



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649905



Messina, 20th April 2017



SOLAR THERMAL AND ENERGY PACKAGE LABELING

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WORKSHOP

New Generation of Solar Cooling and Heating Systems

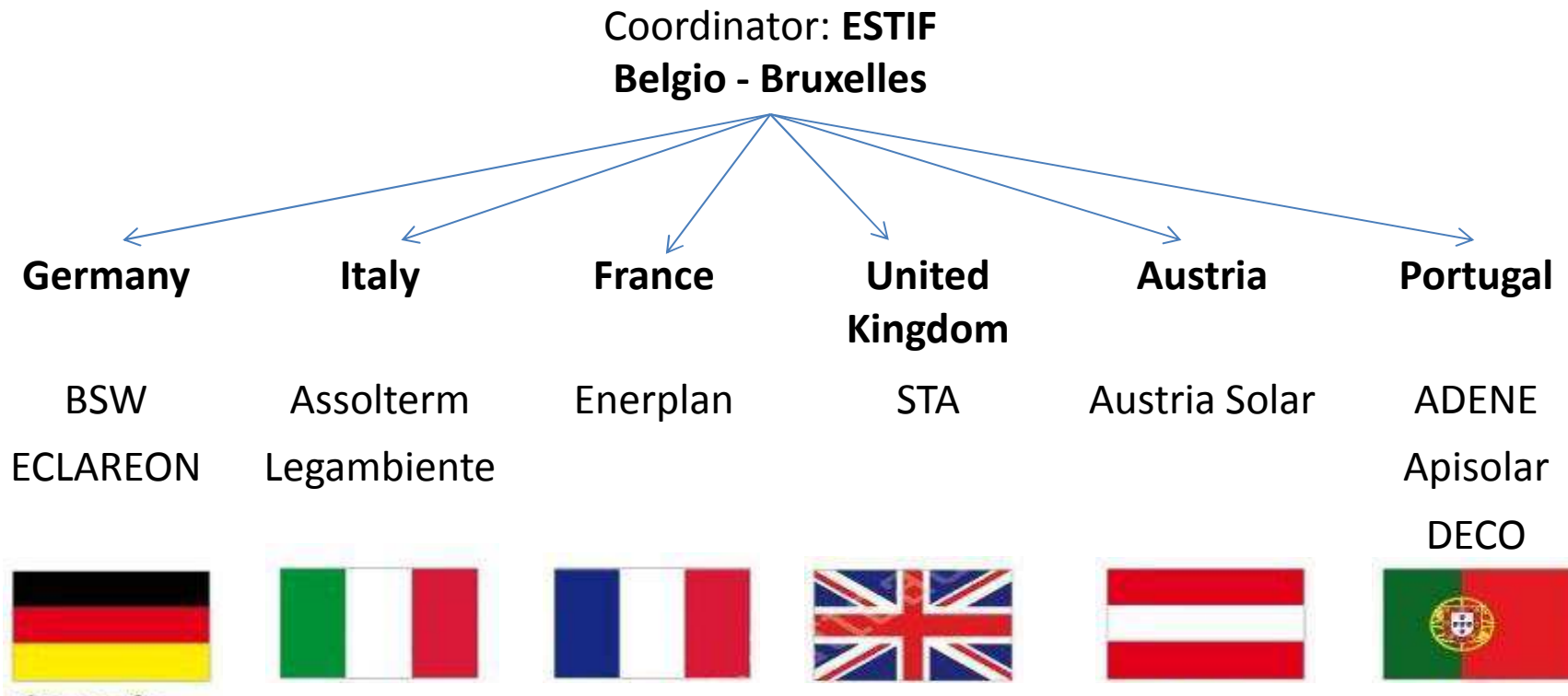
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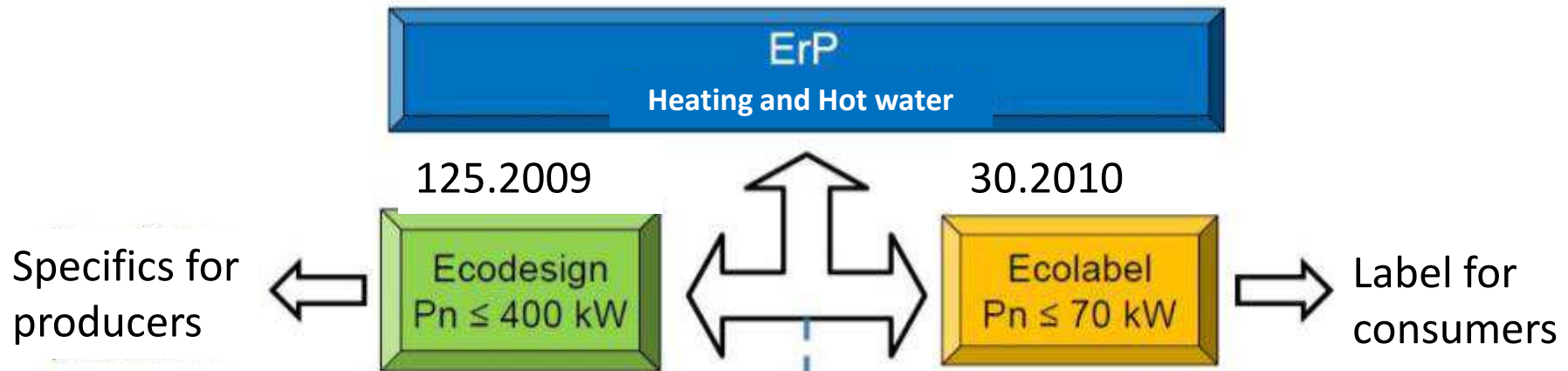
INTRODUCTION: The Label Pack A+ Project



PURPOSE

FACILITATE THE INTRODUCTION OF ENERGY LABEL PACK AND ITS DEVELOPMENT

STANDARD REFERENCES: Directive ErP 2009.125.CE, 2010.30.UE



From 26 september 2015
Products for HEATING and/or HOT WATER, up to 70 kW,
place on the market in Europe have to be supply with
ENERGY LABEL;
The real NEWS is the **ENERGY PACKAGE LABEL**
For systems including heater and other equipments



ENERGY LABEL: What is it about?

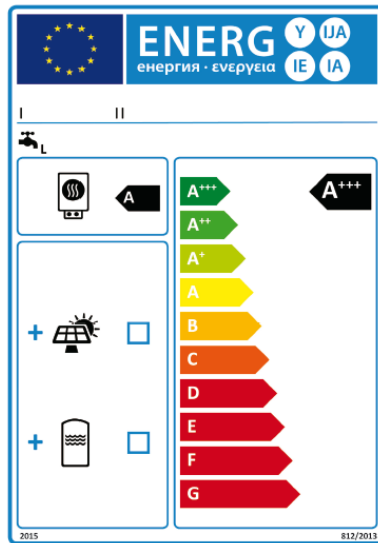
- ✓ It promotes the development of more **efficient** and environmentally **friendly** technologies;
- ✓ It promotes **transparency** of the information, being standardized, and the easier **understanding** of the energy performance;
- ✓ It helps the **consumer** to choose between various solutions the one that is more efficient.

ENERGY LABEL PACK: Types

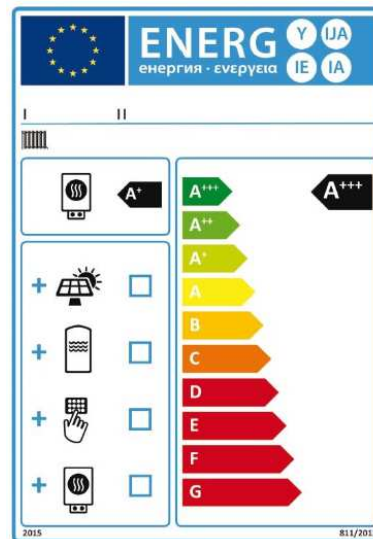
LabelPack **A+**



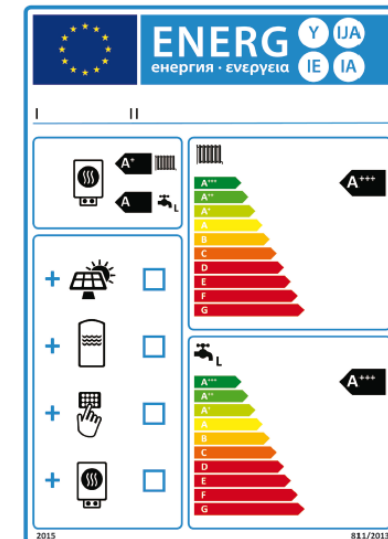
Hot Water



Heating

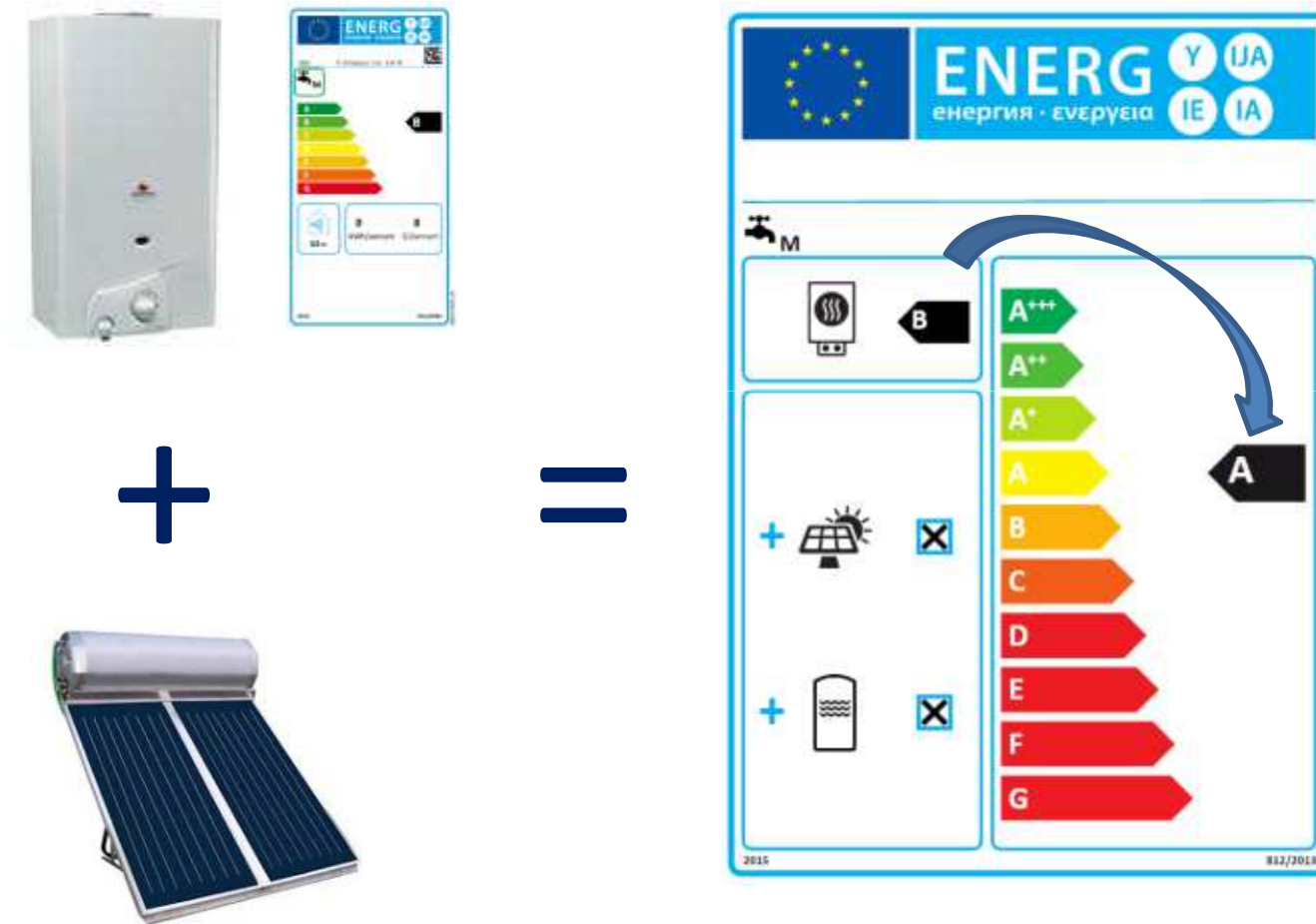


HW + Heating



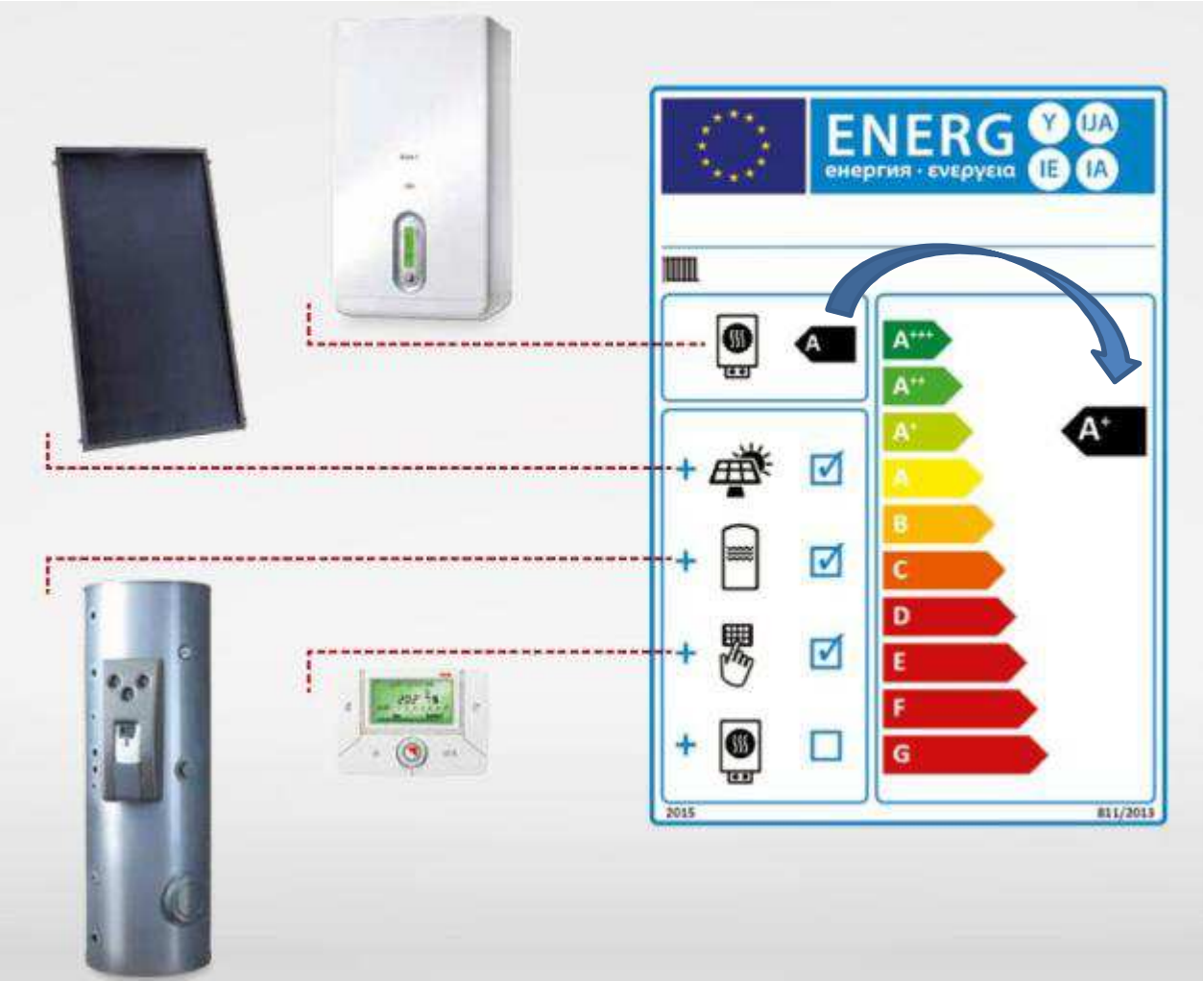
ENERGY PACKAGE LABEL:

Example of label for **HOT WATER?**



ENERGY PACKAGE LABEL:

Example of label for HEATING SYSTEM?



ENERGY PACKAGE LABEL: State of the art

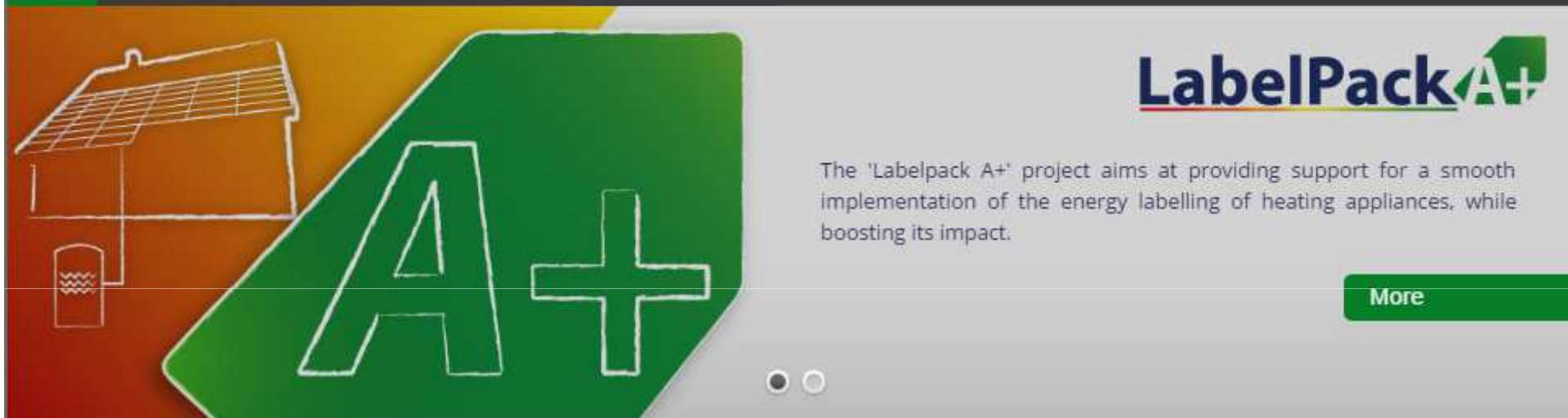
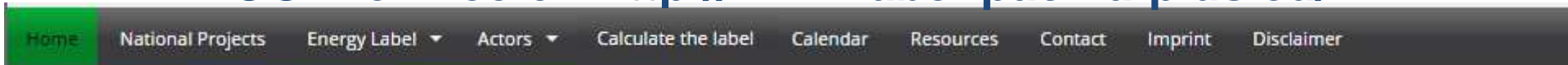


- The energy label started 1,5 years ago (09/15)
 - It is still **little known** and applied but
 - It is an **important way** to promote solar thermal and realization of efficient plants
 - The low application of the energy package label is due to the poor information and mostly to lack of control by the market surveillance entity. About this issue we are discussing at the European level in order to have a **real** and not formal **requirement** of the energy label.

TOOL LABELPACK A+:

Link to the website and quick overview

TOOL for free on <http://www.label-pack-a-plus.eu/>



Interested in LabelPack A+? We have resources for all the supply chain stakeholders.

Upcoming Events

There are no upcoming events at this time.

This project is lead by



Supplier



Dealer



System Designer



Installer



End-user



SECOND PART

Label Pack and Solar Thermal

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COMMENTS ON CALCULATION:

The influence of the solar contribution



□ The heating package energy efficiency

dependes from different factors, which are:

1. Seasonal energy efficiency of pref. boiler η_{pref}
2. Efficiency of Temperature Control (Class) f_{contr}
3. Prated of preferential boiler P_{nom} (boiler,etc.)
4. Area and efficiency of solar system A_{coll} η_{col}
5. Capacity and efficiency of tank V_{ser} f_{tank}



The Solar contribution is

12 * A_{coll} / P_{nom}

6 * A_{coll} / P_{nom}

$$\eta_{insieme} = \eta_{pref} + f_{contr} + \left(\frac{26.75}{P_{nom}} A_{coll} + \frac{10.45}{P_{nom}} V_{ser} \right) \cdot c \cdot \eta_{col} \cdot f_{tank}$$

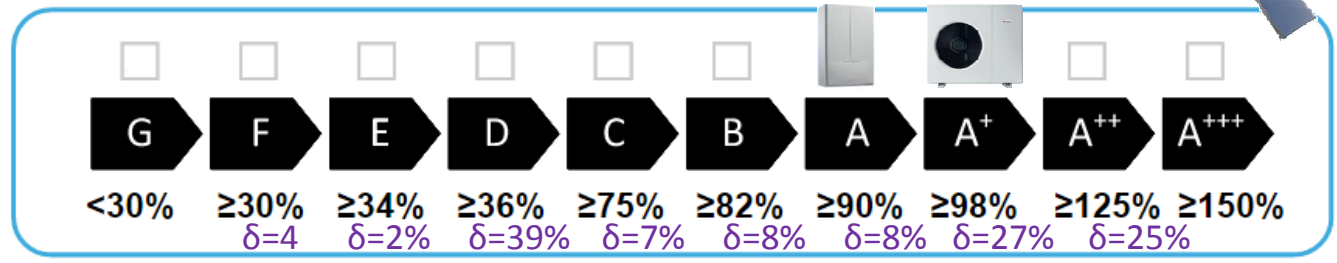
Gas boiler 90÷95% 1÷5%

Heat Pump 100÷120%

Irrelevant

0,9/0,45 0,81÷0,95

0,5÷0,7



CASE STUDY FOR HEATING:

Solar + Gas boiler and different tank volume

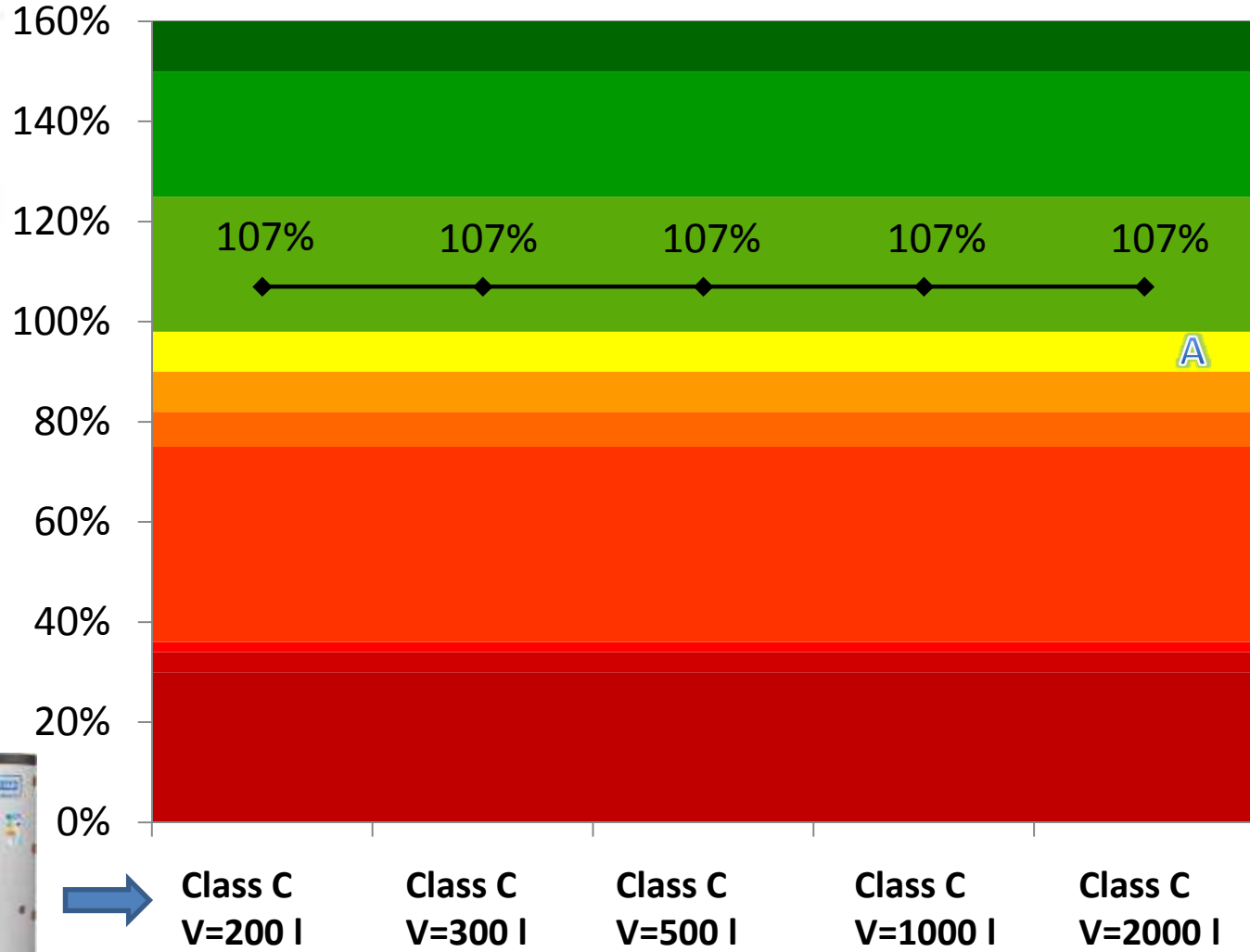


η

$\times 10$
 $\eta = 0,59$
 $S_a = 2,22 \frac{m^2}{coll}$



P = 21 KW
 $\eta = 93\%$
 Class A



- A+++
- A++
- A+
- A
- B
- C
- D
- E
- F
- G
- Valori

A



COMMENTS ON CALCULATION: Influence of the power on the efficiency



$\eta = 98\%$

Class A+

x 5

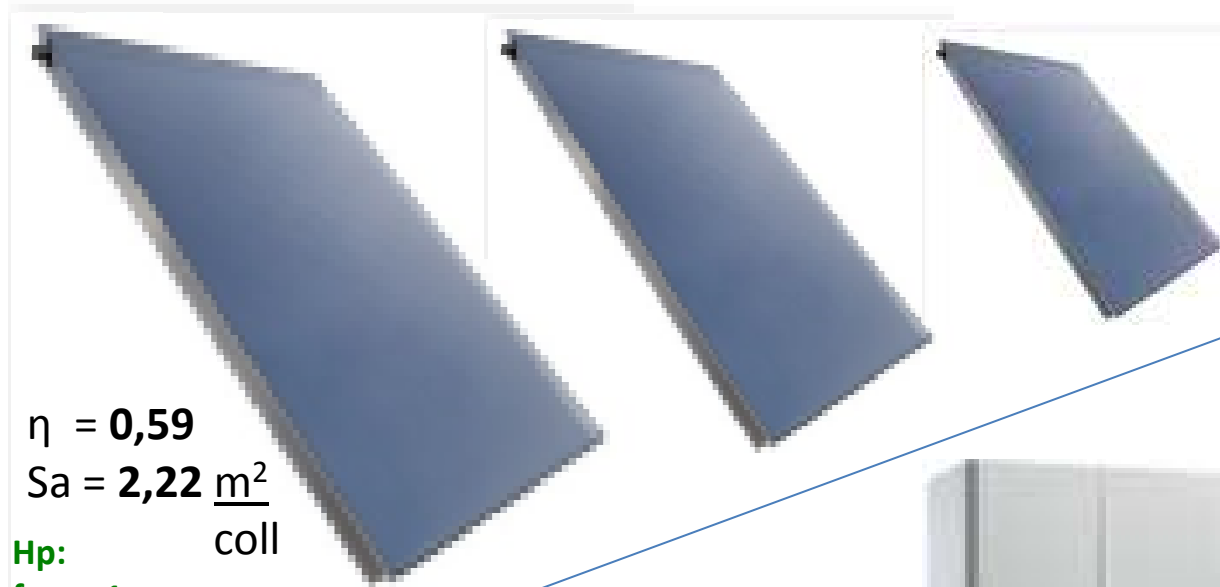


$c=0,9$

x 2

x 3

x 4



$\eta = 0,59$

$S_a = 2,22 \frac{m^2}{coll}$

Hp:

$f_{contr} = 1$

$V_{tank} = 200 l$

$f_{tank} = 0,83(C)$

$\eta = 93\%$

Class A



Pn= 12 kW



Pn= 18 kW



Pn= 24 kW

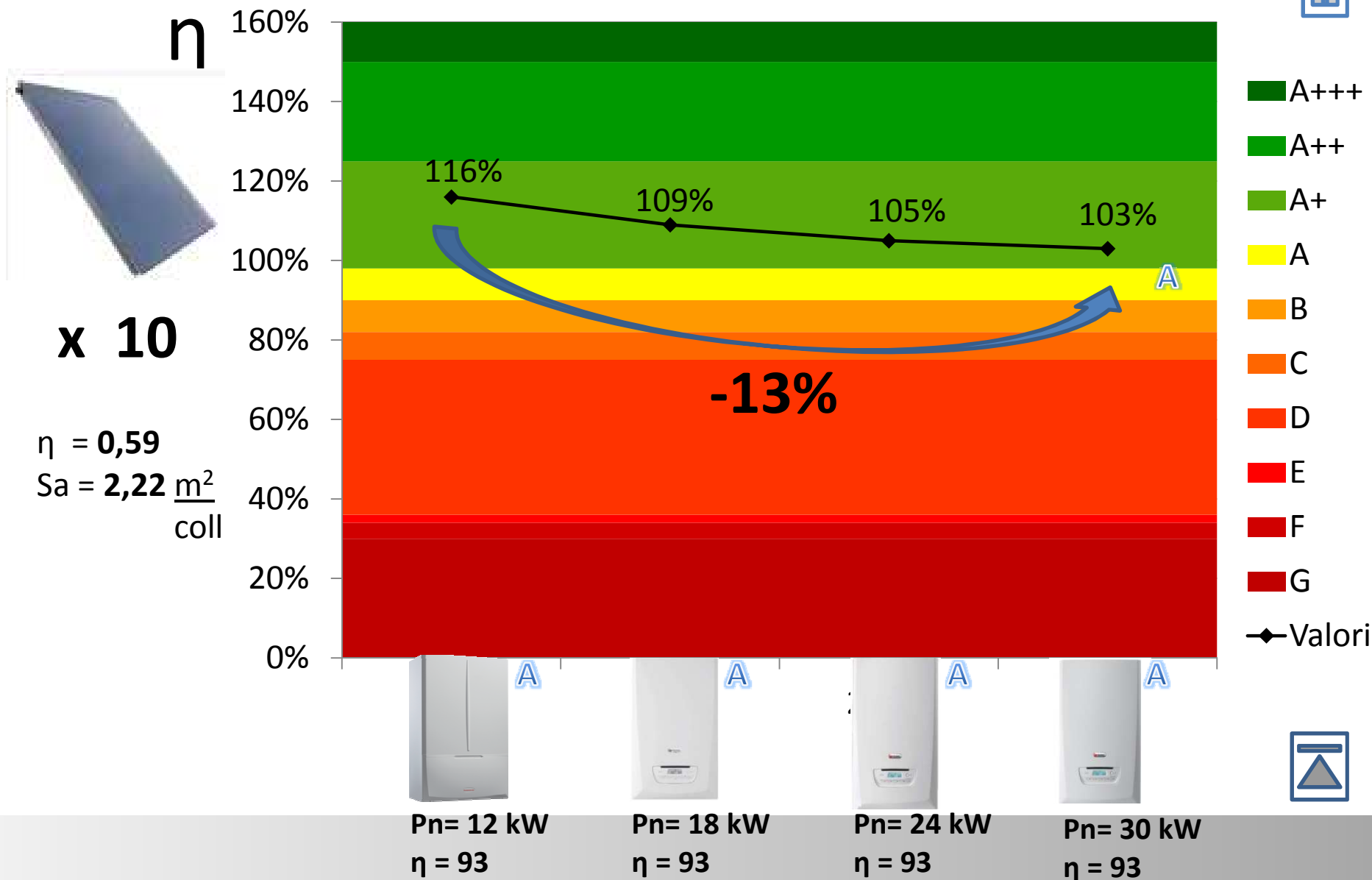


Pn= 30 kW



CASE STUDY FOR HEATING:

Solar + Gas boiler and different power rated



COMMENTS ON CALCULATION:

Influence of the power on the efficiency

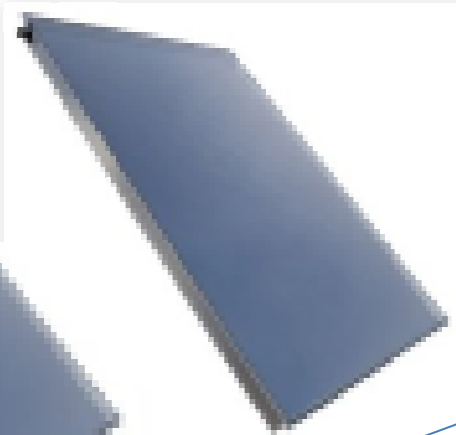
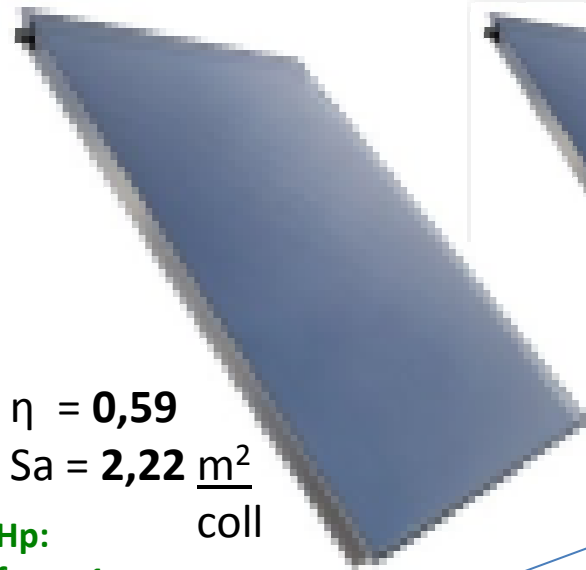


x 2

x 3,5

x 5

x 7



$\eta = 0,59$

$S_a = 2,22 \frac{m^2}{coll}$

Hp:

$f_{contr} = 1$

$V_{tank} = 200 l$

$f_{tank} = 0,83(C)$

$\eta = 116\%$

Class A+

$c = 0,45$

$\eta = 110\%$

Class A+



Pn= 5 kW



Pn= 9 kW



Pn= 12 kW

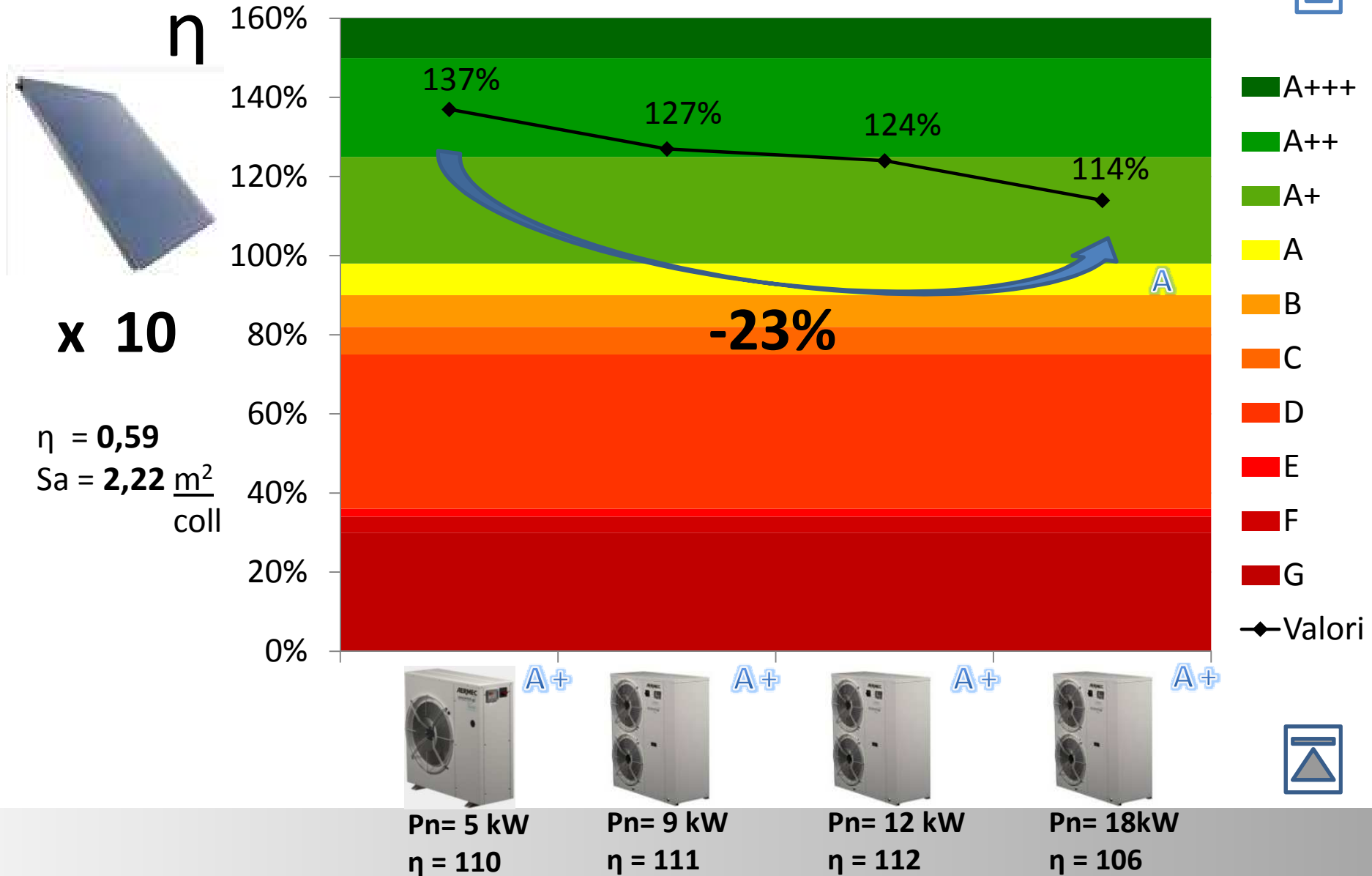


Pn= 18 kW



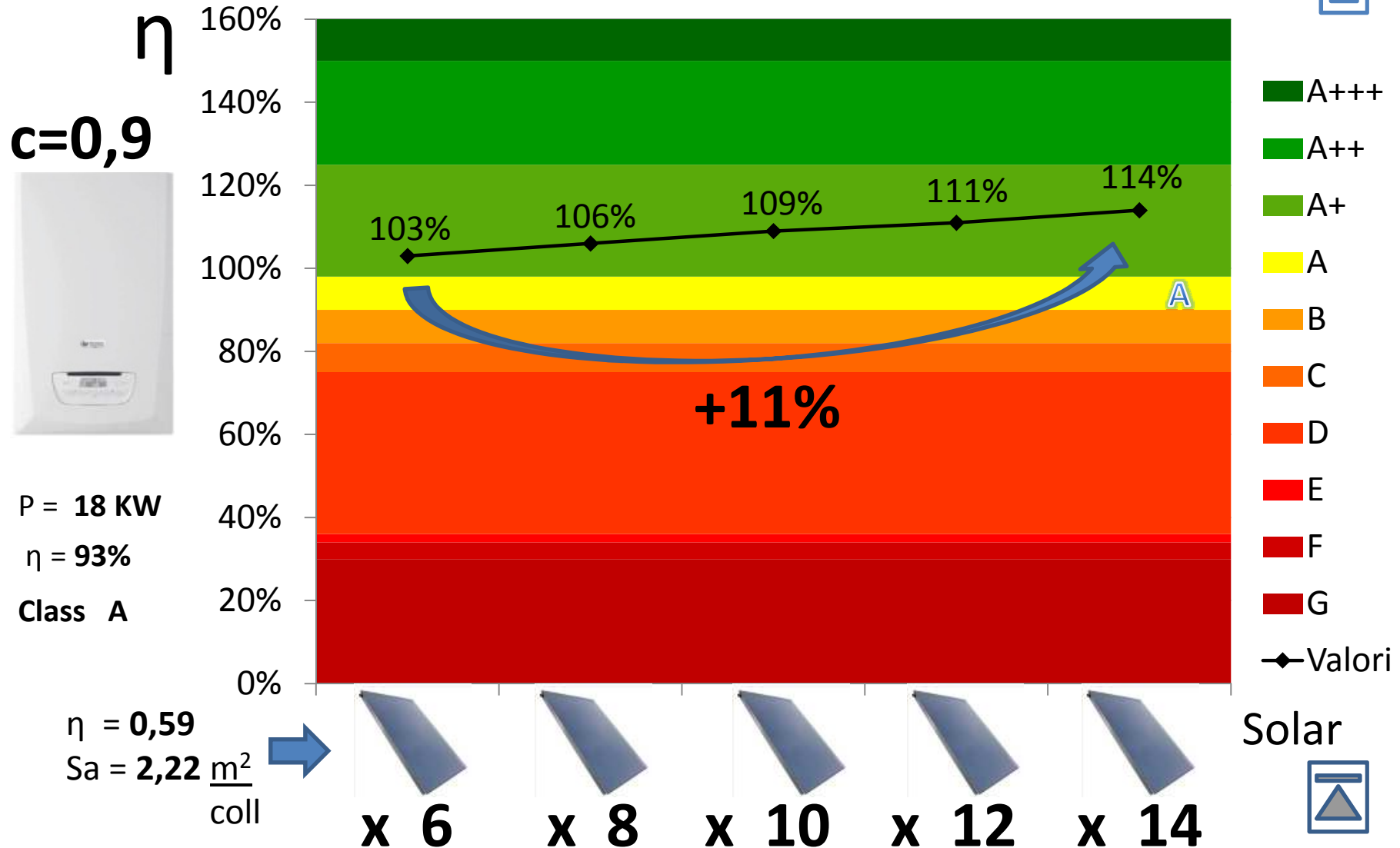
CASE STUDY FOR HEATING:

Solar + Heat Pump and different power rated



CASE STUDY FOR HEATING:

Gas boiler 21 kW and various n. collectors



CASE STUDY FOR HEATING:

Heat pump 18 kW and various n. collectors



$c=0,45$



P = 18 KW

$\eta = 106\%$

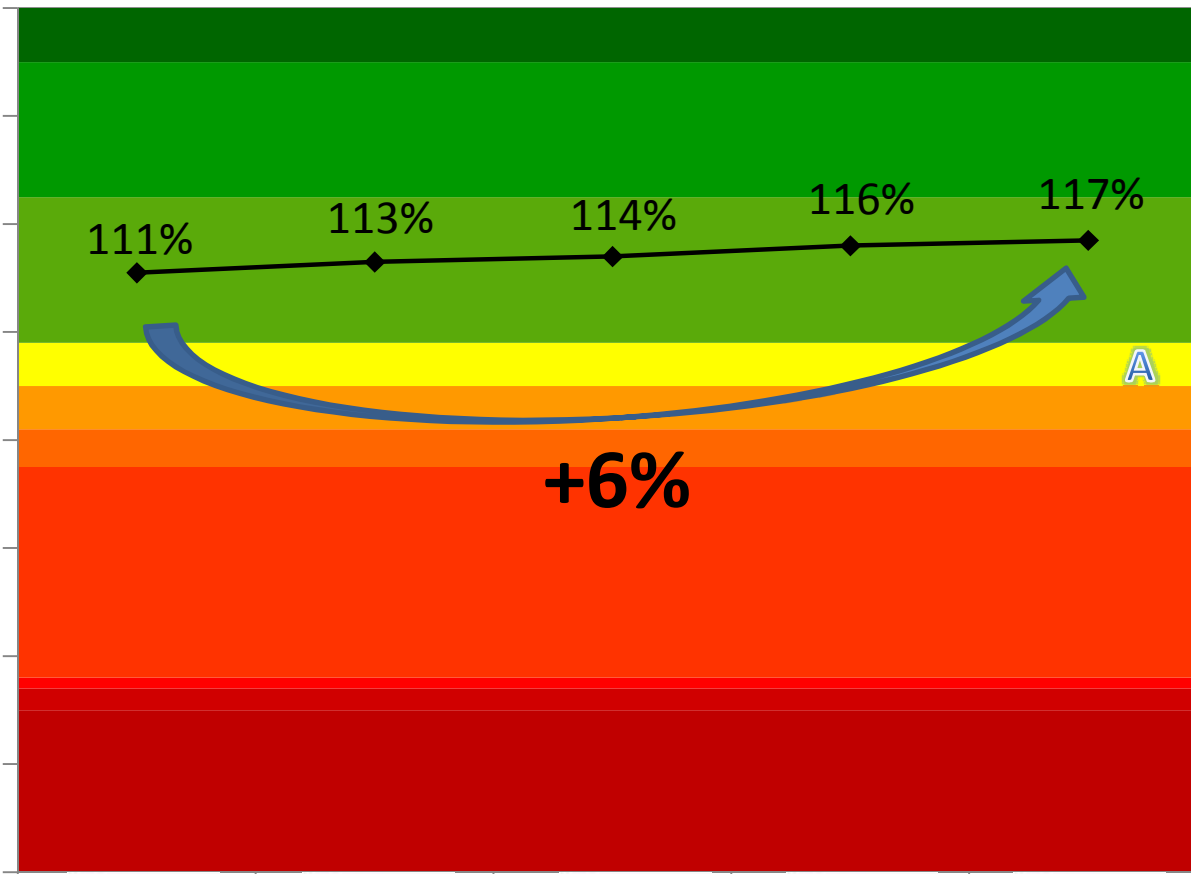
Class A+

$\eta = 0,59$

$S_a = 2,22 \frac{m^2}{coll}$

η

160%
140%
120%
100%
80%
60%
40%
20%
0%



- A+++
- A++
- A+
- A
- B
- C
- D
- E
- F
- G
- Valori

+6%

A

x 6 x 8 x 10 x 12 x 14

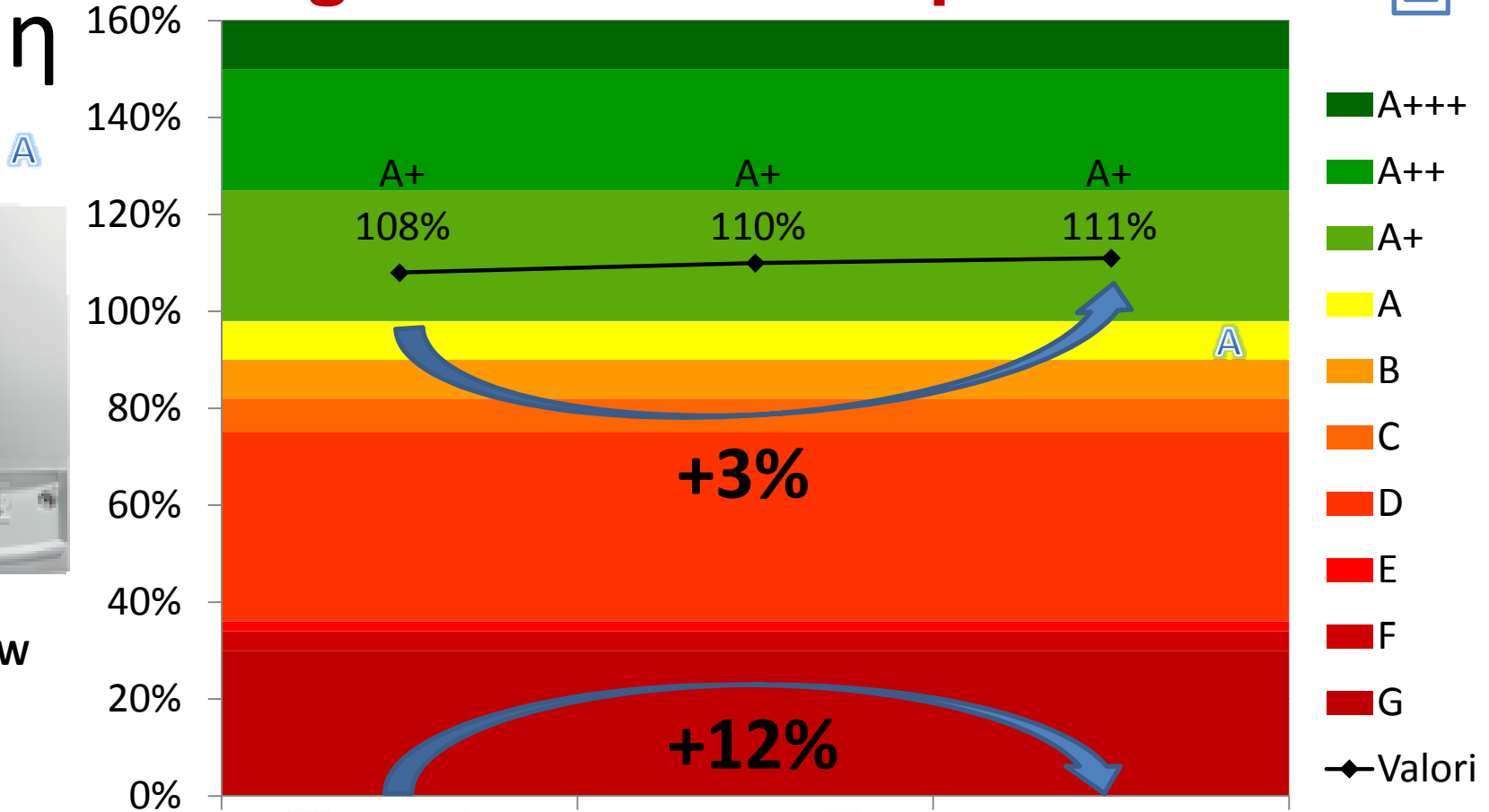
Solar



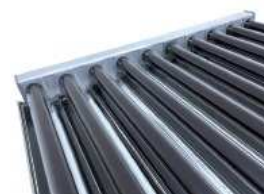
CASE STUDY FOR HEATING: Solar 25 m² + gas heater backup



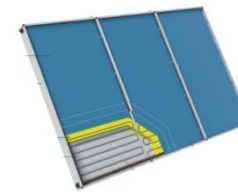
P_n = 21 KW
η = 93%
Class A



m²= 25 η = 59%



m²= 25 η = 67%



m²= 25 η = 71%

Solar



CONCLUSIONS



1. **Adding a solar system to the gas boiler or heat pump, usually it allows to skip an energy class (i.e. A->A+)**
2. **The energy label and calculation method could be certainly improved, through the following proposal:**
 - Resetting the range of the energy classes and erasing the classes A+, A++, A+++ so the top class is just A
 - Reducing the influence of the power rated on the solar contribution (because usually gas boilers are oversized)
 - Displaying the value of the package energy efficiency, on the label, so you can compare systems with same class
3. **The European Commission could decide to take actions in order to increase the use of the package label, but could also decide to cancel it. We hope they will decide to improve the Energy package label.**

Because even though it is no perfect is still a way to promote solar thermal

For further informations:

WEBSITE - <http://www.label-pack-a-plus.eu/italia/>

HELP DESK - labelpackplus@assolterm.it

**THANKS
FOR YOUR
ATTENTION**

Ing. Dario D'Alessandris

DEEPENING SLIDES

ENERGY PACKAGE LABEL : Training data

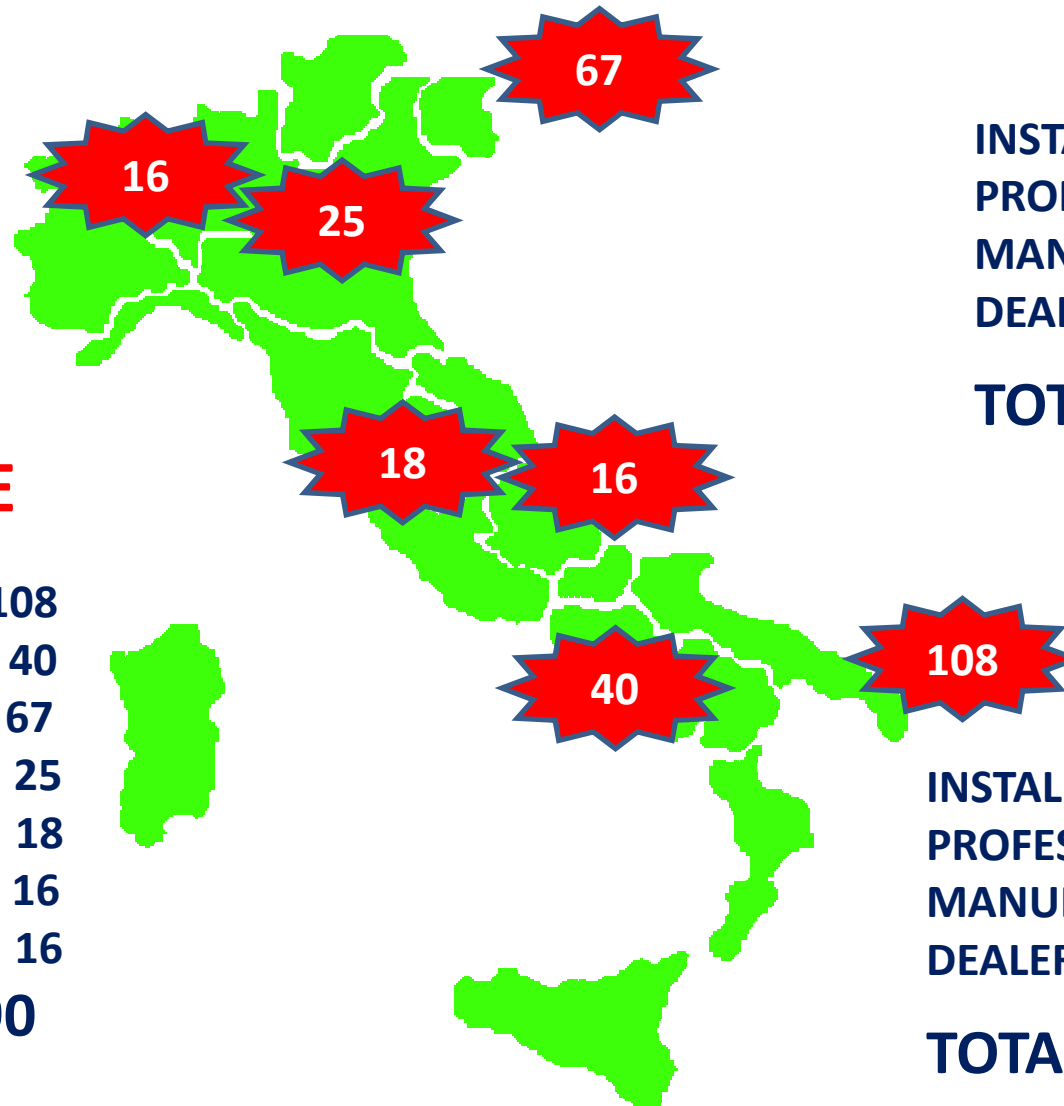


WHO

INSTALLERS	197
PROFESSIONALS	65
MANUFACTURERS	16
DEALERS	12
TOTAL	290

WHERE

LECCE	108
NAPOLI	40
PORDENONE	67
MANTOVA	25
PERUGIA	18
MACERATA	16
MILANO	16
TOTAL	290



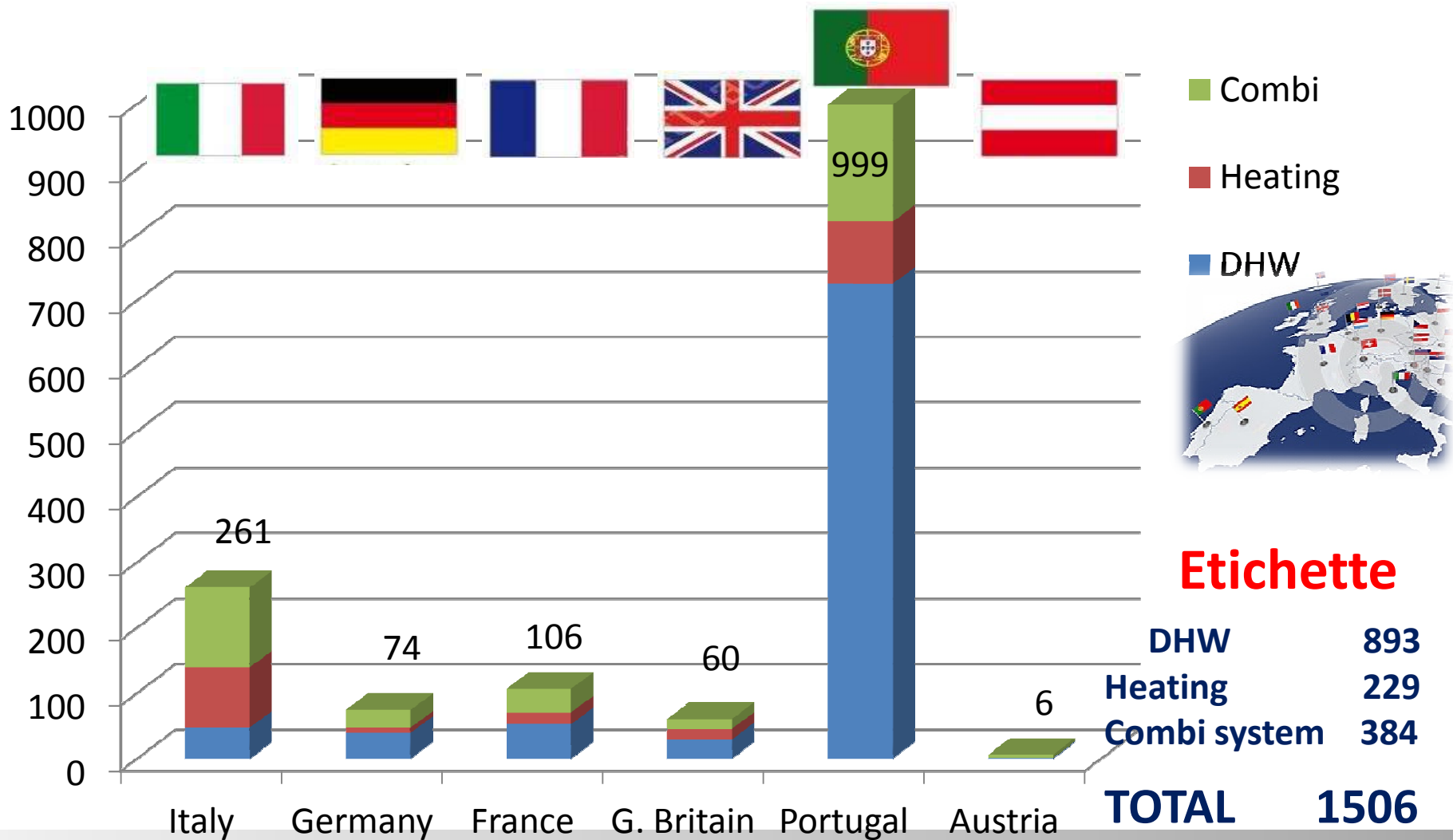
COURSES

INSTALLERS	10
PROFESSIONALS	3
MANUFACTURERS	1
DEALERS	1
TOTAL	14

ENERGY PACKAGE LABEL:

How many labels printed out

Labels printed in different countries from 10/2015 to 03/2017



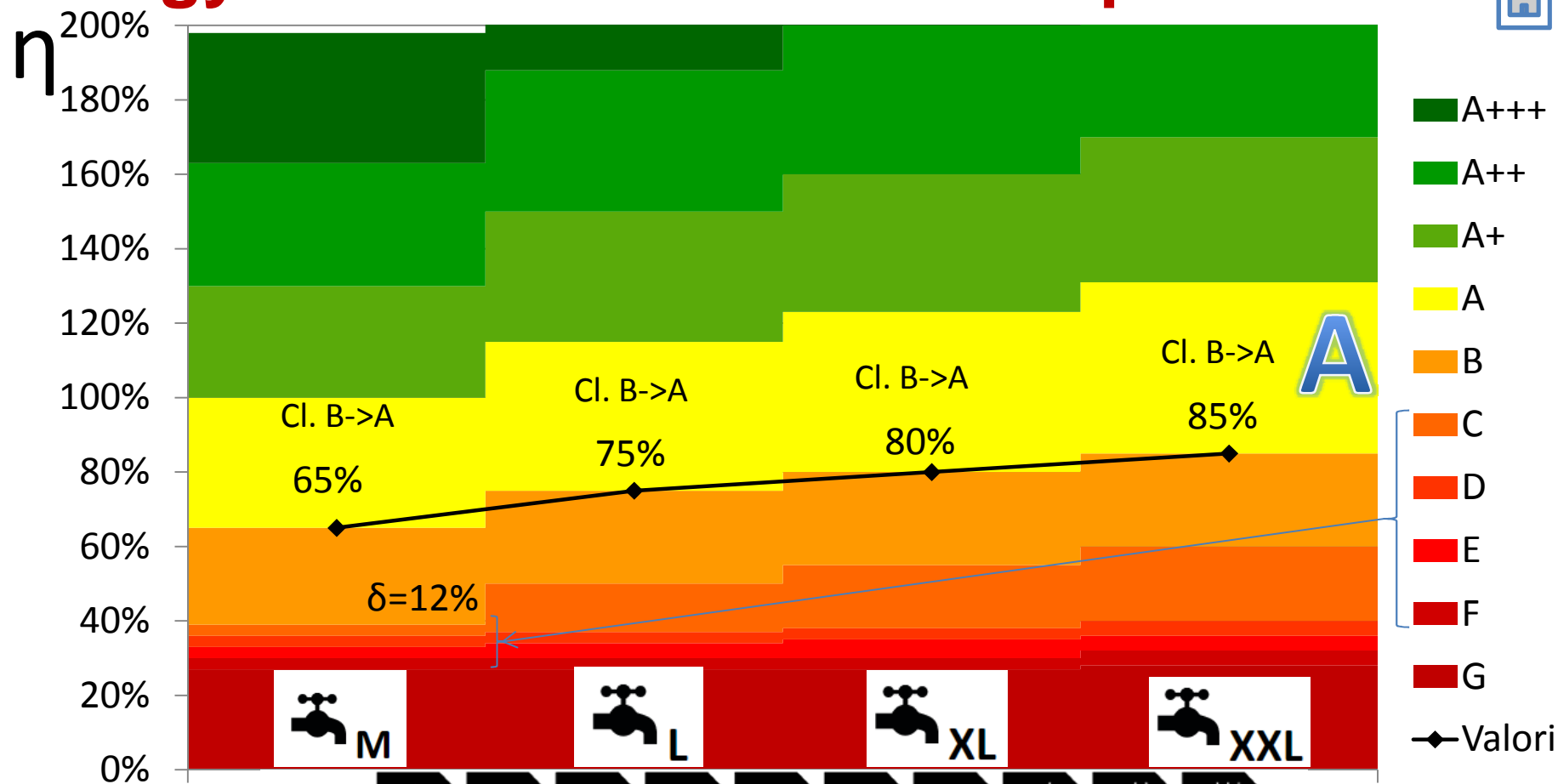
Etichette

DHW	893
Heating	229
Combi system	384

TOTAL 1506

COMMENTS ON ENERGY CLASSES:

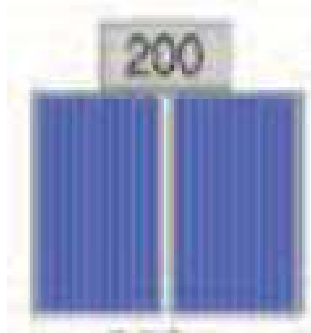
Energy scales for different load profiles



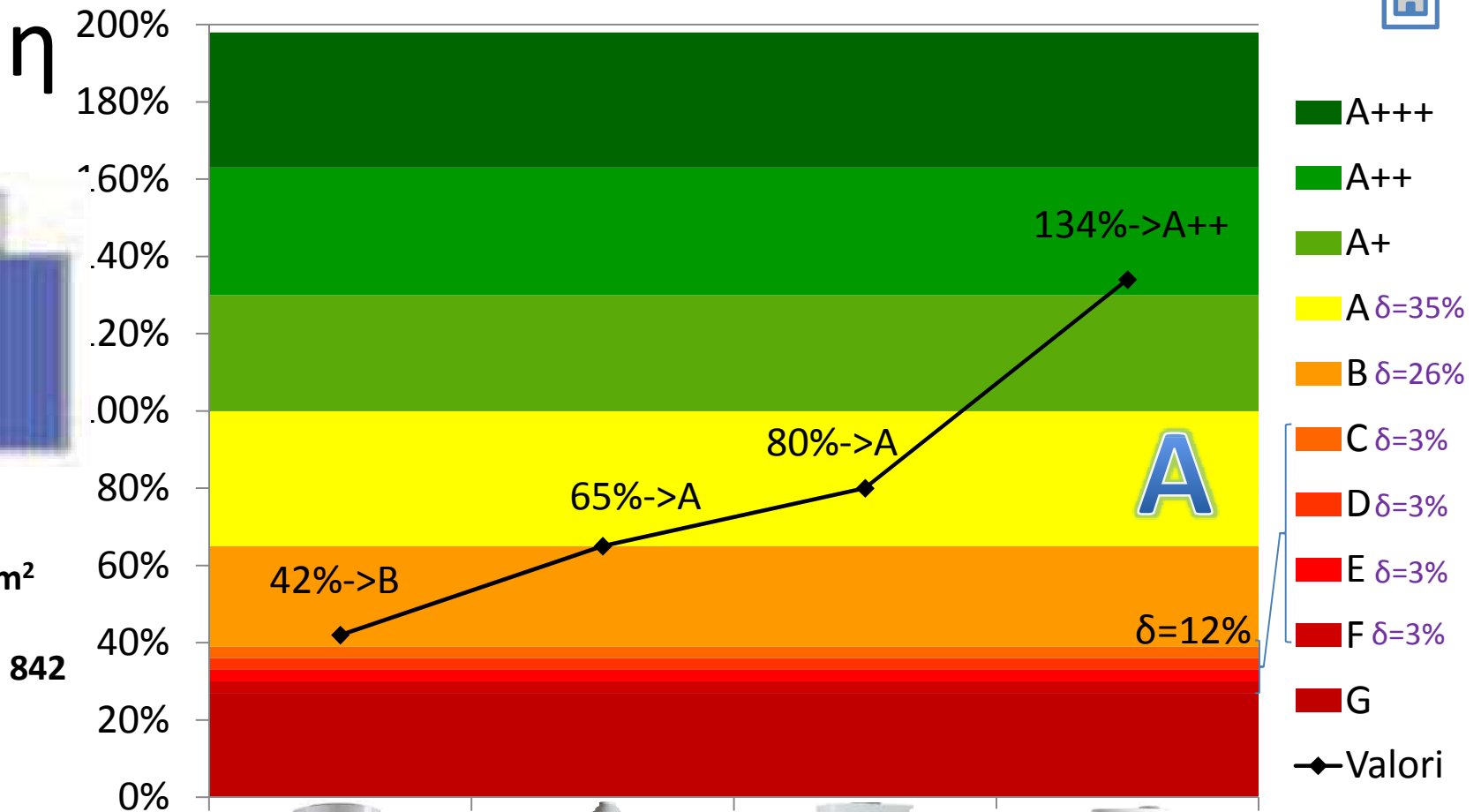
	G	F	E	D	C	B	A	A+	A++	A+++
M	<27%	≥27%	≥30%	≥33%	≥36%	≥39%	≥65%	≥100%	≥130%	≥163%
L	<27%	≥27%	≥30%	≥34%	≥37%	≥50%	≥75%	≥115%	≥150%	≥188%
XL	<27%	≥27%	≥30%	≥35%	≥38%	≥55%	≥80%	≥123%	≥160%	≥200%
XXL	<28%	≥28%	≥23%	≥36%	≥40%	≥60%	≥85%	≥131%	≥170%	≥213%

CASE STUDY FOR HOT WATER:

Basic solar kit and different water heaters



V = 200 lt
 Sa = 4,44 m²
 η = 0,59
 Q_{sol M} = 842
 Q_{aux} = 0



Electricity
80 lt - M



Gas with acc.
80 lt - M



Gas Istantaneous
M



DHW Heat pump
80 lt - M



ENERGY LABEL PACK:

What is it a pack for HOT WATER?



Heater- Conventional hot water

Gas



Electric



Heat Pump



Solar



Tank



ENERGY LABEL PACK: What is it a pack for HEATING?



Preferential heater

Boiler or



Heat Pump or



Cogenerator



Uno o più dei seguenti componenti



Solar



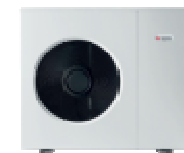
Tank



Control



Supp. heater



ENERGY LABEL PACK:

Example label for COMBINATION HEATER



The image shows a white combination heater unit on the left, connected by a dashed red line to a detailed energy label on the right. The label is titled 'ENERG' and includes the European Union flag, the word 'енергия · ενέργεια', and efficiency classes 'Y IJA' and 'IE IA'. It is divided into two main sections, I and II. Section I shows a boiler icon with a class of 'A' and a solar thermal icon with a class of 'A'. Section II shows a boiler icon with a class of 'A+' and a solar thermal icon with a class of 'A+'. A blue arrow points from the boiler class 'A+' to the solar thermal class 'A+', and another blue arrow points from the solar thermal class 'A+' to the boiler class 'A+'. The label also features a vertical scale of energy classes from A+++ to G, with A+++ at the top and G at the bottom. The label is dated 2015 and 811/2013.

Nell'esempio, il generatore è una caldaia a gas combinata a condensazione che integra un bollitore predisposto per il collegamento al solare termico. Nel sistema è stato inserito un controllo di temperatura di tipo climatico con sonda esterna. Il solare termico supporta entrambe le funzioni di riscaldamento e produzione di ACS.

La classe energetica di partenza è quella dell'apparecchio, dichiarata dal fabbricante e riportata sull'etichetta di prodotto. Sommando ai rendimenti della caldaia i contributi degli altri componenti, si possono ottenere classi energetiche più elevate.

STUDY CASE FOR HOT WATER: Electrical hot water



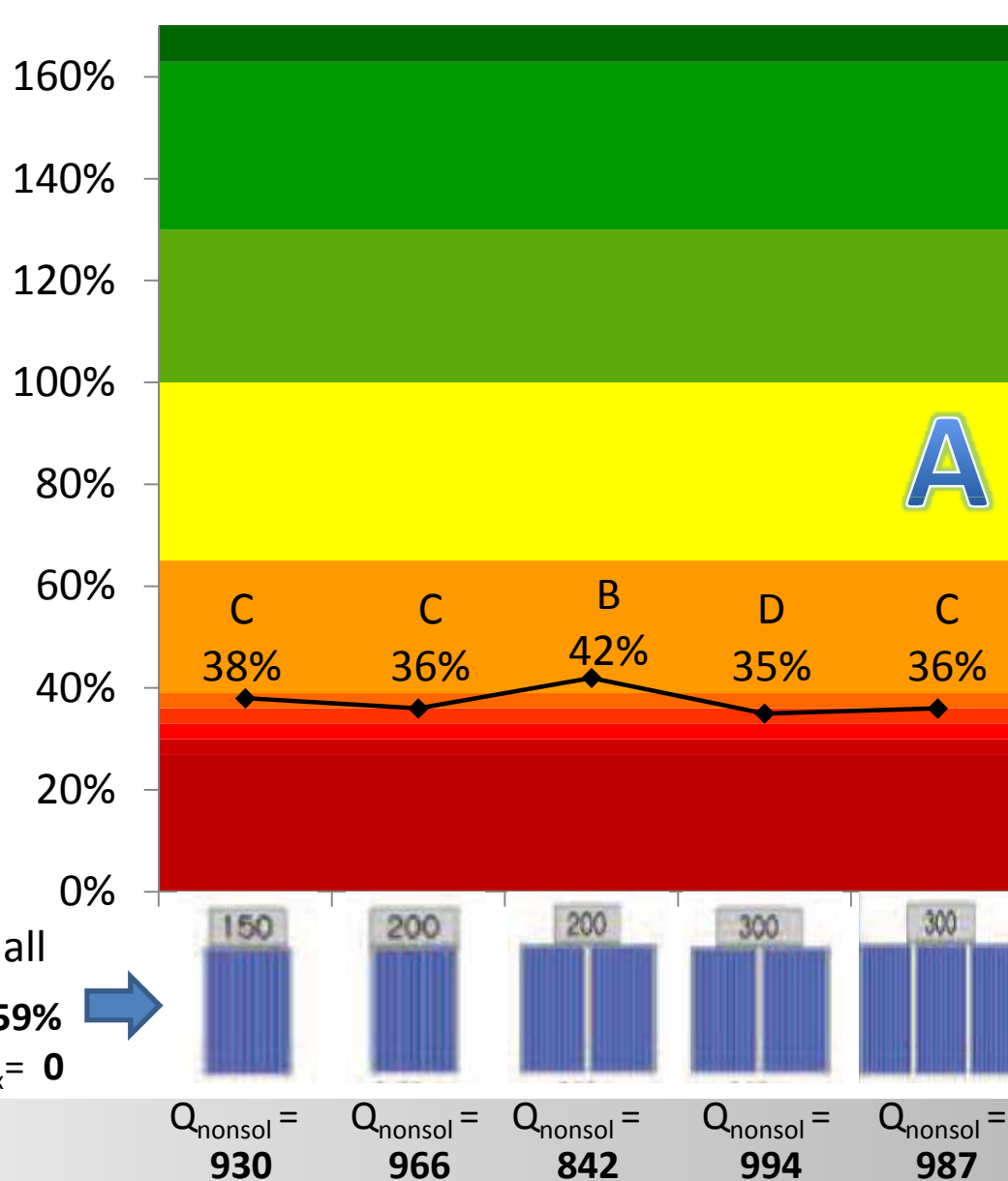
Profilo **M**

$\eta_{Wh} = 34\%$

Classe **D**



For all
 $\eta = 59\%$
 $Q_{aux} = 0$



- A+++ $\geq 163\%$ ($\delta = +\infty$)
 - A++ $\geq 130\%$ ($\delta = 33\%$)
 - A+ $\geq 100\%$ ($\delta = 30\%$)
 - A $\geq 65\%$ ($\delta = 35\%$)
 - B $\geq 39\%$ ($\delta = 26\%$)
 - C $\geq 36\%$ ($\delta = 3\%$)
 - D $\geq 33\%$ ($\delta = 3\%$)
 - E $\geq 30\%$ ($\delta = 3\%$)
 - F $\geq 27\%$ ($\delta = 3\%$)
 - G $< 27\%$ ($\delta = 27\%$)
- ◆ Valori

12%

Solare



$Q_{nonsol} = 930$ $Q_{nonsol} = 966$ $Q_{nonsol} = 842$ $Q_{nonsol} = 994$ $Q_{nonsol} = 987$

STUDY CASE FOR HOT WATER: Gas water heater with accumulation



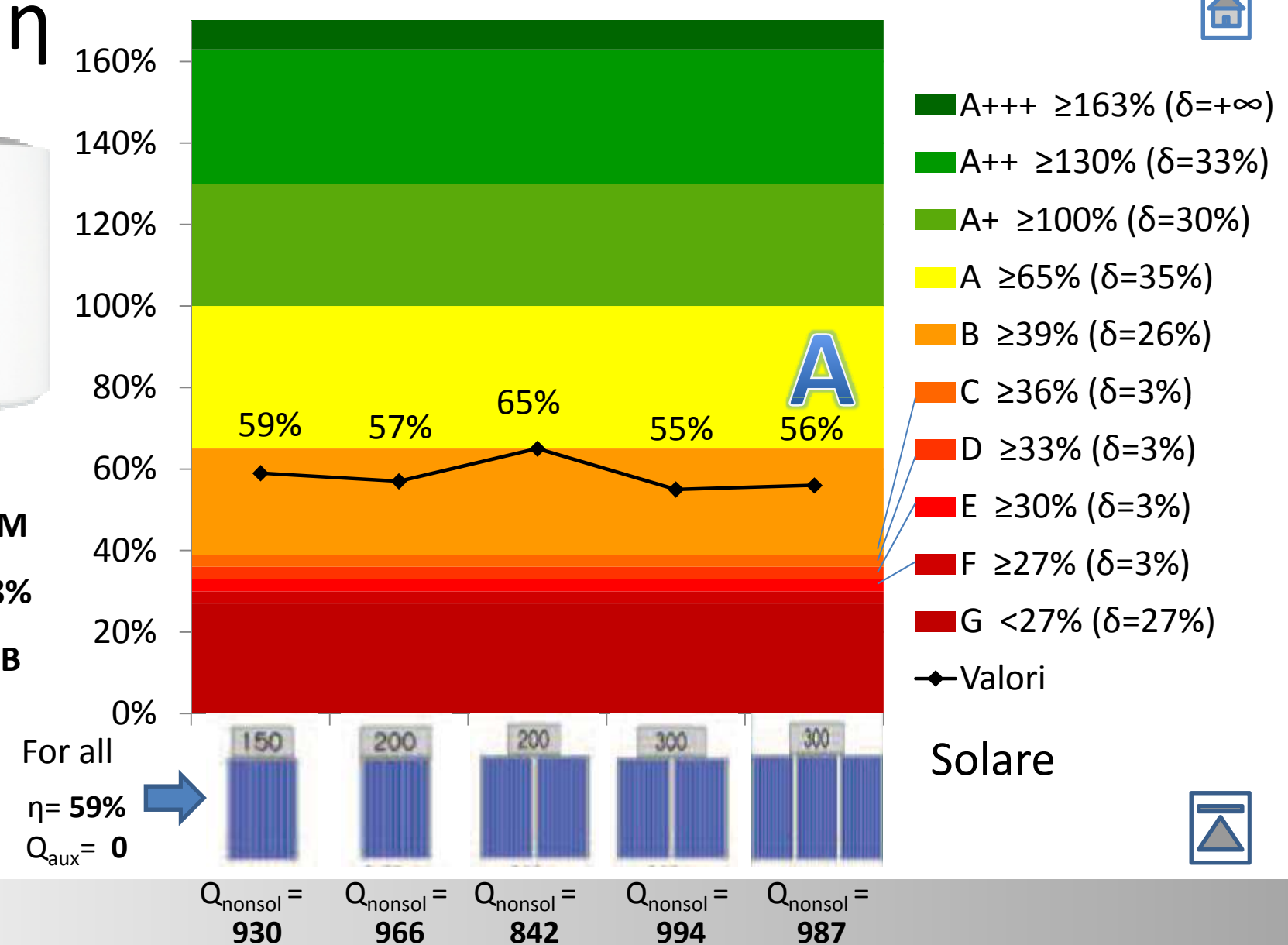
Profilo **M**

$\eta_{Wh} = 48\%$

Classe **B**



For all
 $\eta = 59\%$
 $Q_{aux} = 0$



◆ Valori

Solare



STUDY CASE FOR HOT WATER: Gas water heater instantaneous



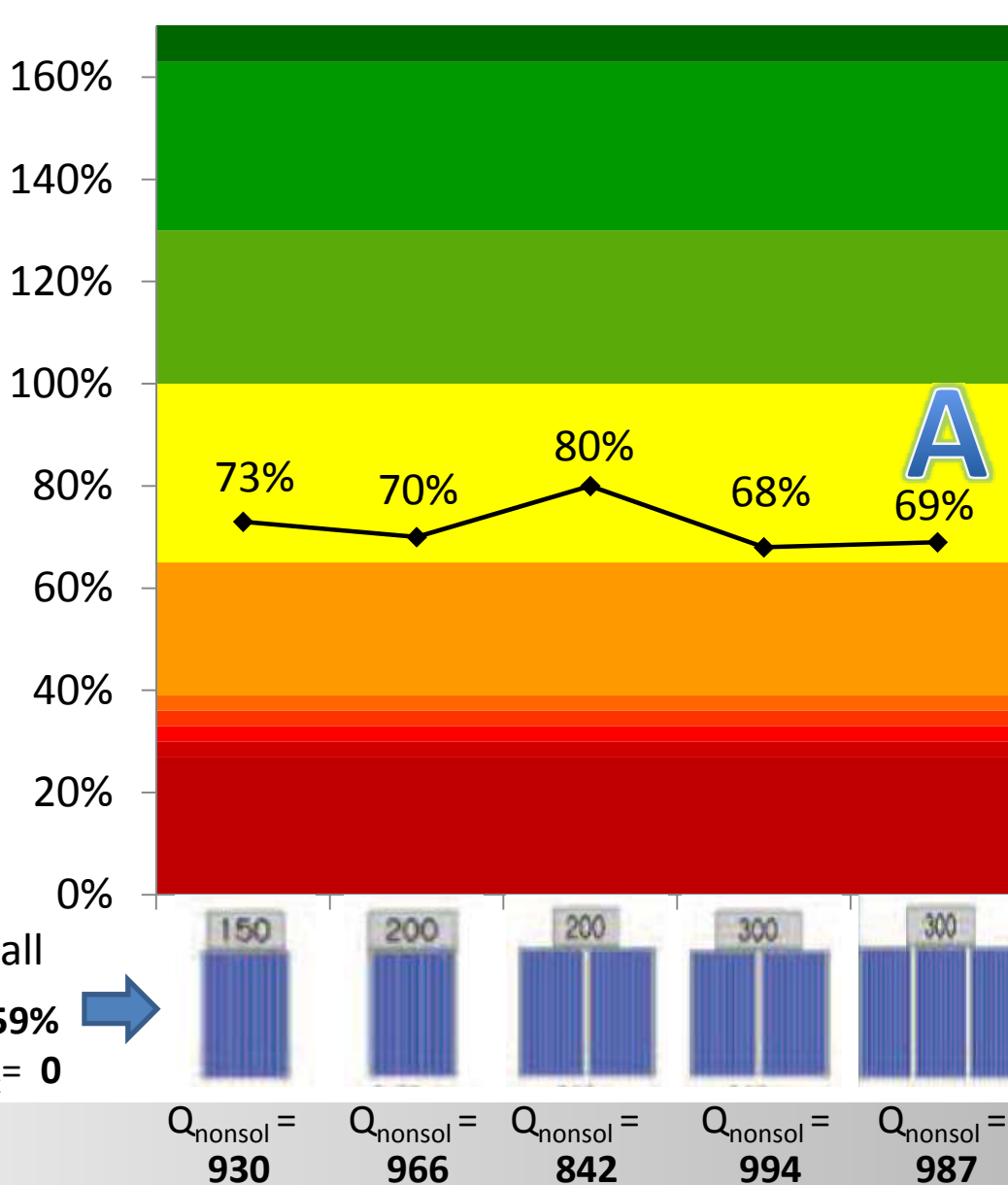
Profilo **M**

$\eta_{Wh} = 57\%$

Classe **B**



For all
 $\eta = 59\%$
 $Q_{aux} = 0$



- A+++ ≥163% ($\delta = +\infty$)
- A++ ≥130% ($\delta = 33\%$)
- A+ ≥100% ($\delta = 30\%$)
- A ≥65% ($\delta = 35\%$)
- B ≥39% ($\delta = 26\%$)
- C ≥36% ($\delta = 3\%$)
- D ≥33% ($\delta = 3\%$)
- E ≥30% ($\delta = 3\%$)
- F ≥27% ($\delta = 3\%$)
- G <27% ($\delta = 27\%$)
- ◆ Valori

Solare



STUDY CASE FOR HOT WATER:

Gas boiler combined with external tank



η 250%

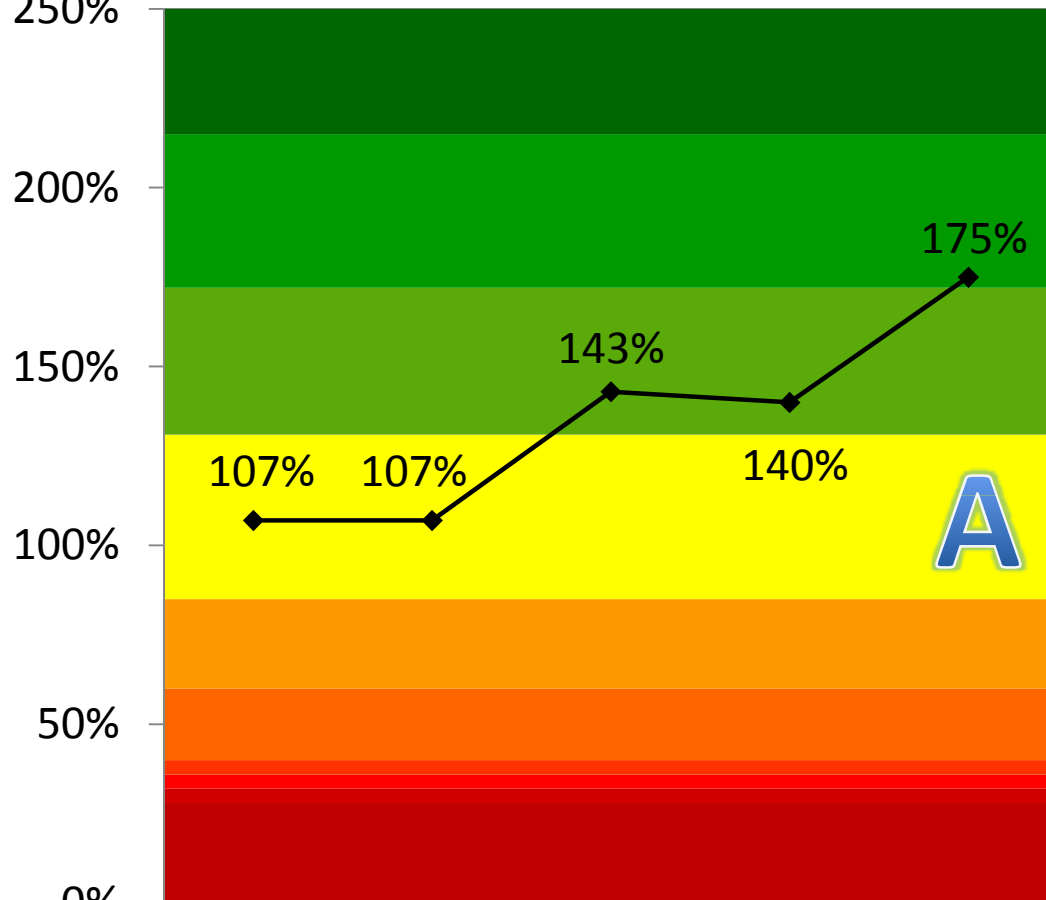


Profilo **XL**

$\eta_{Wh} = 85\%$

Caldaia **Classe A**

Boiler **Classe C**



- A+++ $\geq 200\%$ ($\delta = +\infty$)
- A++ $\geq 160\%$ ($\delta = 40\%$)
- A+ $\geq 123\%$ ($\delta = 37\%$)
- A $\geq 80\%$ ($\delta = 43\%$)
- B $\geq 55\%$ ($\delta = 25\%$)
- C $\geq 38\%$ ($\delta = 17\%$)
- D $\geq 35\%$ ($\delta = 3\%$)
- E $\geq 30\%$ ($\delta = 5\%$)
- F $\geq 27\%$ ($\delta = 3\%$)
- G $< 27\%$ ($\delta = 27\%$)
- ◆ Valori



For all

$\eta = 59\%$

$Q_{aux} = 0$



$Q_{nonsol} = 3273$ $Q_{nonsol} = 3265$ $Q_{nonsol} = 2455$ $Q_{nonsol} = 2495$ $Q_{nonsol} = 1999$

Solare



STUDY CASE FOR HOT WATER: Water heater heat pump



Profilo **XL**

$\eta_{Wh} = 95\%$

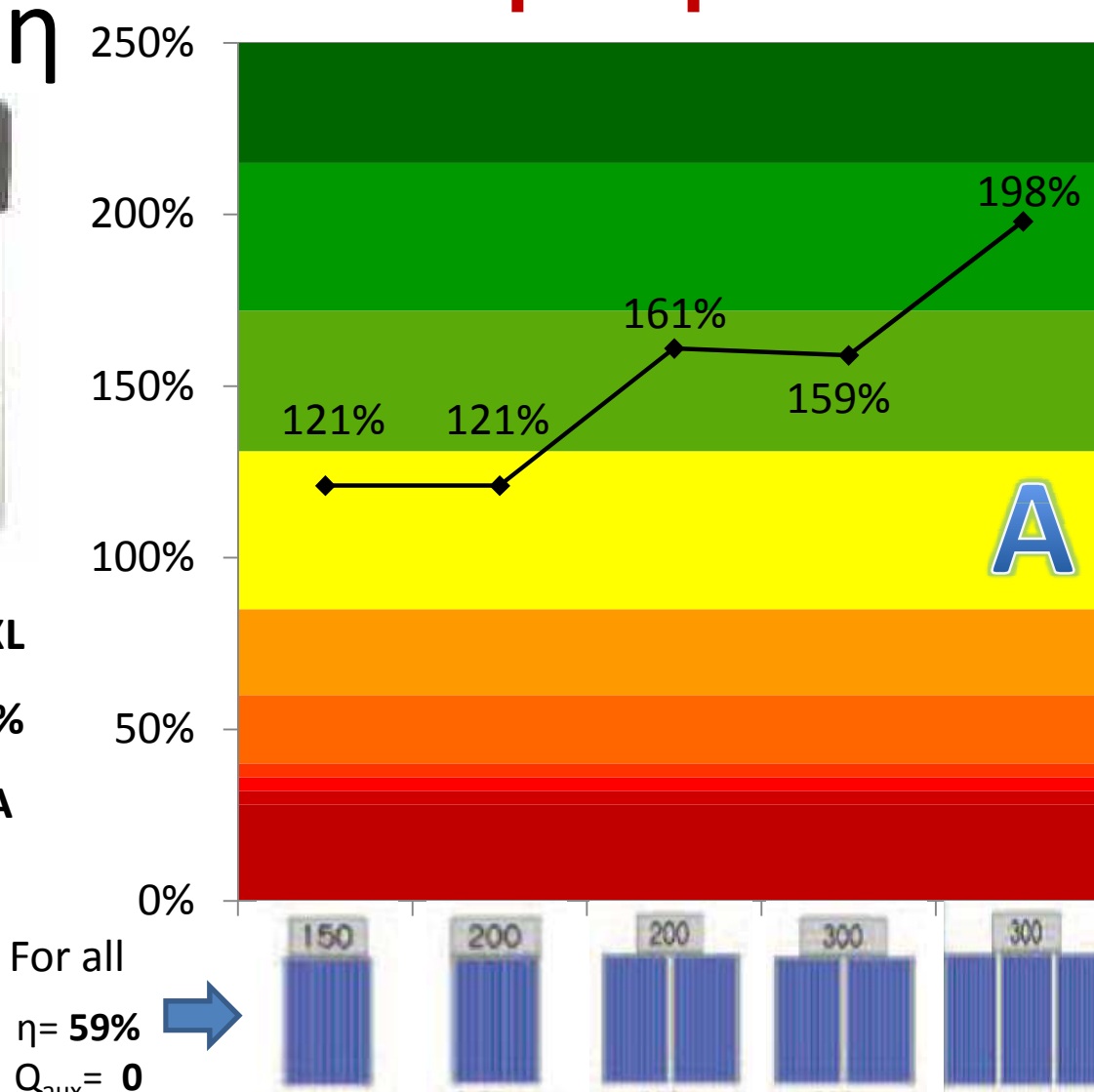
Classe **A**



For all

$\eta = 59\%$

$Q_{aux} = 0$



- A+++ $\geq 200\%$ ($\delta = +\infty$)
- A++ $\geq 160\%$ ($\delta = 40\%$)
- A+ $\geq 123\%$ ($\delta = 37\%$)
- A $\geq 80\%$ ($\delta = 43\%$)
- B $\geq 55\%$ ($\delta = 25\%$)
- C $\geq 38\%$ ($\delta = 17\%$)
- D $\geq 35\%$ ($\delta = 3\%$)
- E $\geq 30\%$ ($\delta = 5\%$)
- F $\geq 27\%$ ($\delta = 3\%$)
- G $< 27\%$ ($\delta = 27\%$)

◆ Valori

Solare



$Q_{nonsol} = 3273$
 $Q_{nonsol} = 3265$
 $Q_{nonsol} = 2455$
 $Q_{nonsol} = 2495$
 $Q_{nonsol} = 1999$

STUDY CASE FOR HEATING:

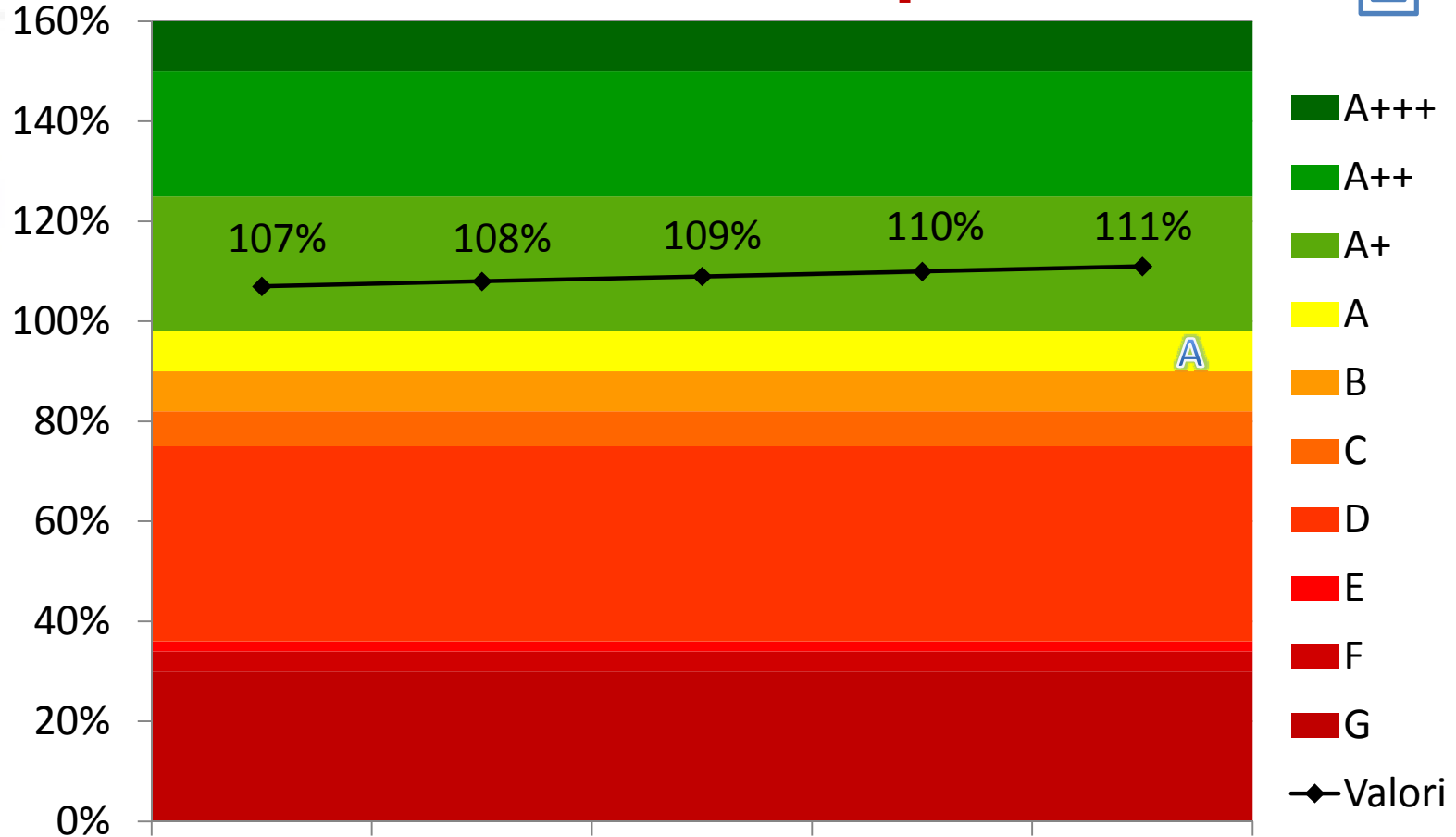
Solar+ Boiler with different temp. control



η
 $\times 10$
 $\eta = 0,59$
 $Sa = 2,22 \frac{m^2}{coll}$



P = 21 KW
 $\eta = 93\%$
Classe A



CL. I

CL. II

CL. V

CL. VI

CL. VIII



Cl= I
 $\eta = +1\%$

Cl= II
 $\eta = +2\%$

Cl= V
 $\eta = +3\%$

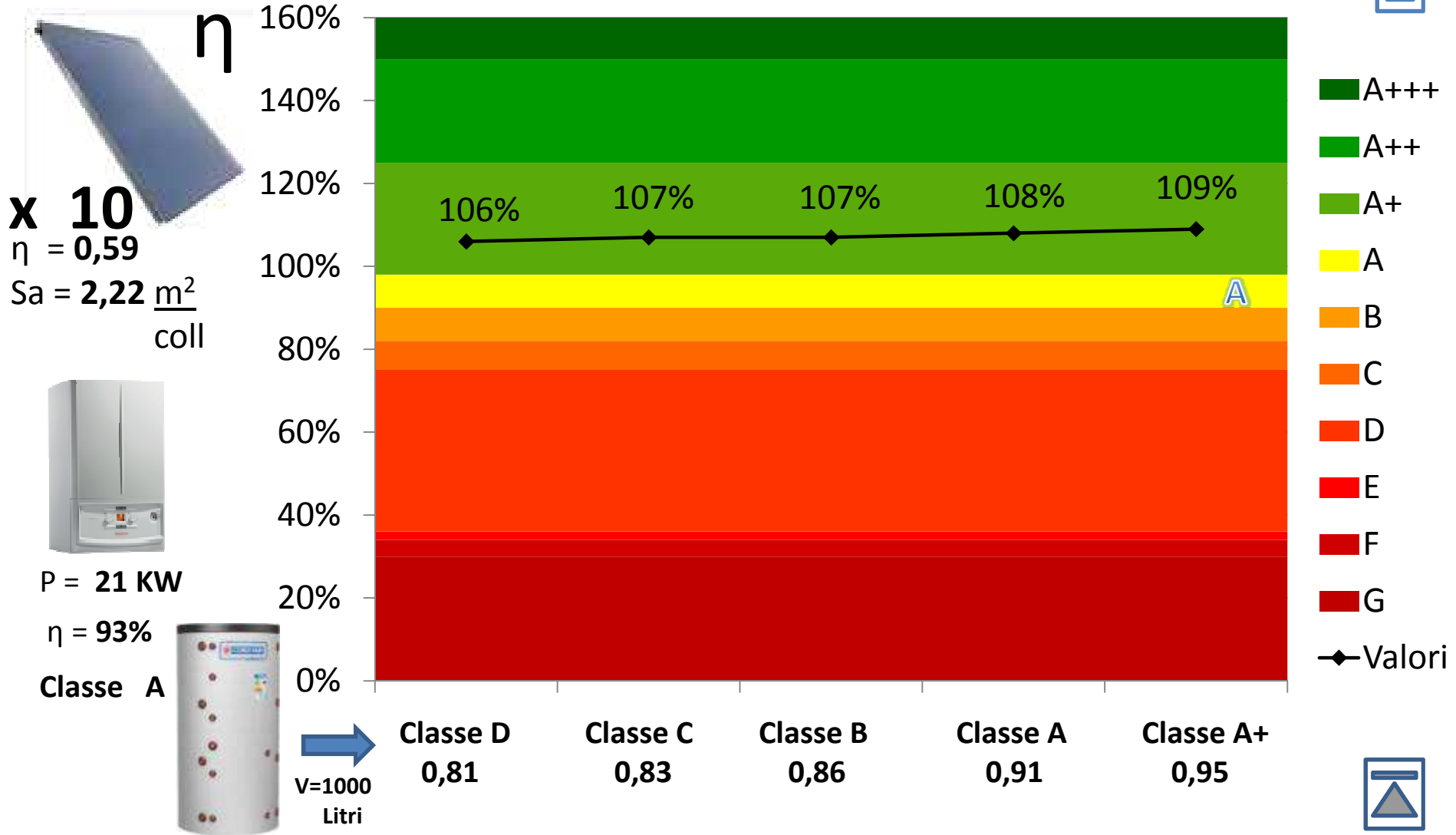
Cl= VI
 $\eta = +4\%$

Cl= VIII
 $\eta = +5\%$

◆ Valori

STUDY CASE FOR HEATING:

Solar + Boiler and various class of tank

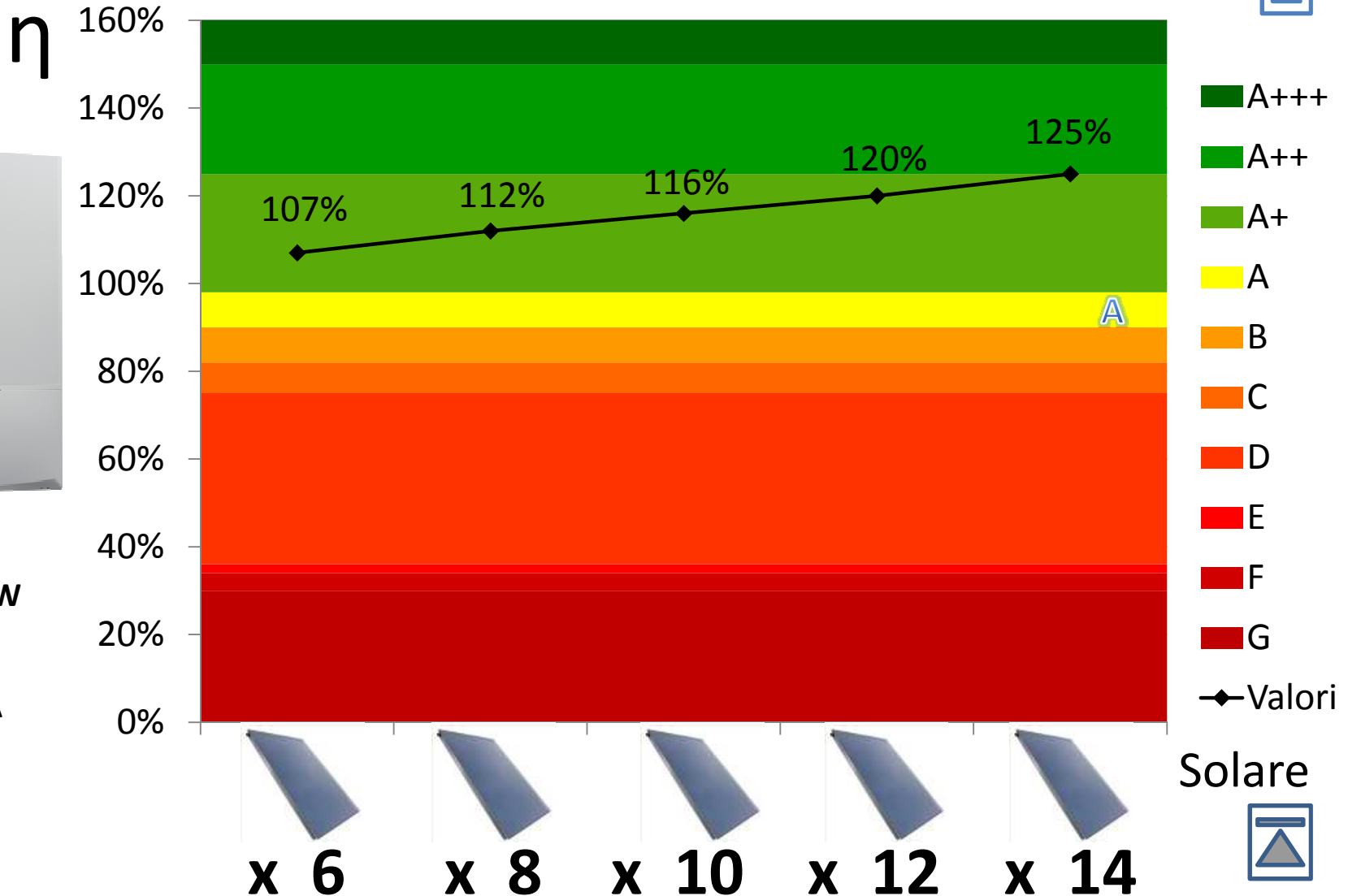


STUDY CASE FOR HEATING:

Gas boiler 12 kW and various n. collectors



P = 12 KW
 $\eta = 93\%$
Classe A



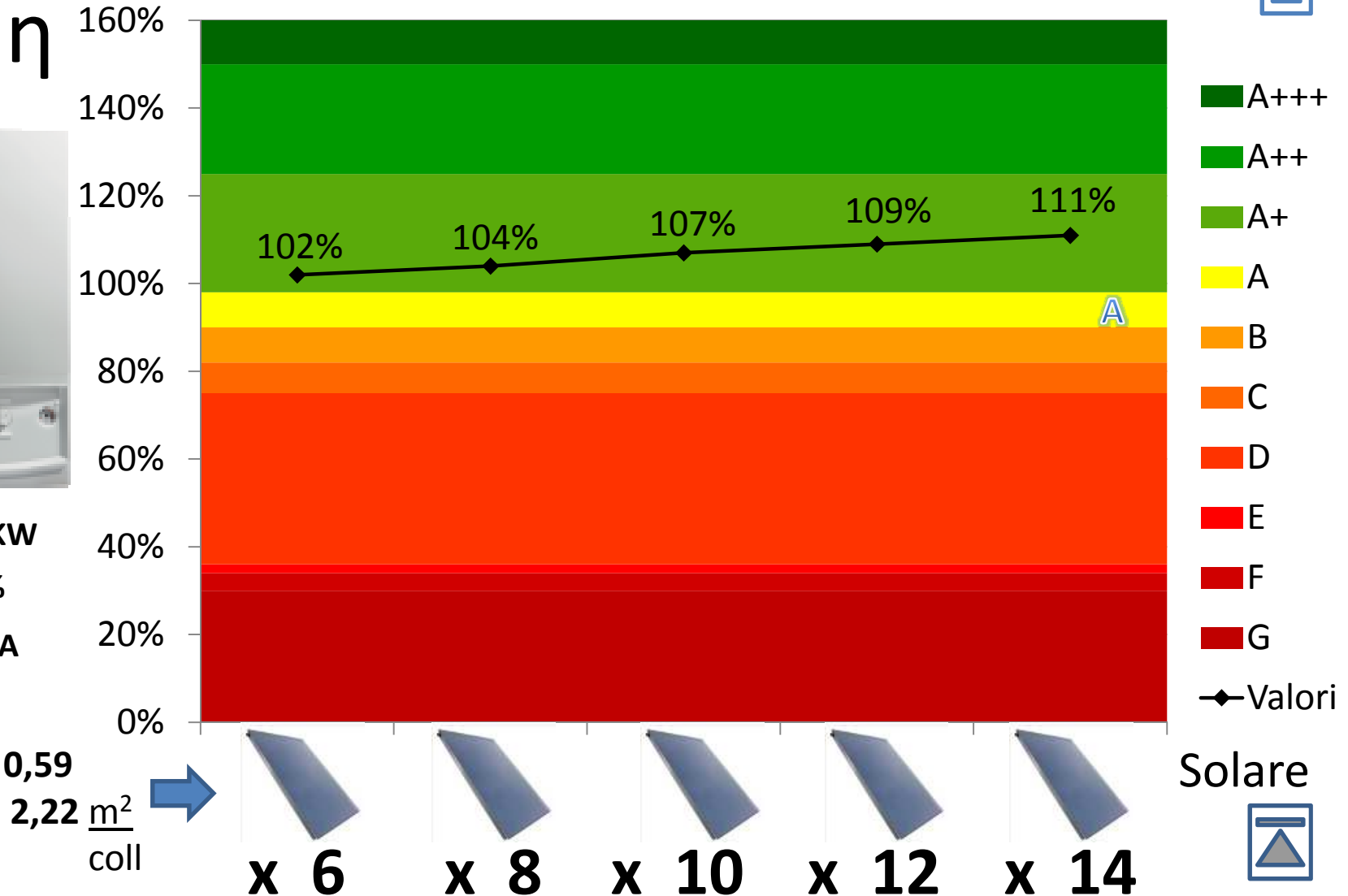
STUDY CASE FOR HEATING:

Gas boiler 21 kW and various n. collectors



P = 21 KW
 $\eta = 93\%$
 Classe A

$\eta = 0,59$
 $S_a = 2,22 \frac{m^2}{coll}$



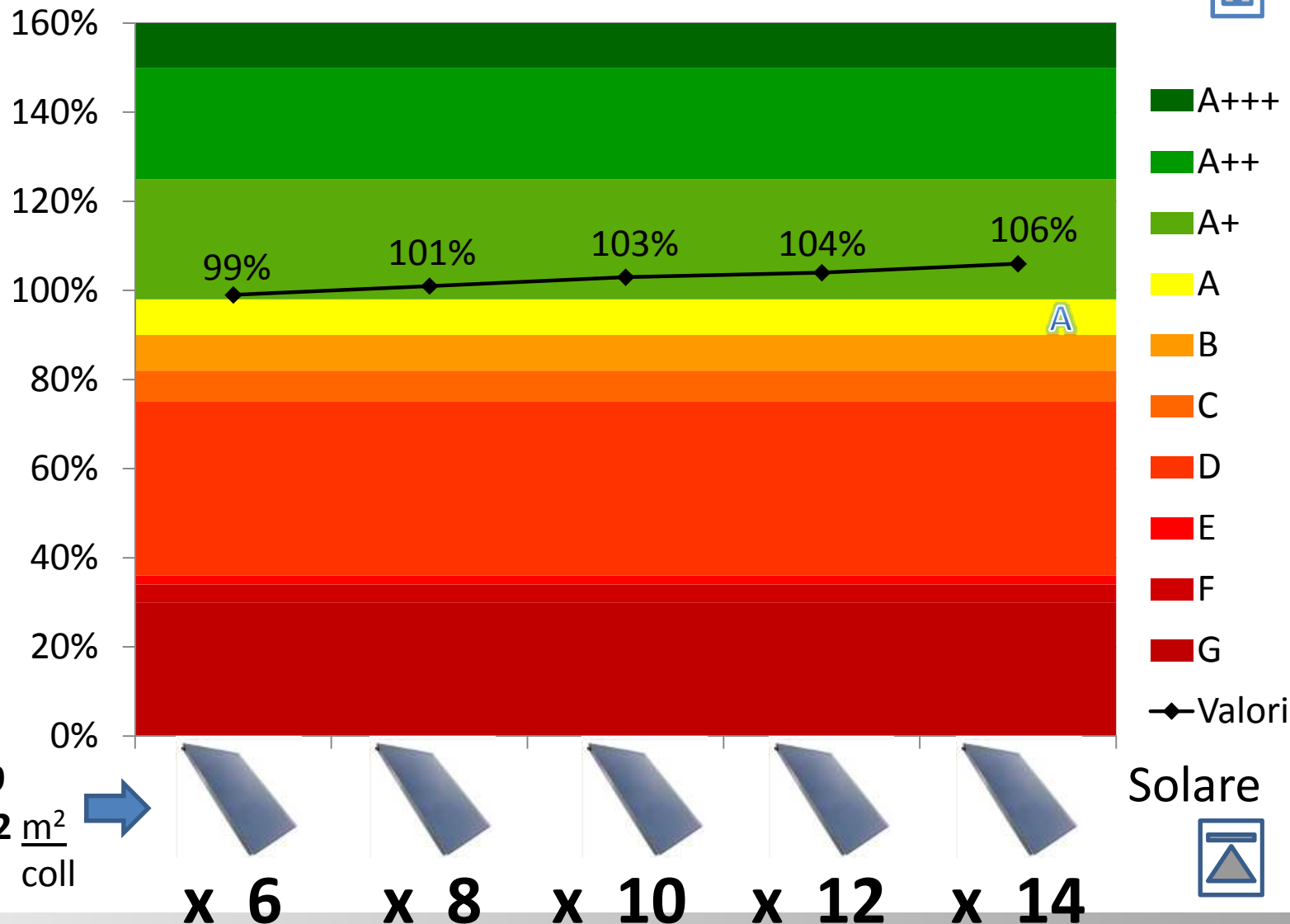
STUDY CASE FOR HEATING:

Gas boiler 30 kW and various n. collectors



P = 30 kW
 $\eta = 93\%$
 Classe A

$\eta = 0,59$
 $S_a = 2,22 \frac{m^2}{coll}$



Solare



STUDY CASE FOR HEATING:

Heat Pump 9 kW and various n. collectors

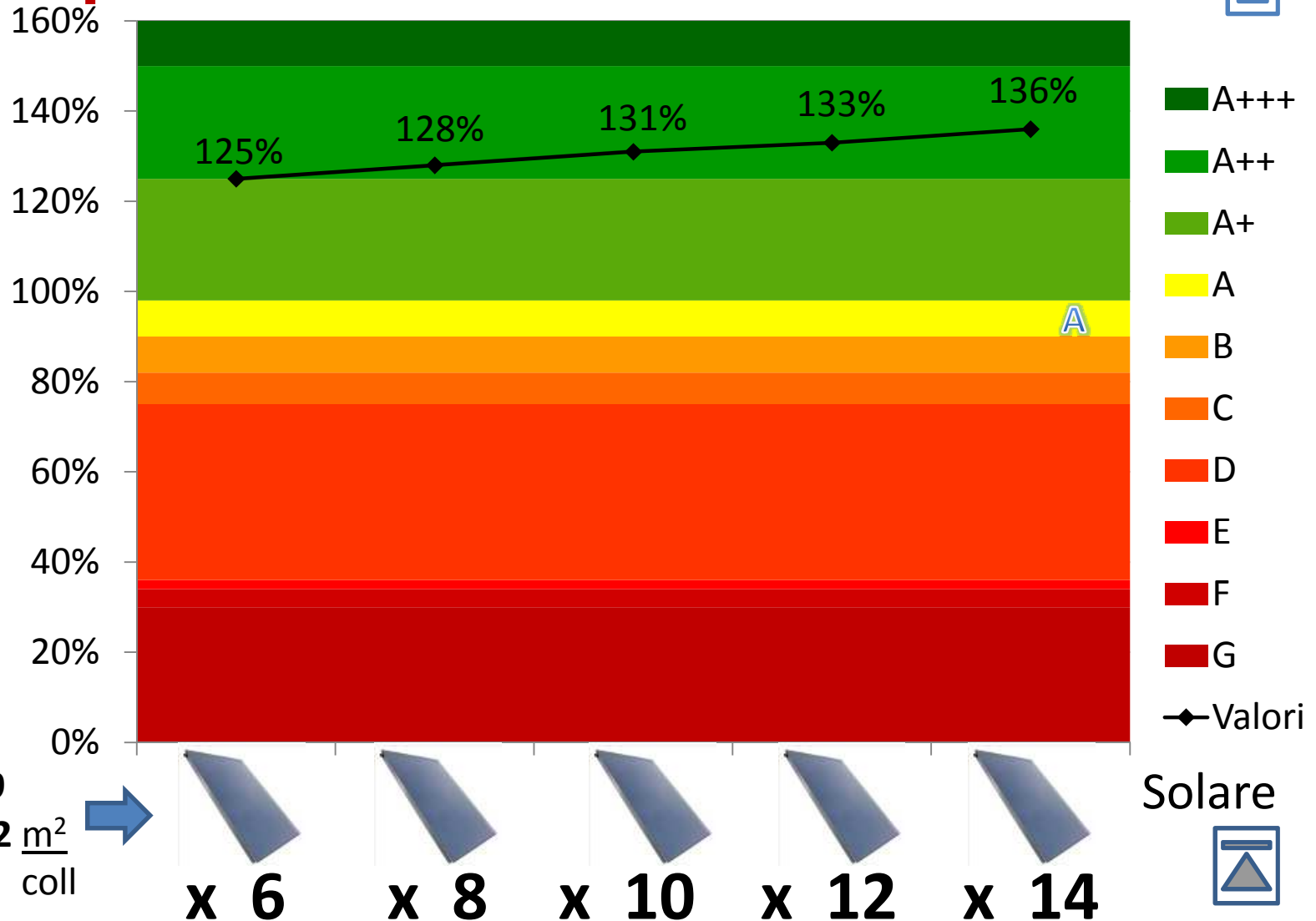


P = 9 KW

$\eta = 115\%$

Classe A+

$\eta = 0,59$
 $S_a = 2,22 \frac{m^2}{coll}$



STUDY CASE FOR HEATING:

Solar 25 m² + heat pump backup 18 kW

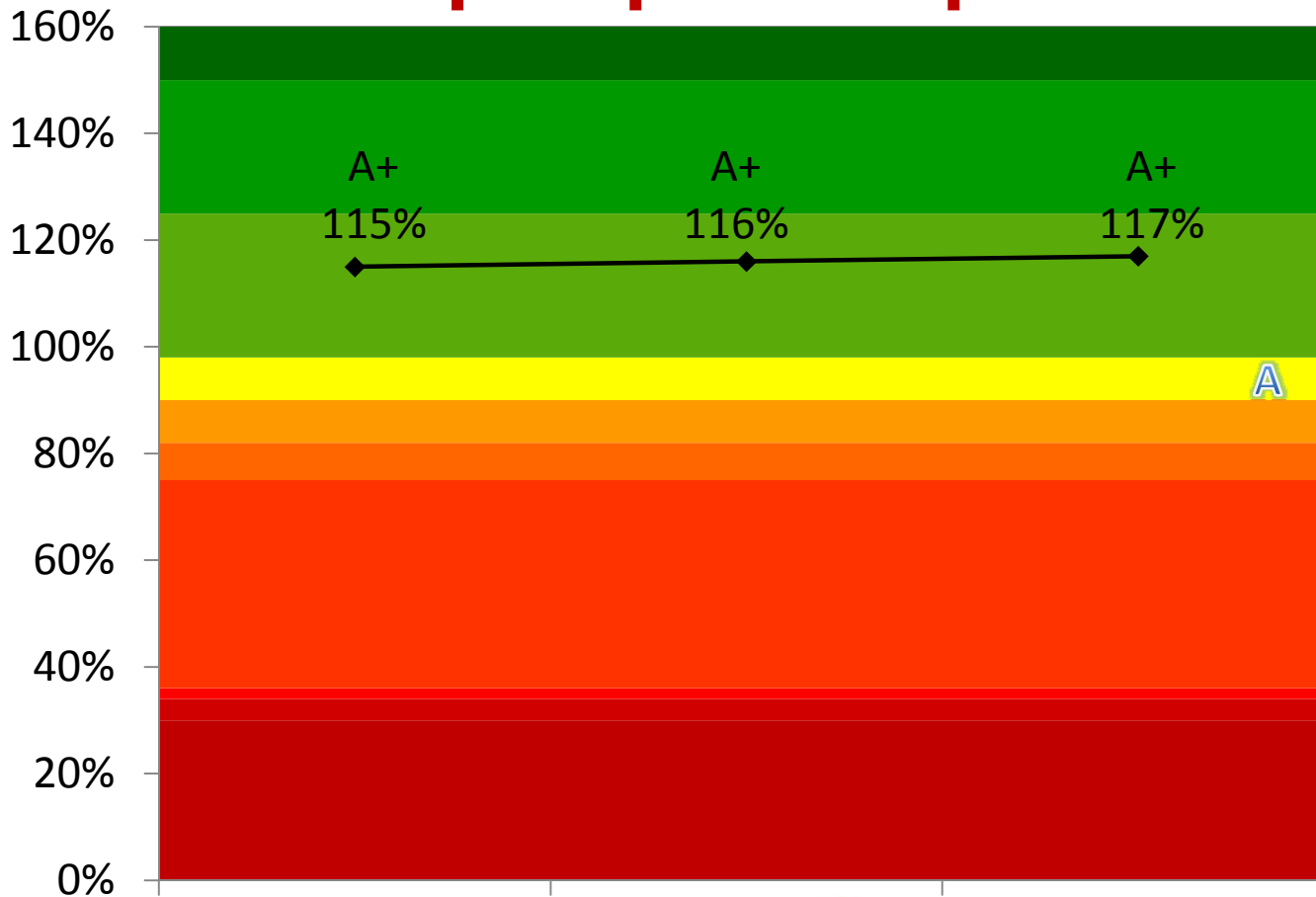


P_n = 18 KW

η = 106%

Classe A+

η
A+



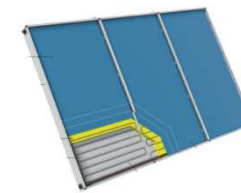
- A+++
- A++
- A+
- A
- B
- C
- D
- E
- F
- G
- ◆ Valori



m²= 25 η = 59%



m²= 25 η = 67%



m²= 25 η = 71%

Solare



STUDY CASE FOR HEATING:

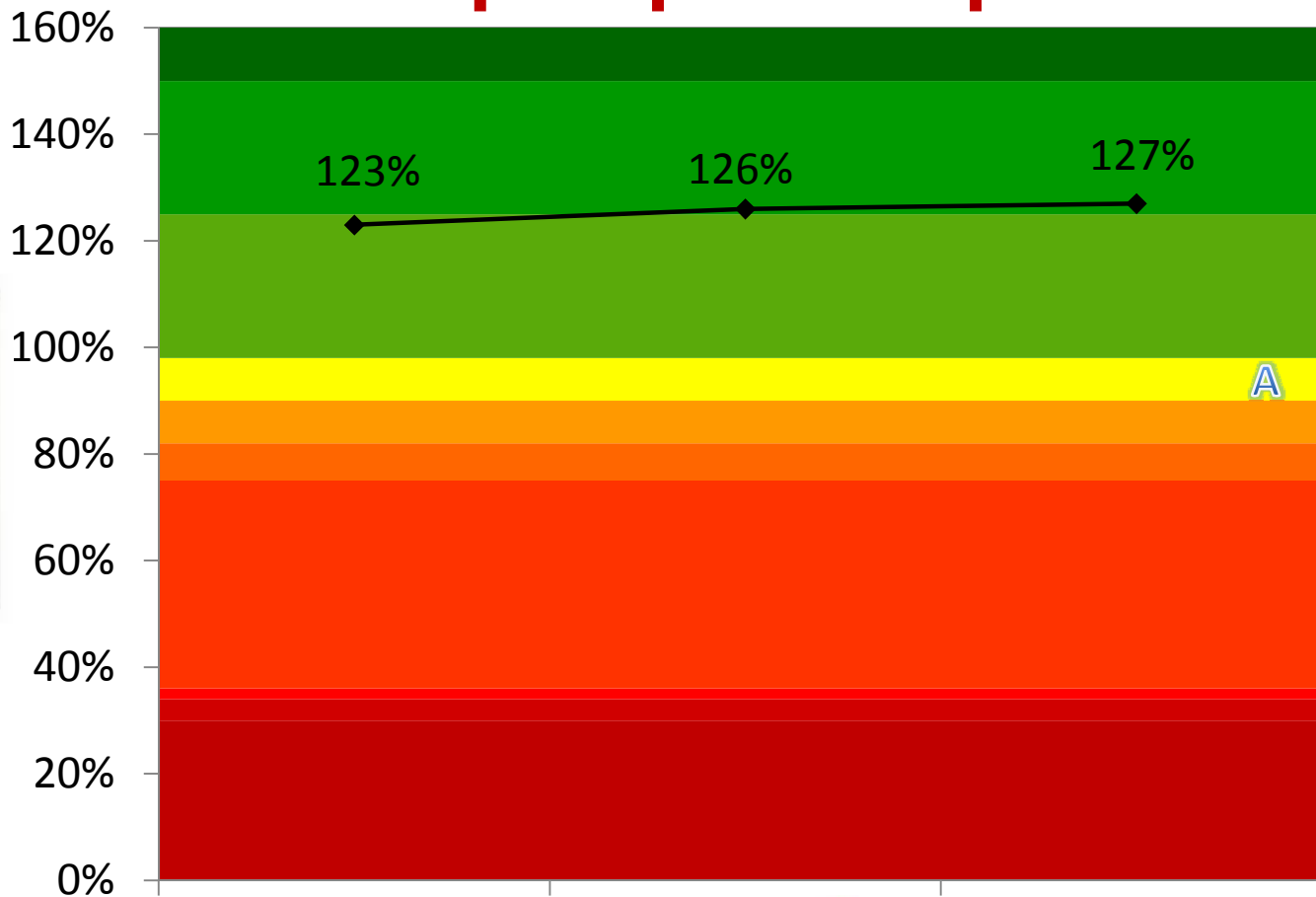
Solar 50 m² + heat pump backup 18 kW



P_n = 18 KW
 η = 106%
 Classe A+

η

A+



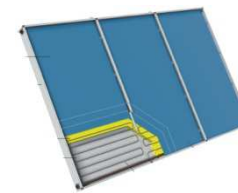
- A+++
- A++
- A+
- A
- B
- C
- D
- E
- F
- G
- ◆ Valori



m²= 50 η = 59%



m²= 50 η = 67%



m²= 50 η = 71%

Solare



STUDY CASE FOR HEATING:

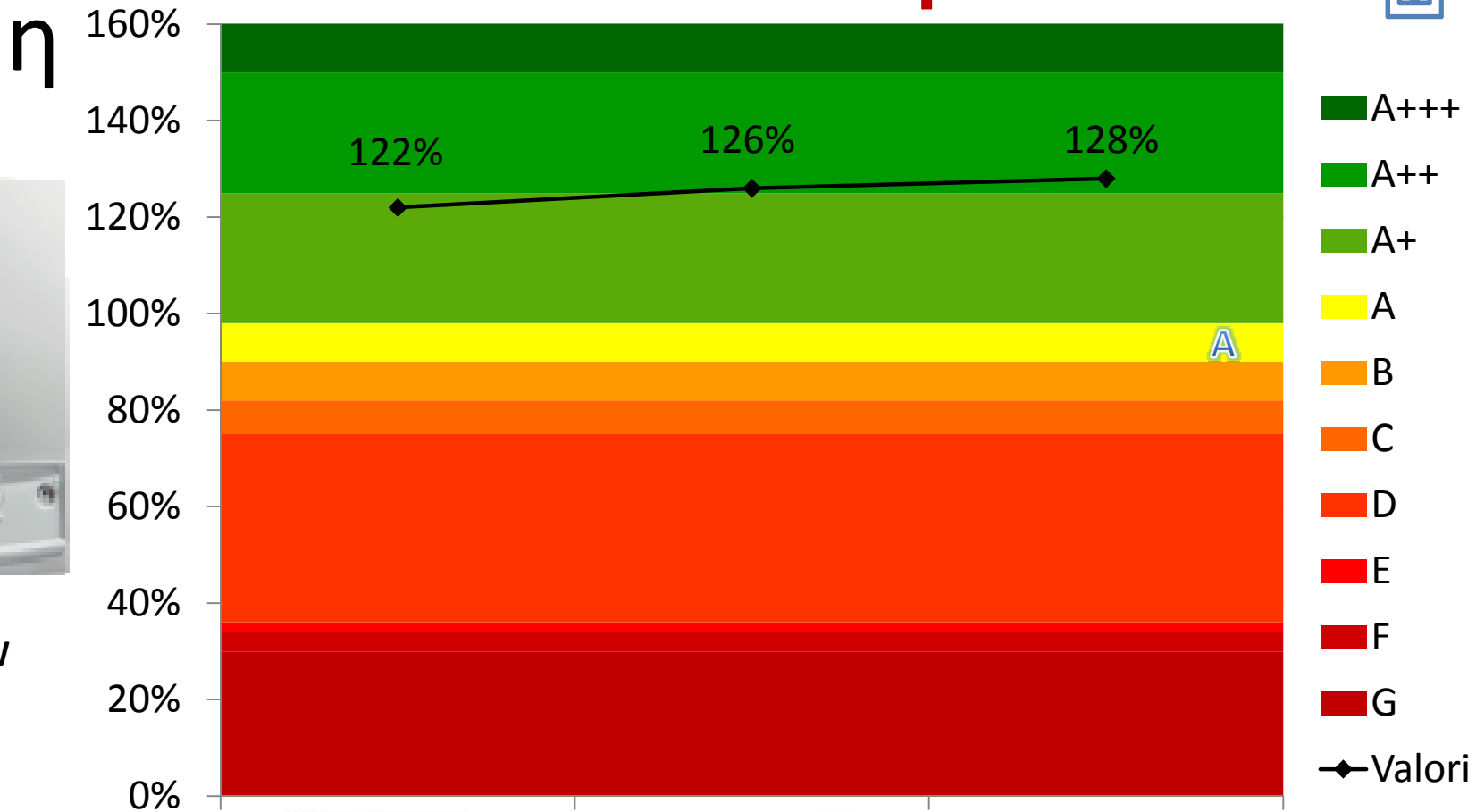
Solar 50 m² + Gas boiler backup 21 kW



P = 21 KW

$\eta = 93\%$

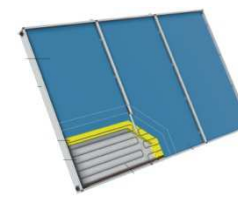
Classe A



m²= 50 $\eta = 59\%$



m²= 50 $\eta = 67\%$



m²= 50 $\eta = 71\%$

Solare

