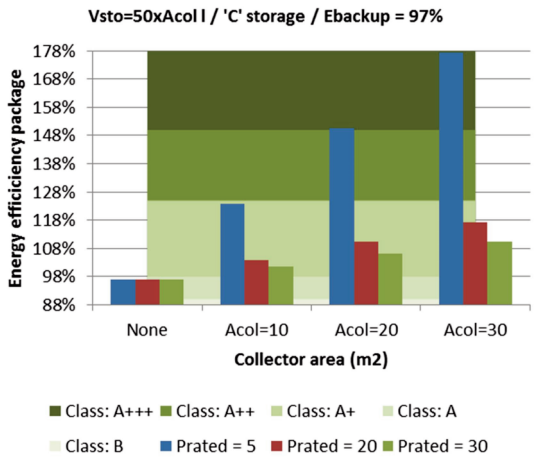


Start: Backup space heater efficiency = 97% (top A class)

Figure 6 – sensibility for storage energy efficiency class (η_o=0,8,a_1=3,5, a_2=0).



Start: Backup space heater efficiency = 89% (top B class)



Start: Backup space heater efficiency = 97% (top A class)

Figure 7 - sensibility for the size of the solar device (η_o=0,8,a_1=3,5, a_2=0).

'None' represents no solar device.

5.1.2 Water heaters

Water heaters with a solar device are handled in two different ways: one for the product label and one for the package label. Both methods appear different but are in essence the same. As with the space heaters, the solar device adds to the energy efficiency of the backup water heater. The added value is determined by the solar device heat output. The higher the output of the solar device, the higher is the added value.

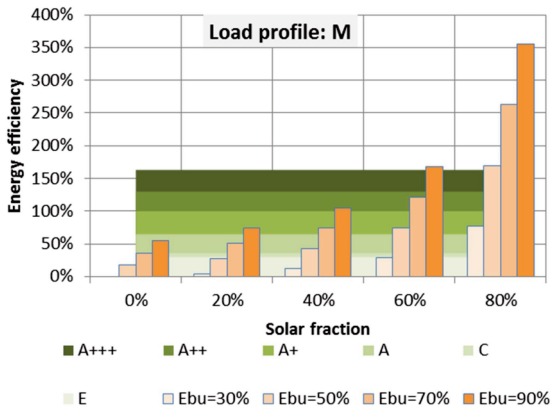
Approaches to reach a high solar output are commonly described (and assumed as known) and are not further discussed in this document.

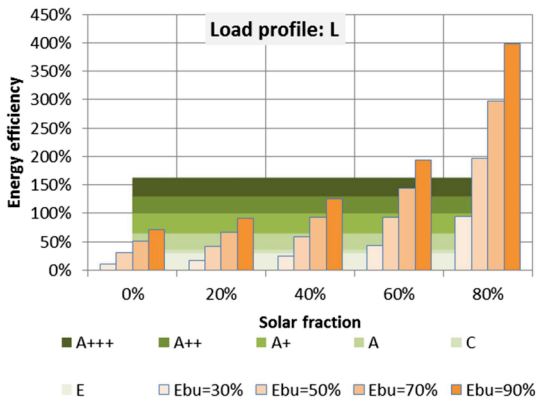
In general the following should be noted.

1) The starting point, the energy efficiency of the backup water heater and the solar fraction are both the main determining parameters to reach high label classes.

2) A solar device can be added to a low class backup water heater to raise the label class to more 'acceptable' values. For instance an electrical 'E' class water heater can be upgraded to 'A' or even above with a large enough solar device.

3) Starting with the best available backup water heater ('A'), label classes up to A^{+++} can be reached by using a large enough solar device. Be careful however. The product label for a water heater is maximized to 'A'.





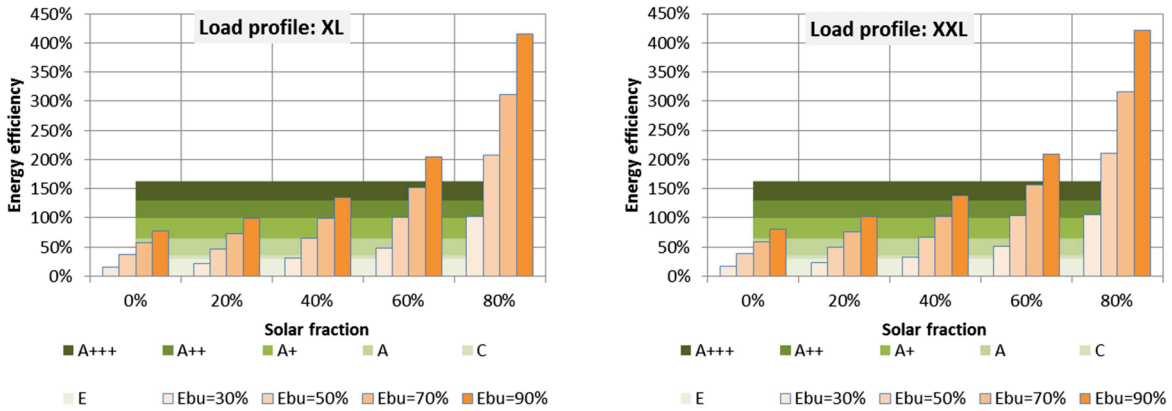


Figure 8 - sensibility for the main parameters on the energy class of the system

5.1.3 Combination heaters

Combination heaters are labelled twice: once for the space heating function and once for the water heating function. In the methodology both functions are not interrelated. For the space heating function the whole system is assumed to be dedicated to the space heating (see 5.1.1). For the water heating function the whole system is assumed to be dedicated to the water heating (5.1.2).

5.1.4 Hot water heat storage tanks

It is expected that the typical European hot water storage tank will reach level of 'C' or 'D' label class. Higher label classes are only reachable by applying innovative insulation concepts, such as evacuated systems or aerogel.

The relevance of a very high label class for solar thermal is limited.

– As discussed in 5.1.1, the influence of the storage label class on the added value of a solar device for a space heater package is only minor.

– The effect of the storage label class on the output of a solar device for water heating is usually described (and assumed to be known). For a pre-heater system this effect is limited, but for a solar-plus-supplementary system the effect will be very significant and will be reflected in the energy label class for water heaters.

5.2 Working with load profiles

The load profile is one the performance parameters of a water heater and an input for the determination of the solar thermal output.

The regulation assumes the following procedure.

(1) the load profile, best fitted to the needs of a client, is overriding in the choice of a water heater. The considerations for such a choice are the expected hot water comfort, the number of tapping points, and more.

(2) the dimensions of the solar device are selected as usual by estimating the annual heat demand and other elements of the application. The thermal performance is that determined for the dimensions of the solar device and the annual heat demand that is calculated from the load profile of the water heater, as can be seen in figure 9.

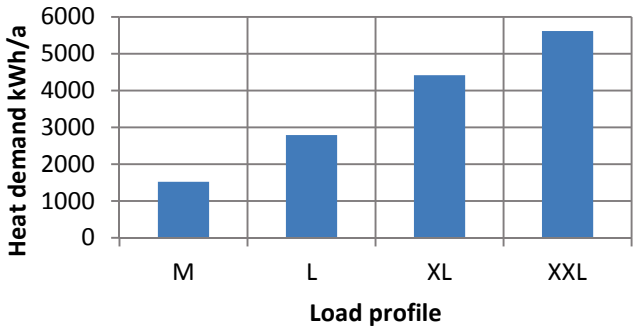


Figure 9 - load profile versus the annual hot water heat demand as defined in the regulation.

(3) The performance parameters of the water heater and the solar device are put together and an energy class is determined.

The basis for determining the solar output is the annual heat demand. For the selection of the size of the solar device the input is the actual situation at the customer. However, for the calculation of the label the assumed relation with the load profile is input. Both are not the same. As a result the expected savings from the label are not accurately related to what the customer can really expect.

5.3 A new marketing approach

The energy labelling regulation offers important new opportunities to communicate the benefits of a solar thermal system to the customer.

5.3.1 Enlarging the pie

Despite all competition between the suppliers of solar thermal products the market is still far from saturated and the turnover can significantly be increased by attracting new customers. That is *enlarging the pie*; improving business for all solar suppliers and dealers.

Let us not forget: the main (technical) competition comes from gas, electrical or oil heaters. The energy labelling regulation can show convincingly the benefits of a solar device over a conventional heater.

The best condensing boiler is limited to an 'A' label. Adding a solar thermal device to such a device lifts the label class to a more acceptable and favourable level of A^{+} or even A^{+++}.

Even the less advantageous, though sometimes necessary, electrical heaters can be made more acceptable by adding a solar device. This can lift the 'B' or 'C' level of an electrical heater to an 'A' class.

This 'enlarging the pie' mechanism is made possible by the successful and strong lobby by ESTIF to have a level playing field between all technologies in the heating industry.

Enlarging the pie will, of course, only be effective when there is a public trust in the reliability of the label class presented. *It is in the common interest of all suppliers and dealers to safeguard the quality of the labels in the market.*

Although the energy label mechanism, label classes marked with a letter and plus signs and accentuated with colour grading, is well known, it cannot be taken for granted. The label is mostly self-explanatory, but especially the '+.." scales may not be so obvious to the general public.

From recent research in the field of household refrigerators the common perception is that an A^{+++}-label is only marginally better than an A-label. However, this is not the case. An A-label refrigerator consumes over three times as much electricity as an A^{+++}-class. This order of magnitude of difference between a common and the highest label class is also the case for our solar thermal products.

For enlarging the pie we have a common interest to communicate the significant difference between an A-label and a $A^{+..}$-label.

5.3.2 Mutual competition between brands and types

With only three classes above 'A' and a total of ten classes, the discriminating effect between the performance of different brands and types of solar devices will prove to be limited.

The evaluation of the other labels in operation shows that the market usually grows faster for the highest label class, leaving only a small market share for the lower label classes. Of course, a heating system may not be comparable with refrigerators and different market mechanisms will play a role. Nevertheless, we may expect a market movement towards the best, A-class (conventional) heaters. As a result, the added value of a solar device will have to compete within the highest three label classes from A^{+} to A^{+++}.

Focusing on the combination of backup heater and solar device

A classical competition between suppliers of solar thermal products is aimed at the best solar output (and the best price). However, due to the introduction of the energy label it may be more effective to aim at the best combination of backup heater and solar device.

Assuming that the customer goes for a high label class, the first task is to offer systems that are combined with a backup heater having initially a high label class.

Specifically for a space heating or combi-system, a **backup heater with a low rated heat output** should be chosen for the best result.

By aiming at the combination of backup heater and solar device, the competition 'playing field' on energy performance is defined between the label classes 'G' and 'A^{+++}'. Such a playing field of ten classes can make a difference.

A secondary tool offered by the regulation is the energy efficiency value of the combination of the backup heater and the solar device. Although this value is not communicated on the label itself, it is printed on the product fiche. Product fiches are publicly available and the formal value is the same as for the label.

The energy efficiency value is more discriminatory between the performance of brands and types than the label class. As such this value could become an important tool for making the distinction between brands and types. However, there is a downside too.

Due to the very simplified method adopted in the regulation for space heaters, in this case the energy efficiency is not an accurate representation of the solar system performance. Using this value to compare brands and types does not necessarily favour the best performing solar device.

For solar water heaters the energy efficiency should be a good representation of differences between the performances of various systems.

Focusing on the added value of a solar device

Starting with a high class backup heater, the distinction in the added value of solar devices will be limited to a maximum of three or four label classes. Looking at the methods applied, it is expected that the distinction between brands and types will mainly be due to the 'size' of the solar system and less to the efficiency. As such the share of the (enlarged) pie, based on the label class distinction, will probably be focusing on price and an optimal system dimensioning aimed at, a minor, but important overriding class limit.

Focusing on the energy performance of the solar device

All in all the energy efficiency is not an effective and adequate tool for comparison between brands and types of a solar device.

Currently, in commercial terms, the system output or solar fraction is often used as the basis for comparison between brands and types. With regard to solar devices for water heating the same tools are applied to determine the solar performance as in the regulation.

In the case of solar devices for space heating such methods are also commonly used; although, the applied methods are not consistent with the regulation. Moreover, several methods are being used for this purpose with different reference conditions.

Despite the implementation of the energy labelling, the use of current performance methods is likely to be continued for comparison between brands and types in commercial trade.

5.4 Relation to Solar Keymark

One of the main goals of the Solar Keymark is to minimize trade barriers between member states. The energy labelling directive is harmonizing this for the products and components within its scope, but limited to energy performance parameters. For all other quality aspects the Solar Keymark will be needed to minimize trade barriers.

* *Accurate and reliable performance data*

It should be noted that the structure of energy labelling can only be successful when accurate and reliable performance parameters are applied. This is not different from the normal trading practices, although fraud in this case has an extra dimension as being illegal in relation to the energy labelling directive. Applying certified performance parameters is a very secure way to safeguard the reliability of the performance parameters used in the methods.

* *Access to components data of packages*

Especially for the package labels, the collection of the required documents, and consequently the gathering of technical parameters, is a very complex task that needs simple access to the documentation of the components. A publicly available structure for distribution of these documents is expected to be necessary for a successful introduction of the package label.

** Accurate and reliable calculations*

The required procedures are vulnerable to incorrect use of data, untraceable source of the data and faulty calculations.

For reliability issues on the level performance data and procedures and the distribution of data, the Solar Keymark can play an important and decisive role.

In this regard, the following suggestions are made:

- distribute the certified data clearly marked as such and with obligations on the users of the data to explicitly mention this certified source of the data;
- endorse the schemes that distribute data for support of the energy labelling scheme, with the above mentioned restriction.
- publish the certified data in a format that can be used directly in the technical document or data fiche, without possible confusion;
- create a Solar Keymark for an energy label, keeping not only the validity of the performance rating (test results and calculations), but also the other relevant quality aspects;
- communicate clearly the scope of the energy labelling, that is limited to performance only and does not take into account the other quality aspects;
- create and implement a cooperation model with other test institutes and certification bodies involved in the non-solar components to make available the needed data with clear restrictions on certified product data.

In general the advice would be to play an active role in the coming developments surrounding the implementation of the energy labelling as a means to safeguard the values represented by the Solar Keymark .

6 Future developments

6.1 Known issues

Now that all relevant documents of the regulation have been published, we can conclude by observing that there remain many errors, ambiguous text and unfavourable issues. Part 2 of the document, describing the procedures in detail, points out all known issues and recommends how to work with this. It may be expected that new issues will arise, when more and more people start working with the regulation.

All in all, it will prove to be impossible to fully comply with all that is required. As a result, people will find solutions for these issues in order to meet the requirements as much as possible.

6.2 The CEN mandate 495

Currently, details of the method are described and published by the European Commission in the so-called transitional methods. Although these documents have a formal status, they describe the methods in a very succinct manner with little concern for details and nuances. Presently, these publications are the only reference that we have regarding the applied methods.

The intention is to replace the published transitional documents by harmonized standards as soon as possible. This would give the solar thermal sector a considerably better formal reference towards the applied methods, than currently is the case. However, this will take time and is not expected to be concluded before September 2015.

Moreover, the revisions of the standards will highlight all the errors, ambiguities in the text and unfavourable issues. It is not likely that a CEN technical committee will agree on a revision that is erroneous or not in agreement with the standards or the perception of the members of that committee. As a result the harmonization will take (considerable) time and we may expect changes in the methods afterwards. Consequently, the validity period of the transitional document will be extended and possibly up to the date of the first revision of the regulations.

6.3 Next phases of the regulation

The current regulations explicitly lay down the timetable to which the requirements must adhere in order to facilitate future product improvements and to phase out not optimally performing products. The timetable differs for each specific regulation.

Table 6 - time table for tightening the requirements

2015				2016	2017				2018	
15/9	15/9	26/9	26/9		15/9	15/9	26/9	26/9	26/9	26/9
Phase 1					Phase 2				Phase 3	
CDR 811/2013 Energy label Space heating & combination heaters	CDR 812/2013 Energy label Water heating & hot water storage tanks	CDR 813/2013 Ecodesign Space heating & combination heaters	CDR 814/2013 Ecodesign Water heating & hot water storage tanks		CDR 811/2013 Energy label Space heating & combination heaters	CDR 812/2013 Energy label Water heating & hot water storage tanks	CDR 813/2013 Ecodesign Space heating & combination heaters	CDR 814/2013 Ecodesign Water heating & hot water storage tanks	CDR 813/2013 Ecodesign Space heating & combination heaters	CDR 814/2013 Ecodesign Water heating & hot water storage tanks

Note: the revision date for phase 3 energy labelling are not known.

Each new phase for the energy labelling will remove lower classes and add higher classes. For Ecodesign the minimum requirement will be tightened.

6.4 Date first revision

Nothing has formally been mentioned about an expected date for the first revision. However, since many concerned parties have already complained about the many errors in the regulation, an early first revision may be expected.