

AUSTRIAN ENERGY AGENCY

Austrian Energy Agency

Raising the efficiency of boiler installations

G. Simader, G. Trnka, F. Zach

C. Barthel, G. Wohlauf (Wuppertal Institut)

F. Lezsovits (Innoterm Energetics Ltd.)

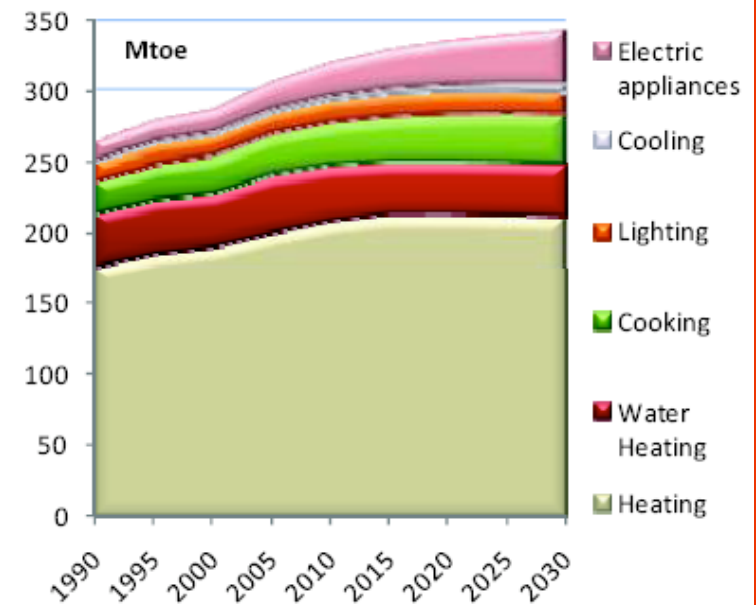
A. Coronas, J. C. Bruno, M. Puig-Arnabat, N. Quince
(CREVER - Universitat Rovira i Virgili)

Motivation to optimize heating (boiler) installations

Space heating is the largest component of energy use in the residential sector virtually in all Member States, accounting for 67 % at the level of the EU-15,

Demonstrations based on laboratory analysis show that new condensing boilers achieve efficiencies of over 100 %, both for gas and oil boilers. This is in strong contrast with selective results from field studies in real conditions, where the seasonal efficiencies of boilers were up to 15 to 20 % lower than under optimal conditions in demonstration cases.

Although several policies (i.e. EPBD, EuP) were initiated in the past this problem seems to stay unsolved.



Source: DG Energy & Transport, 2008

Typical weaknesses of boiler installations

75 audits were carried-out in typical residential buildings (nominal power about 20 kW) in Austria, Germany, Hungary, Spain, and Greece showing typical weaknesses like:

Incorrect boiler and radiator sizing (no heat load calculation performed) (66 % of investigated systems)

Too high exhaust gas losses, surface losses and/or ventilation losses of the boilers (72 %)

Insufficient insulation of pipes and armatures (93 %)

Weak setting of the control and operation system (e.g. unsuitable advance and return temperatures)

Missing control systems (thermostatic valves, etc.) (57 %)

No hydraulic balance performed (95 %)

...

In total 27 major weaknesses were identified, summarised, published in form of a report and communicated to the national project stakeholder groups (incl. installers, end-consumers, etc.).

Further reading:

[http://www.energyagency.at/\(en\)/publ/pdf/D2-5_Summary_Audits.pdf](http://www.energyagency.at/(en)/publ/pdf/D2-5_Summary_Audits.pdf)



Foto: Missel GmbH & Co.KG

Two new market approaches – implementation of EE in heating systems

The results of the audits were also the basis for developing of two new market approaches for the refurbishment/modernisation of heating systems:

**A declaration of a high quality installation
(DHQUI)**

A performance guarantee (GPQU)

Both DHQUI and GPQU should become part of quotations from installers when offering heating systems (boilers) to the end-consumers

The DHQUI should also become basis for public energy efficiency programs (i.e. subsidy schemes for boiler exchange programs, ...) and/or any other public/ industrial initiative, voluntary agreements, etc.

Declaration of high quality installation (DHQI)

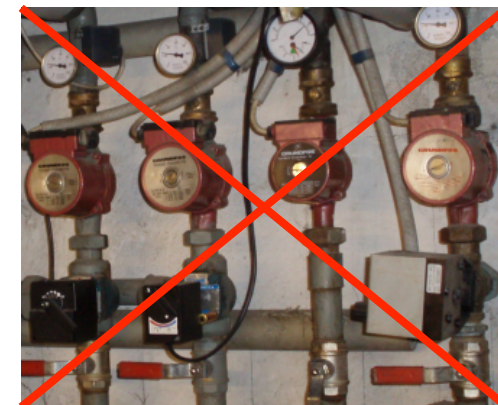
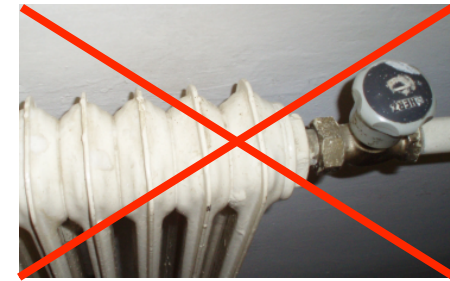
The declaration of high quality installation includes the following major criteria:

- Implementation of a heat-load calculation
- Installation of a high efficient boiler technology (e.g. condensing boilers)
- Calculation of the hydraulic system for dimensioning of the circulation pump
- Installation of high efficient circulating pump(s)
- Correct dimensioning of the domestic hot water demand and installation of the corresponding storage tank
- Implementation of the hydraulic balance of the heating system
- Implementation of pipe- and armature insulation
- Operation start-up and adjustment

...

Further reading:

[http://www.energyagency.at/\(en\)/publ/pdf/D3-1_D3-2_DHQI_v2_final.pdf](http://www.energyagency.at/(en)/publ/pdf/D3-1_D3-2_DHQI_v2_final.pdf)



Fotos: Österreichische Energieagentur

Garantueed performance quality (GPQU)

Tough market conditions for high quality installations; high competition with very cheap installations, focusing only on the boiler and(!) not on the heating system!

Quality is no issue when placing quotations, so far!!!

End-consumers need information concerning energy (and cost) savings and seasonal efficiency when investing in new “more expensive” heating systems following DHQUI!



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BRUNNEN 88/78 82

Usage of GPQU by the installers

Three possibilities have been worked-out:

(0) Information concerning the future seasonal efficiency and the energy (and cost) savings!

(I) guarantee about the future seasonal efficiency and information concerning the energy (and cost) savings!

(II) guarantee about the future seasonal efficiency and the energy (and cost) savings!

Garantieerklärung

Die von uns vertriebenen und installierten Heizanlagen sowie deren Zubehör entsprechen höchstem technischen und qualitativen Standard. Deshalb übernehmen wir hiermit eine eigenständige Garantie von zwei Jahren ab Installationsdatum nach Maßgabe folgender Bestimmungen:

- 1) Unsere Garantiezusage bezieht sich auf die Effizienz bzw. den Jahresnutzungsgrad der neuen Heizungsanlage im Vergleich zur alten Anlage. Es wird garantiert, dass basierend auf den nachfolgenden Voraussetzungen, Richtlinien und Berechnungsgrundlagen die Heizungsanlage einen Jahresnutzungsgrad von% erreicht. Damit kann bei gleich bleibendem Nutzerverhalten, sowie durchschnittlicher mittlerer Außentemperatur und Heiztagen eine Energieeinsparung von MWh/a im Vergleich zur Altanlage garantiert werden.
- 2) Zeigt sich innerhalb der Garantiezeit ein Mangel, der die Nichteinhaltung des zugesicherten Jahresnutzungsgrads bzw. Energieeinsparung zur Folge hat, wird kostenfrei nachgebessert. Der Garantiezeitraum wird hierdurch nicht beeinflusst, also weder verkürzt noch verlängert. Sollte es sich um einen nicht behebbaren Mangel handeln, wird die Differenz der Energiekosten für eine Heizungsperiode rückerstattet.
- 3) Der Garantiefall tritt jedoch nicht ein, wenn der Mangel unter folgenden Umständen verursacht wurde:
 - ✓ Bei unsachgemäßer oder zweckentfremdeter Handhabung und Anwendung der Heizungsanlage.
 - ✓ Wenn die Heizungsanlage Fehlanwendung, Unterlassung, Unfall, Gewaltanwendung oder Missbrauch ausgesetzt war.
 - ✓ Wenn die Heizungsanlage unsachgemäß verändert oder abgeändert wurde.
 - ✓ Bei unzureichender Wartung der Heizungsanlage.
 - ✓ Bei Veränderungen der Heizungsanlage, die nicht auf eine normale Abnutzung zurückzuführen sind.
 - ✓ Bei Abweichungen bedingt durch Nutzerverhalten, klimatischen Bedingungen, Umbauten, etc. verfällt die Garantiezusage!

Ort, Datum

Objekt (inkl. Adresse und Ort, PLZ)

Installateur/Unternehmer
(Unterschrift/Stempel)

Calculation of the seasonal efficiency and of the energy (and cost) savings

For the calculation of the seasonal efficiency and the energy savings of the new high-quality system compared to the old heating system, a calculation method and tool was developed based on the “finger print method” of the German University of Applied Sciences in Wolfenbüttel.

Two modules were worked-out:

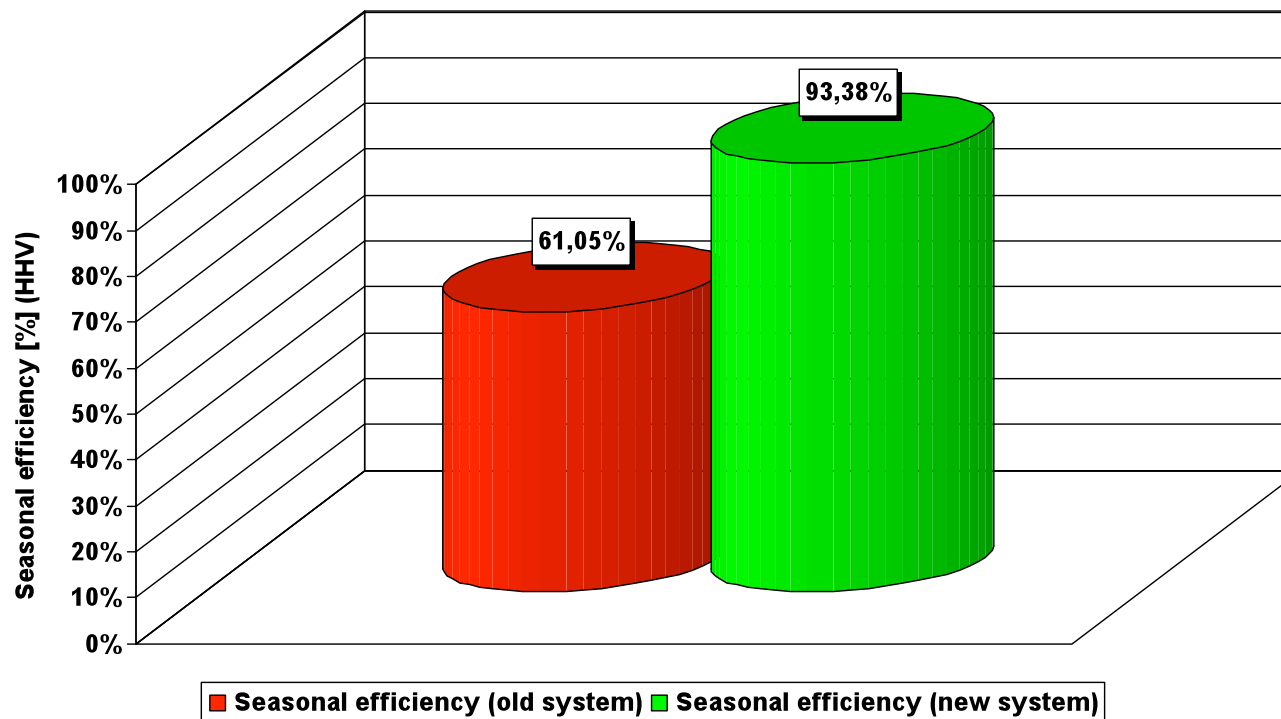
Module I – Applying the finger print method by executing of an audit at the end-consumer’s site taking into account the characteristics of the building, the heating system and the customer’s behavior!

Module II – Applying the finger print method by using an empirical equation(s) mainly taking into account the characteristics of the new boiler!

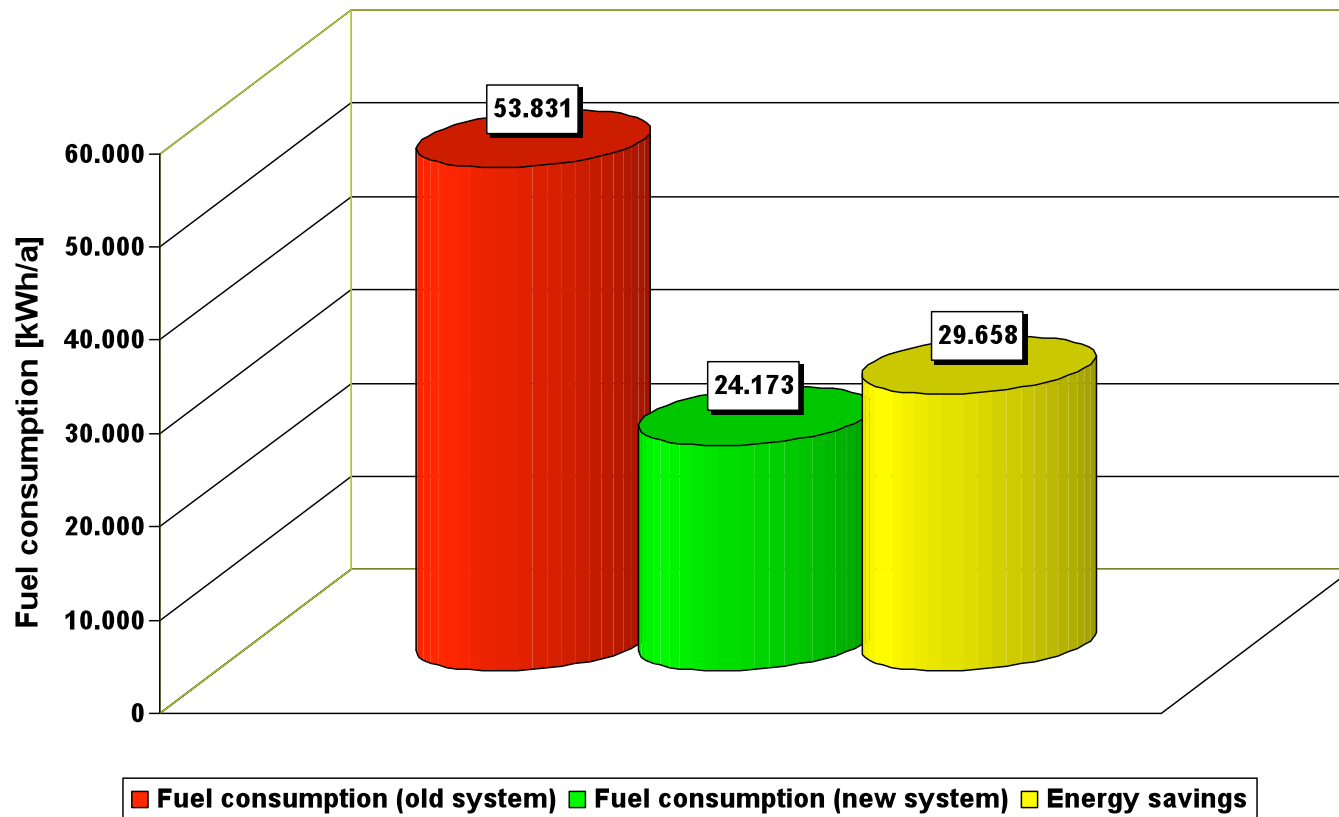
Further reading:

[http://www.energyagency.at/\(en\)/publ/pdf/D4-2_GPQU-QM.pdf](http://www.energyagency.at/(en)/publ/pdf/D4-2_GPQU-QM.pdf)

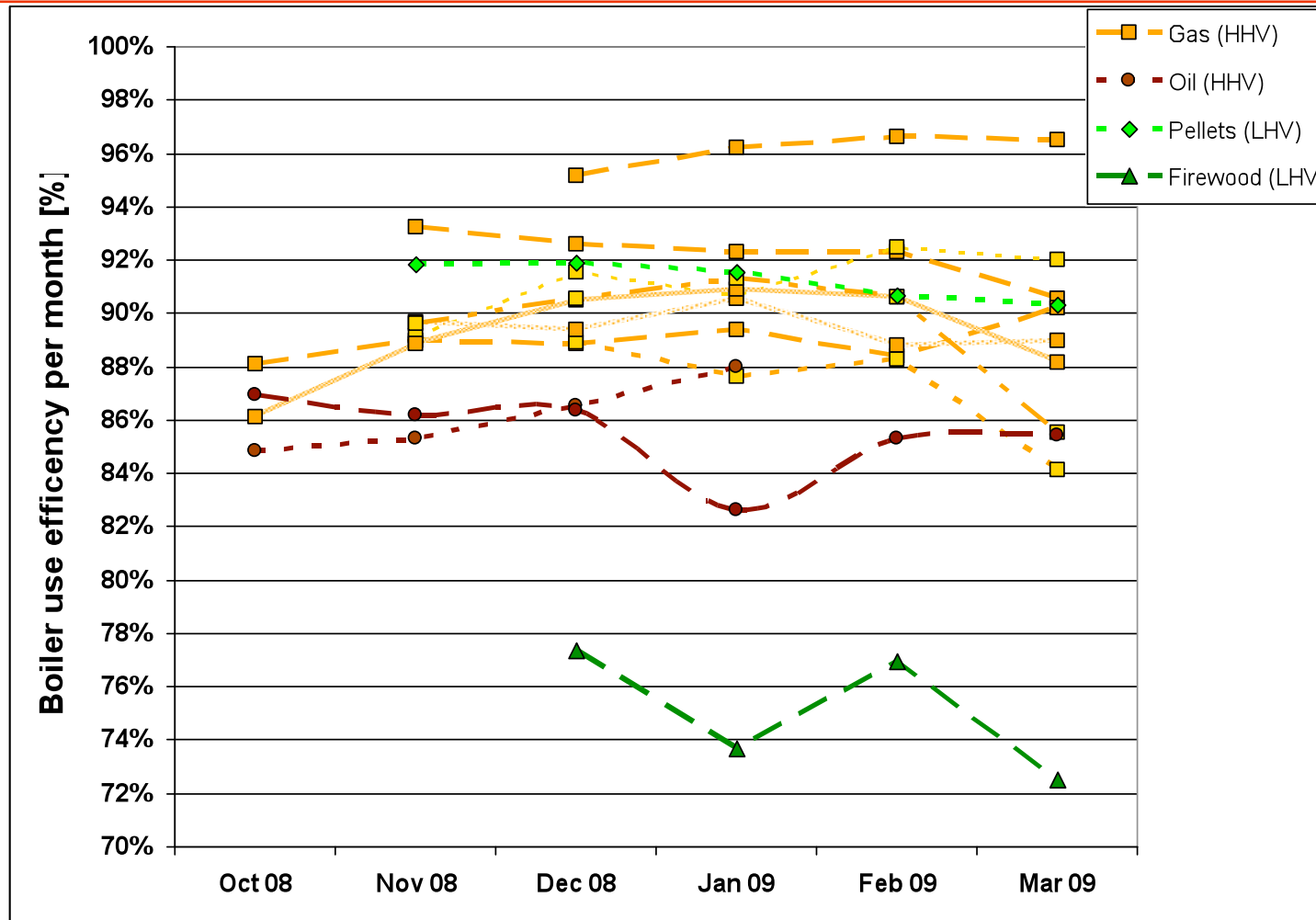
The finger prints lead to two results: I – Seasonal efficiencies



The finger prints lead to two results: II - Fuel consumption and energy (and cost) savings



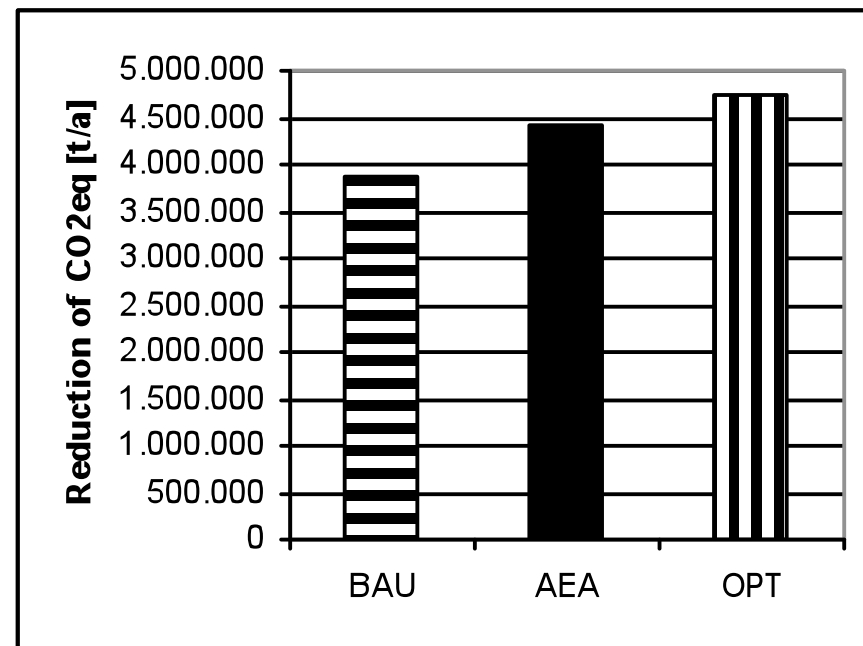
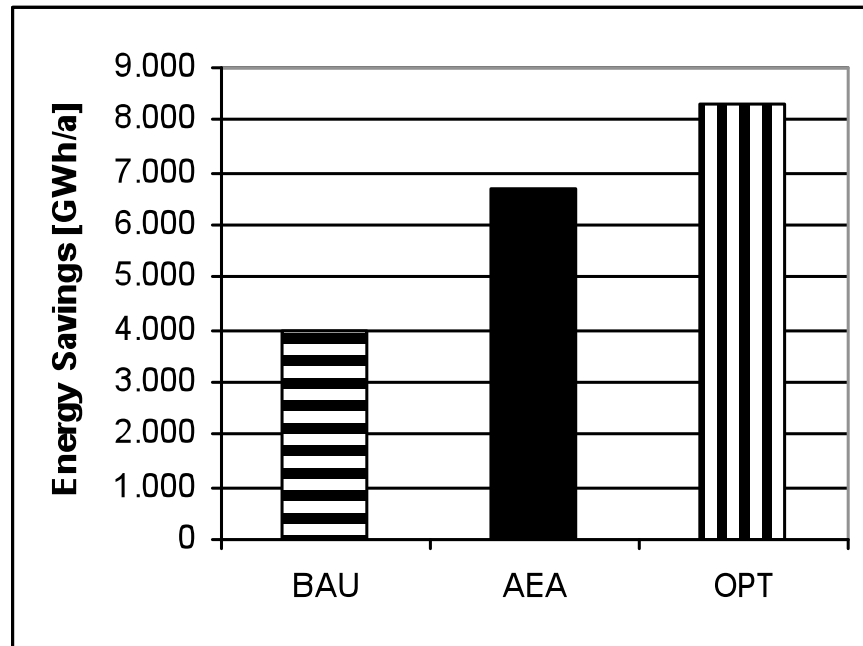
Field testing – Evaluation of DHQUI (Austrian case)



Seasonal efficiencies: GPQU - measured and calculated! (Austrian case)

Nr	Fuel	Heat load	GPQU I	GPQU II	Field Test	GPQU I - Field Test	GPQU II - Field Test
		[kW]	[η]	[η]	[η]	[%]	[%]
1	gas	13,1	88,1	90,8	88,8	0,7	-2,0
2	gas	3,3	85,7	90,8	88,4	2,7	-2,4
3	gas	5,8	85,1	87,3	88,1	3	0,8
4	gas	11,4	92	87,3	N.A.	N.A.	N.A.
5	gas	4,7	85,7	87,3	85,4	-0,3	-1,9
6	gas and solar	11,2	89,4	87,3	91,3	1,9	4,0
7	gas and solar	7,5	89,6	87,3	88,2	-1,4	0,9
8	gas	12	92,2	90,0	89,5	-2,7	-0,5
9	oil	8,3	87,1	87,3	85,8	-1,3	-1,5
10	oil	9,8	90,8	87,3	83,5	-7,3	-3,8
11	biomass and solar	4,2	76,4	N.A.	73,9	-2,5	N.A.
12	biomass and solar	11	88,9	N.A.	90,9	2	N.A.
13	gas and solar	22	93,3	93,6	94,9	1,6	1,3

Energy savings and reduction of greenhouse gases (Austrian case)



Summary

Two new market approaches (DHQUI and GPQU) were developed assisting both the installers and end-consumers when refurbishing heating systems

DHQUI should also become part of public energy efficiency programs (i.e. subsidy schemes for boiler (exchange) programs) and/or any other public/industrial initiatives, etc.

The results of the field tests (so far):

- show high seasonal efficiencies (confirming DHQUI criteria)
- allow guarantees with a security band of 3 %;
- in future up to 2 %!

Further development and implementation of both approaches need a strong cooperation between different stakeholder groups (installers, consumers, energy agencies, etc.) and further developments of the boiler industry (more sophisticated but inexpensive measurement equipment)

Major energy savings and reductions of greenhouse gases will be gained by the usage of DHQUI and GPQU (low investive measures)!

Thank you for your attention!

Further Information:

<http://www.energyagency.at/boileff.htm>

Contakt:

Günter R. Simader

Austrian Energy Agency

+43(0)1 5861524-124

guenter.simader@energyagency.at