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HEAT4U
"Gas Absorption Heat Pump solution for existing residential buildings"

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1. Introduction

Present deliverable, D7.2 “Labelling and certification of the GAHP”, has been implemented in the framework of WP7 “LCC, LCA, HSE, Risk Assessment, Certification and Labelling” and in particular with reference to Task 7.4 “Development of Labelling and Certification Elements”, under D’Appolonia responsibility. Contributions to present deliverable and review activities have been provided by different partners from HEAT4U Consortium: ROBUR, BRITISH GAS, GDF SUEZ, GAZUNO, GrDF SA.

The scope of present deliverable is to outline the legislative framework that applies to Gas Absorption Heat Pumps (GAHP), thus identifying the pattern to follow for verifying GAHP compliance with current regulations in terms of design, installation and maintenance requirements for the residential application.
The European countries of interest at the purpose of present legislative framework analysis have been: Italy, France, Germany, Belgium, The Netherlands, United Kingdom and Poland.

Chapter 2 presents the Executive Summary of the all the contents included in the deliverable in order to allow the reader to have a general overview of all the topics analyzed and developed in the document.

Chapter 3 is structured in seven different sections, one for each of the most significant topics identified and it is presented in terms of “Key Questions” related to GAHP technology. Each Key Question is deeply analyzed and a conclusive paragraph summarizes the results coming from each one of the seven topics.

Chapter 4 includes the summary of the results and conclusions coming from each of the seven Key Questions. Moreover, recommendations and proposals resulting from the carried out analyses are presented within this chapter, providing a roadmap on the way ahead for a possible development of a normative framework more inclusive of the peculiarities of the GAHP technology.

APPENDIX A, B and C include respectively the summary of the legislative framework investigated and used as a reference for throughout the deliverable, the comparison among specific sections of different national standards and some legislative details.

1 Executive summary

The scope of the present Deliverable *"Labelling and certification of the GAHP"* is to assess the legislative framework that GAHP appliances shall comply with over the different European countries, in preparation of a deployment of the technology into the residential sector.

The analysis shows how the legislative framework is currently not taking in due account the peculiarities of the relatively-new GAHP technology, probably not yet fully familiar to legislators, thus setting non-technological barriers which might have an impact on GAHP penetration.

The Deliverable is structured in seven different sections, one for each of the identified topics of concern, and it is presented in terms of "Key Questions". Here is a description of the topics and the relevant conclusions:

KQ1: ***Design and manufacturing (PED):*** Check the implementation at national level of the European *Pressure Equipment Directive 97/23/EC (PED)* and assess national differences possibly affecting GAHP.

Conclusion: as far as Design and Manufacturing (see KQ2 for In-service inspections), no substantial deviation from the core text of the Directive was found in the national laws transposing PED. Nevertheless, PED includes a long list of derogations for many categories of products, which requirements are delegated to specific product norms.

It is recommended that **PED incorporates absorption appliances in this list of derogations**, **delegating the relevant requirements to the product norm EN12309**, thus unifying and simplifying the regulatory framework.

KQ2: ***In-service inspections (PED):*** Analyse the requirements of each Member State in terms of in-service periodical inspections and requalification programs as far as pressure-related safety aspects during the operational life of the GAHP appliance.

Conclusion: differently from Design and Manufacturing (KQ1), PED leaves the competence for In-service inspections to single Member States. As a result, requirements, schedules and responsibilities present a huge range of variability among countries. France was found to have the most advanced regulation (*Cahier Technique Professionnel n. 2*), well-customized on the peculiarities of GAHP.

It is recommended that **guidelines for In-service inspections are harmonized among Member States on the basis of the French CTP n. 2, through an inclusion of the relevant contents in the product norm EN12309**.

KQ3: ***Installation norms (EN378):*** Appraise the applicability of installation norms (in particular *EN378*) to GAHP and the relevant implications in the residential sector.

Conclusion: installation norm EN378 has an extremely wide field of applicability, ranging from small split-units to industrial refrigeration systems, not allowing catching the peculiarities of GAHP technology.

It is recommended that **a *formal liason* is set up between Technical Committees in charge of EN378 and EN12309**, in such a way that specific installation rules for GAHP are directly included in product norm EN12309.

KQ4: ***Measurement of emissions (GAD):*** Compare different approaches for the calculation of emissions in the frame of the *Gas Appliance Directive 2009/142/EC (GAD)*.

Conclusion: GAD focuses on the gas consumption to evaluate emissions; a reference to the useful effect delivered to the final user would be more appropriate when the energy released by the combustion process is amplified by the GAHP a thermodynamic cycle.

It is recommended to **include in GAD a clause to impose the calculation of emissions with reference to thermal output**, instead of thermal input, through a cross-reference to methods already described in EN12309.

KQ5: ***Flueless installation:*** Search and evaluate the existing regulations and requirements among the Member States for this new category of installation (as defined by *prEN12309:2014*) made possible by the GAHP technology.

Conclusion: Apart from prEN112309:2014, it seems that no existing European norm is making any explicit mention or implicit reference to this new category of installation.

It is recommended that **EN12309 is extended to include** not only the definition and design requirements, but also **installation requirements for flueless appliances**.

KQ6: ***Calculation software (EPBD):*** Ascertain if the GAHP is included in the regional-specific software-programs issued by local Technical Bodies for assessing and certifying the *Energy Performance of the Buildings* according to the national implementations of the relevant European directive *EPBD (2002/91/EC)*.

Conclusion: only a few calculation programs across Europe already include GAHP; for inclusion, several Member States are accepting only assessments and certifications by their own national Technical Bodies and tests by their own national accredited laboratories.

It is recommended to enforce a common accreditation program for laboratories and **mutual recognition among Technical Bodies** in order to reduce fragmentation and costs.

KQ7: ***Incentive schemes:*** Outline the incentive programs in force in the Member States and verify if the GAHP technology is listed as being eligible to subsidies.

Conclusion: although most of European incentive programs are claiming energy savings and use of renewable energies as main goals, GAHP is not yet eligible in several schemes.

It is recommended to **promote a wider dissemination of the advantages provided by GAHP among the Governmental institutions** in charge of setting eligibility criteria for subsidies.

The set of conclusions and recommendations listed above per each topic and summarized in the final paragraph are providing a guideline to develop better-fitting regulatory conditions for GAHP.

The general direction suggested to address the lack of recognition for GAHP encountered throughout the analyses of this Deliverable is to include all type of specific requirements for GAHP (design, manufacturing, installation, in-service inspections, and measurement of emissions) in the product norm EN12309, in such a way to make it the single reference text for all aspects of GAHP lifecycle. The availability of a fully comprehensive norm that defines the design, the performance measurement and the installation will be instrumental

for the following activity of harmonization of the different European directives and local legislation measures.

Details of the above summarized analyses are presented in the following paragraphs.

3 Identified Key Questions for GAHP technology

The present chapter is intended to provide a general overview throughout European countries of the most significant laws, directives and norms that regulate GAHP. To this purpose, because of the higher market potential identified by the market analysis of WP1, the European countries taken as a reference have been: Italy, France, Germany, Belgium, The Netherlands, United Kingdom and Poland.

The analysis of the current legislative framework has highlighted some grey areas of interpretation or contradiction about the application of the GAHP technology; main critical issues have been identified and deeply investigated in the following sections, presented in the form of "Key Questions".

For each of the proposed Key Questions possible actions and recommendations to address these areas of uncertainty have been proposed, aiming at supporting the diffusion and free circulation of GAHP products throughout all Member States by means of clear and harmonized standards.

Here is a list of the Key Questions:

ID No.	Topic index (*)	Key Question short description	Standard(s) of reference	Reference in the text
KQ1	P	***Design and manufacturing*** Analyse the implementation at national level of the European *Pressure Equipment Directive* (PED) and assess national differences possibly affecting GAHP.	*Pressure Equipment Directive 97/23/CE and related National implementations*	§3.1 and APPENDIX A APPENDIX B
KQ2	M	***In-service inspections*** Analyse the requirements of each Member State in terms of in-service periodical inspections and requalification programs as far as pressure-related safety aspects during the operational life of the GAHP appliance.	*Pressure Equipment Directive 97/23/CE and related National implementations*	*§* 3.2 and APPENDIX A
KQ3	I	***Installation norms*** Analyse the applicability of installation norms to GAHP and the relevant implications in the residential sector.	*EN378 "Refrigerating systems and heat pumps*	*§* 3.3 and APPENDIX A
KQ4	P	***Measurement of emissions*** Compare different approaches for the calculation of emissions in the frame of the *Gas Appliance Directive (GAD).*	*Gas Appliance Directive 2009/142/EC*	*§* 3.4 and APPENDIX A
KQ5	I	***Flueless installation*** Search and evaluate the existing regulations and requirements among the Member States for this new category of installation made possible by the GAHP technology.	*Gas Appliance Directive 2009/142/EC and prEN12309:2014*	*§* 3.5 and APPENDIX A

KQ6	P	***Calculation software*** Ascertain if the GAHP is included in the regional-specific software-programs issued by local Technical Bodies for assessing and certifying the *Energy Performance of the Buildings* according to the national implementations of the relevant European *Energy Performance Building Directive* (EPBD).	*Energy Performance Building Directive 2002/91/EC*	*§* 3.6 and APPENDIX A APPENDIX C
KQ7	P	***Incentive schemes*** Analyse the incentive programs in force in the Member States and verify if the GAHP technology is listed as being eligible to subsidies.	*Different national incentives schemes*	*§* 3.7 and APPENDIX A
(*) Topic index: • *P – Design and Performance* • *I – Installation* • *M - Maintenance*				

Table 3-1: Summary of Key Questions

3.1 *Key Question No. 1: Design and manufacturing*

ID No.	Key Question short description	Standards of reference
KQ1	***Design and manufacturing*** Analyse the implementation at national level of the European *Pressure Equipment Directive* (PED) and assess national differences possibly affecting GAHP.	*Pressure Equipment Directive 97/23/CE and related National implementations*

3.1.1 Introduction

The Pressure Equipment Directive (97/23/EC) - PED - was adopted by the European Parliament and the European Council in May 1997. It has initially come into force on 29 November 1999. From that date until 29 May 2002 manufacturers had a choice between applying the pressure equipment directive or continuing with the application of the existing National legislation. From 30 May 2002 the pressure equipment directive is mandatory throughout the EU.

"The PED Directive 97/23/EC arises from the European Community's Program for the elimination of technical barriers to trade and is formulated under the "New Approach to Technical Harmonisation and Standards". Its purpose is to harmonise National laws of Member States regarding the design, manufacture, testing and conformity assessment of pressure equipment and assemblies of pressure equipment. The pressure equipment directive is one of a series of technical harmonisation directives for machinery, electrical equipment, medical devices, simple pressure vessels, gas appliances, etc.

The Directive concerns items such as vessels, pressurised storage containers, heat exchangers, steam generators, boilers, industrial piping, safety devices and pressure accessories. Such pressure equipment is widely used in the process industries (oil & gas, chemical, pharmaceutical, plastics and rubber and the food and beverage industry), high temperature process industry (glass, paper and board), energy production and in the supply of utilities, heating, air conditioning and gas storage and transportation.

Under the Community regime of the Directive, pressure equipment and assemblies above the specified pressure and/or volume thresholds must:

- Be safe
- Meet essential safety requirements covering design, manufacture and testing;
- Satisfy appropriate conformity assessment procedures
- Carry the CE marking and other information.

Pressure equipment and assemblies below the specified pressure / volume thresholds must:

- Be safe
- Be designed and manufactured in accordance with the sound engineering practice of a member state and bear specified markings (but not the CE marking).

The basic difference between the two above described situations is that while for the first class of devices a formal certification process (by third Party) is mandatory, for the second class it is not.

Hence, considering the European legislative framework PED directive has to be considered as the reference point for the GAHP technology, based on a pressurized system; however,

the implementation of PED directive at national level by means of particular national laws and regulations, introduces specific sets of derogations which might differ among Member States.

3.1.2 Analysis of Key Question

The analysis of the present key question has been articulated in different phases. First, a dedicated investigation has been carried out in order to identify the National standards that correspond to the National implementation of PED directive. Then, the identified standards have been properly analyzed in order to find out if any substantial deviation from the core text of the European directive was introduced. Finally, a special focus has been made with regards to appliances excluded from the scope of PED. The aim of this last investigation has been to attempt either to identify if there was any excluded device GAHP appliance can be assimilated to and to assess if any derogation could be directly applicable to HEAT4U gas absorption heat pump.

The results of the first aforementioned analysis are presented in the following table, in which a list of the National laws implementing PED directive is presented. As specified in the introductive part of present deliverable, Member States of interest in the framework of current analysis on PED directive implementation have been: Italy, France, Germany, the Netherlands, Belgium, UK and Poland.

EU country	National Transposition of the PED
Italy	Decreto legislativo No. 93 of 25/02/2000, laying down the implementing measures for Directive 97/23 on pressure equipment (G.U. No. 91 of 18/04/2000, Supplemento Ordinario Nº 62
France	Décret No. 99-1046 of 13/12/1999 on pressure equipment (JO 290 of 15/12/1999); Arrêté of 21/12/1999 on the classification and conformity assessment of pressure equipment (JO 300 of 28/12/1999)
Germany	Arbeitsschutzgesetz – ArbSchG - BGBl I 1996, 1246, 7.8.1996 (Law on Occupation Protection); Betriebssicherheitsverordnung – BetrSichV - BGBl I 2002, 3777, 27.9.2002 (Occupational Safety Order); Geräte- und Produktsicherheitsgesetz - GPSG - BGBl I 2004, 2 (219), 6.1.2004 (Law on the Safety of Devices and Products); Druckgeräteverordnung - 14. GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002 (Pressure Devices Order)
Belgium	Arrêté royal of 13/06/1999 concerning the placing on the market of pressure equipments (MB of 08/10/1999) title amended by Arrêté royal of 06/12/2005 (MB of 07/02/2006)
The Netherlands	Warenwetbesluit Drukapparatuur. Decree on Pressure Equipment of 5 July 1999 (Stb. 1999, 311)
UK	Pressure Equipment Regulations 1999 (SI No. 2001 of 1999)
Poland	Regulation of the Minister of Economy, Labour and Social Policy on the essential requirements for pressure equipment and pressure units (Rozporzadzenie Ministra Gospodarki, Pracy i Polityki Spolecznej w sprawie zasadniczych wymagan dla urzadzen cisnieniowych i zespolow urzadzen cisnieniowych), of 8 May 2003 (Dz.U. No. 99, item 912).

Table 3-2: Summary of National PED Transposition – KQ.1

It is important to highlight that the PED directive was transposed in different times and by different laws and decrees in each Member State and with different updating levels. Hence, it is has been essential to investigate also National Standards and laws related to PED proceedings in order to find out if any deviation from the text of the European directive was applicable. APPENDIX A reports a summary of the investigated National laws applicable to GAHP technology. The main focus of the analysis has been related to design and manufacturing aspects applicable to GAHP technology.
Finally, the analysis of the devices excluded from the scope of PED has been carried out. PED includes a long list of derogations for many categories of products, which requirements are delegated to specific product norms.
At this purpose, PED sections of interest have been:

- Article 1 *Scope and Definitions*
- Article 2 *Market Survillance*
- Article 3 *Technical requirements*

The correspondent articles has been investigated and deeply analyzed also in the national legislative frameworks of interest. The detailed and carried out comparative analysis is presented in specific tables included in APPENDIX B, where the original text of the national standard is reported together with the related English translation.

3.1.3 Conclusions

The aforementioned analyses have allowed reaching the following conclusions:

- All State Members of interest have implemented PED directive by means of proper national standard(s);
- No specific deviations from the core text of the European directive have been found, with regards to design and manufacturing aspects;
- Even if a long list of exclusions is presented in PED, both at national and European level, specific derogations *directly* applicable to HEAT4U GAHP appliance were not found;
- On the other hand, the list of derogations includes a bunch of pressure devices which might be regarded as presenting similarities to GAHP appliances.

3.1.4 Recommendation for KQ1

Considering in particular the last conclusion of the previous paragraph, it is recommended that **the list of derogations of PED is extended to include absorption appliances**, **incorporating the relevant requirements with possible adaptations into a dedicated section of the product norm EN12309 (to be developed)**, thus unifying and simplifying the regulatory framework for GAHP all over EU.

Such a recommendation also leverages on the results of the Risk Assessment Report of HEAT4U Deliverable 7.1, proving a general low risk potential for the GAHP appliances, and on the statistical evidence of a zero rate of accidents in the recent years for GAHP appliances deployed in large numbers in the light-commercial size; incidentally, this is also recognized by the French association USNEF (*Union Syndicale Nationale des Exploitations Frigorifiques*) in charge of the redaction of the procedures for the in-service inspections of GAHP as far as pressure-related issues (*Cahier Technique Professionnel*), that, in light of the absolute absence of accidents on all the GAHP appliances installed in France, is currently proposing to reduce the frequency of periodical inspections for GAHP (see the next paragraphs on KQ2).

3.2 *Key Question No. 2: In-service inspections*

ID No.	Key Question short description	Standard(s) of reference
KQ2	***In-service inspections*** Analyse the requirements of each Member State in terms of in-service periodical inspections and requalification programs as far as pressure-related safety aspects during the operational life of the GAHP appliance.	*Pressure Equipment Directive 97/23/CE and related National implementations*

3.2.1 Introduction

Still concerning PED (Directive 97/23/EC) and beyond what elaborated in the previous paragraph about national implementations, while the Directive is detailed in defining all the upstream conditions to be met up to the introduction on the European market (design, manufacturing, certification, etc.), the downstream domain of first commissioning and periodical integrity and functional checks throughout the operational life of the equipment is not thoroughly covered. This results in an inhomogeneous situation where some of the Member States have independently issued un-harmonized National laws and regulations with different provisions, sometimes contradicting each-other when compared. As a matter of fact, different regulations concerning periodical checks might also imply the convenience of different choices for the design of the equipment, so that these different regulations do also represent a barrier *de facto* to the free circulation of goods. Therefore, in view of a large-scale deployment of the absorption technology over the European countries, it is advisable that a specific harmonized standard is defined for periodical integrity and functional checks during operational life of absorption appliances.

As said above, the scope of the PED does not thoroughly cover in-service inspection; national legislation in this area is applied across many industrial sectors in Europe and often has the goal of ensuring that pressure equipment meets specified safety requirements during the use phase of the product. Normally, in-service inspection legislation establishes a number of assessments and tests either during the installation of pressure equipment and / or at subsequent intervals after it has been put into service. Given that the legislation is formulated and overseen by national bodies, national regimes differ in their nature and scope. A survey conducted by the European Committee for User Inspectorates (ECUI) noted that the requirements of different Member States relevant to the scope, nature and frequency of in-service inspections and the authorization of Inspection Bodies, were based on parameters relating to the history, size and complexity of the plant, pressure, volume, stored energy and temperature of the equipment, and inspection and testing methods.
An analysis of the degree of flexibility of the requirements and parameters led the ECUI to conclude that broadly speaking two types of inspection regime operated in Europe:

- In some countries, responsibility is taken by the government authority through prescriptive requirements which limit the role of firms in making independent judgements;
- In other countries, more flexible regimes are in place, assigning the primary responsibility for the safe management of pressure equipment, subject to safeguards, on the user.

The ECUI concluded that flexible regimes could be successfully introduced across Europe and would incur greater benefits for the pressure equipment industry than the current 'fragmented' approach.

3.2.2 Analysis of Key Question

3.2.2.1 National Case 1: Italy

Passing to the Member States level, in Italy the PED 97/23/EC was transposed by the *Decreto Legislativo 93/2000, "Attuazione della direttiva 97/23/CE in materia di attrezzature a pressione"*; maintenance operations were then covered by *Decreto ministeriale 329/2004, "Regolamento recante norme per la messa in servizio ed utilizzazione delle attrezzature a pressione e degli insiemi di cui all'articolo 19 del decreto legislativo 25 febbraio 2000, n. 93.",* published on Gazzetta Ufficiale Supplemento Ordinario n° 22 del 28/01/2005. In this latter Decree, requirements about periodical requalifications are introduced, split into:

1. integrity verification (defined in art. 12)
2. functionality verification (defined in art. 13)

The integrity verification is performed to verify the structural status of all the external frames to detect damages which can affect the structural integrity of the equipment, and is made by:

- External visual inspection of the different parts, internal inspection if possible
- Thickness of the pipe controls
- Other tests, on the base of the damage detected, comprehensive of root cause analysis if the damage can affect the system functionality.
- If the equipment cannot be inspected completely a hydraulic test (1.125 of the maximum working pressure) must be performed with a liquid medium. Gas medium can be used for the test (1.1 of the maximum working pressure) with a period of two hours without pressure decrease. The integrity verification for piping does not imply nor the hydraulic test nor the internal inspection: adequate nondestructive testing to verify structure integrity can be used instead.

The functionality verification is performed to verify the operational status of the equipment, and is made by:

- Consistency verification of the actual operating condition with the operating manual specification
- Verification of the security devices operation

The time scheduling of the maintenance operation is fixed by two tables provided in annex A and B, divided for the two groups of fluids identified by PED 97/23/EC.

Group 1 comprises dangerous fluids. A dangerous fluid is a substance or preparation covered by the definitions in Article 2 (2) of Council Directive 67/548/EEC of 27 June 1967 on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances.
Group 1 comprises fluids defined as:

- Explosive
- Extremely flammable

- Highly flammable
- Flammable (where the maximum allowable temperature is above flashpoint)
- Very toxic
- Toxic
- Oxidizing

Group 2 comprises all other fluids not referred to in the previous Group.

Where a vessel is composed of a number of chambers, it shall be classified in the highest category applicable to the individual chambers. Where a chamber contains several fluids, classification shall be on the basis of the fluid which requires the highest category.
In particular for our scope, GAHP, which contains R717 refrigerant which is classified as B2 (higher toxicity and lower flammability), is included in group 1. For this group the table in Annex A of DM 329/04 prescribes:

Pressure equipment	Inspection frequency
Vessel / System in category III and IV	Every 2 year: functionality verification Every 10 year: integrity verification
Vessel / System in category I and II	Every 4 year: functionality verification Every 10 year: integrity verification

Table 3-3: DM 329/04 Prescription about maintenance and inspection

GAHP systems, depending on their pressure and volume, can be classified as category III or IV. A table for system category definition is presented in figure 3.1.

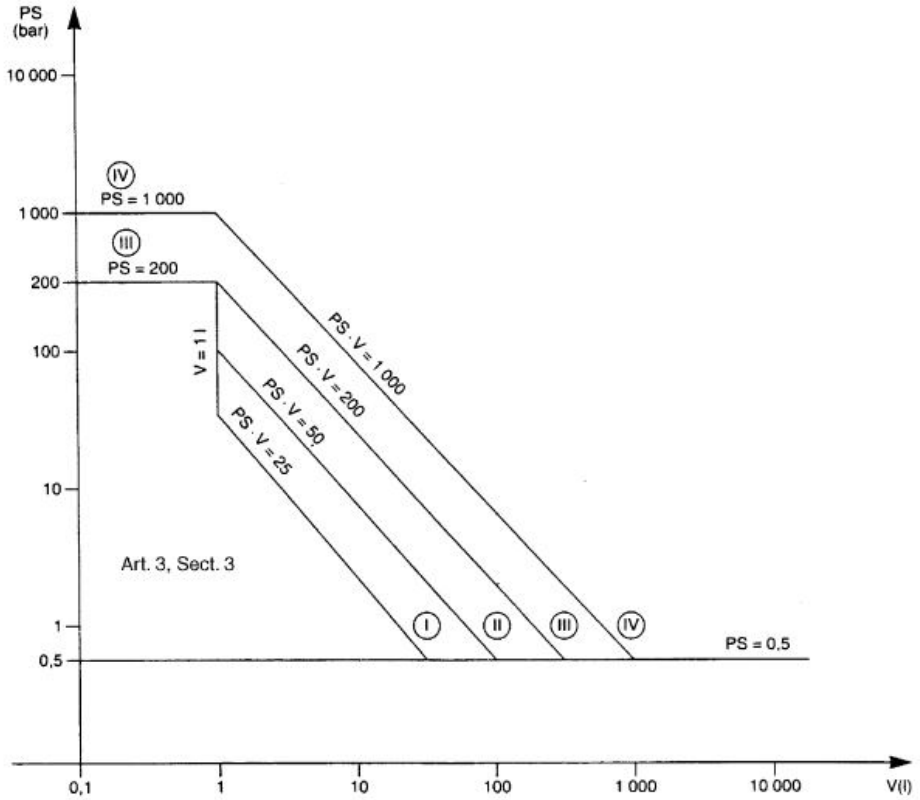

Table 1
Vessels referred to in Article 3, Section 1.1 a), first indent

Figure 3-1- PED 97/23/EC Annex II table 1, Category for gas of group 1

This scheme is derived from the PED 97/23/EC, so this kind of structure to analyze the present topic is quite common in many countries.

According to the D.M.329/04, art.12, the integrity verification is composed of:

- Visual check (internal and external) of all the parts of the systems, focusing on joints and membranes;
- Non destructive controls (check of the welding joints according to ultrasonic controls made by straight and angled probes;
- Hydraulic test at 1,125 Design Project pressure or pneumatic test at 1.1 Pressure Safety Value.

According to the D.M.329/04, art.13, the functionality verification is composed of checks of the safety devices, for example the Pressure Safety Valve. These checks have to be made as follow:

- Functionality test in work;
- Functionality test at the test bench;
- For the Pressure Safety Valve functionality verification can be substituted by the supervision of the calibration and settings documents during the validation time scheduling defined by the manufacturer and within the requalification period scheduling.

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
Italy	**Art. 12 & Art. 13, Decreto Ministeriale n° 329del 01/12/2004** Regolamento recante norme per la messa in servizio e utilizzazione delle attrezzature a pressione e degli insiemi di cui all'articolo 19del decreto legislativo 25 febbraio 2000, n. 93.	**Integrity check:** hydraulic test not mandatory. Non destructive testing, as the ultrasonic testing, can be performed instead of pressure test for the piping.	10 years (ANNEX A, DM329)	End-user
		PSV inspection: (Art 13) the test can be carried out using test benches, simulations, or directly in operation, without affecting operational conditions. In particular, for PSV, the test can consist in the assessment of calibration pressure of the valve within the time interval established by the manufacturer and within the limits for the periodicity maintenance checks.	2 years (ANNEX A, DM329)	End-user

Table 3-4: Italy-Procedure and timing for GAHP inspection procedures

3.2.2.2 National case 2: France

Up to date France has addressed the topic in the most exhaustive and complete way, duly taking into account the peculiarities of the absorption appliances through a standard called *"Cahier Technique Professionnel n°2 - Pour l'Inspection en Service des Équipements Sous Pression Constitutifs d'un ensemble sous pression utilisé en Réfrigération et Conditionnement de l'Air"* (hereafter referred to as "CTP 2"), of February 26th, 2009. In detail, the CTP 2 defines the provisions for periodical checks during operation of heat pumps whose refrigerating circuit is either sealed in factory or sealed on-site after assembly, with a CE marking released by the manufacturer under his responsibility.
According to the French legislation implementing (and complementing) PED directive, periodic checks on pressure equipment in operation are divided into two categories:

- Annual inspection
- Periodical requalification

where Periodical Requalification for absorption heat pumps is due every 5 years and is including (among other requirements) both a tightness test and an operational check of the device directly protecting the sealed circuit from overpressure (i.e.: Pressure Safety Valve, PSV).

In derogation to the above, CTP 2 states that for absorption appliances using ammonia as a refrigerant, under the following conditions:

- Nominal charge of refrigerant lower than 50 kg
- Assembly, refrigerant charge and sealing of the refrigerant circuit done in factory
- Installation outdoor or in a technical room
- Presence of an intrinsically-safe device for the direct limitation of the generator temperature (thermostat)

the first PED Periodical Requalification is postponed after 10 years of operation.

On top of that, CTP 2 further postpones the first operational check of the PSV of 5 more years (i.e.: after 15 years of operation) if the absorption appliance is equipped with additional devices reducing the likelihood of intervention of the PSV to extreme conditions, such as (by example) an internal pressure release valve of by-pass between the High Pressure and Low Pressure parts of the refrigerant circuit, activated by a maximum differential pressure between the two parts. All these considerations are intelligible from the text, as you can read from the CTP 2 normative:

> "**4.4 Dispositions spécifiques pour la requalification des systèmes de réfrigération, de**
> **conditionnement de l'air ou des pompes à chaleur à absorption utilisant l'ammoniac comme fluide frigorigène**
>
> *Si toutes les conditions énoncées ci-après sont respectées, les systèmes de réfrigération, de conditionnement de l'air ou les pompes à chaleur à absorption utilisant l'ammoniac comme fluide frigorigène bénéficient d'un sursis de 5 ans pour la première requalification périodique :*
> *– charge nominale de fluide frigorigène limitée à 50 kg ;*
> *– assemblage et charge en usine ;*

– installation soit à l'air libre, soit dans une salle des machines, soit, pour les matériels dont la charge en ammoniac est au plus égale à 2,5 kg, à l'intérieur du bâtiment mais en dehors d'une salle des machines ;
– présence d'un dispositif de limitation de la température au générateur à sécurité positive. Ce dispositif est à remplacer dès la cinquième année puis tous les 5 ans, dans le cadre de l'inspection périodique, par un nouveau dispositif de limitation de température, soit identique, soit présentant des caractéristiques techniques identiques au produit d'origine et accompagné d'un document l'attestant, dans ce cas joint au dossier d'exploitation de l'ensemble frigorifique sous pression tenu par l'exploitant.
De plus, la vérification des dispositifs de limitation directe de la pression des systèmes de réfrigération, de conditionnement de l'air ou des pompes à chaleur à absorption, qui respectent les conditions énoncées ci-dessus, bénéficie d'un sursis supplémentaire de 5 ans, sous réserve que ces systèmes présentent des dispositions réduisant la mise en action des dispositifs de limitation directe de la pression à l'éventualité de circonstances extrêmes, par exemple une soupape interne de by-pass HP/BP à déclenchement sur différentiel maximum de pression.

Since the first months of 2014, the French association USNEF (*Union Syndicale Nationale des Exploitations Frigorifiques*, in charge of the redaction and update of the CTP), has been working on an update of the CTP2; in absolute absence of accidents in the recent years, on the basis of technical considerations on the intrinsic safety of GAHP appliances, it is currently proposed to increase the period of the periodical inspection (visual inspection) from 1 year to 2 years and maintain the current prescription for periodical requalification (check of functionality of safety valve). These new dispositions should become effective from 2015.

The above described provisions of the French standard CTP2 for Periodical Requalification and PSV operational checks for absorption appliances result from a specific analysis of the limited risks relevant to GAHP against the very wide range of even large industrial-scale equipment covered by the same PED; therefore, they represent a well shaped regulatory frame on which basis it would be advisable to propose a harmonized standard to be applied by all Member States.

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EU country	**Reference standard**	**Inspection procedure**	**Inspection timing**	**Responsible**
France	Décret No. 99-1046 of 13/12/1999 on pressure equipment (JO 290 of 15/12/1999); Arrêté of 21/12/1999 on the classification and conformity assessment of pressure equipment (JO 300 of 28/12/1999) *(French transposition of PED directive)*	**Integrity check:** hydraulic test not mandatory. Non destructive testing, as the ultrasonic testing, can be performed instead of pressure test for the piping	Maximum intervals required between two periodic inspections are: 24 months if the machine is a Category 4 40 months if the machine is a category 2 or	Responsible to do inspection : authorized person Responsible to do periodic requalification: accredited companies

			3. Periodic requalification have to be performed: the first one at 10 years (maximum), the others every 5 years if all the technical criteria are obtained.	
		PSV inspection: mandatory, valve dismantling is required	Verification every 5 years (the first verification can be performed at 15 years (maximum) under the conditions mentioned in CTP – part E.3)	Responsible to do inspection : authorized person Responsible to do periodic requalification: accredited company

Table 3-5: France-Procedure and timing for GAHP inspection procedures

3.2.2.3 National case 3: Germany

The reference normative is *"Richtlinie 97/23/EG des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Druckgeräte – version 2004"*.

In Germany, national in-service inspection requirements allow a lower number of inspections if pressure equipment is designed according to former national standards (all the inspection periods are postponed by one year). If other standards are used, the frequency of inspections is higher.
Manufacturers argued that the legislative practices in Germany and other Member States discriminated against the selection of certain standards or other design and production approaches. In effect, they were seen as providing an additional set of requirements over and above the PED which need to be appropriately addressed in order to efficiently enter these markets. The National normative to be used as a reference point in the framework of pressure vessels is AD 2000.
Moreover other instructions about periodic controls are added:

(1) An installation subject to monitoring and its components shall be subjected to recurrent inspections in certain intervals by an approved body to ensure their proper condition with respect to its operation. The operator shall determine the inspection intervals of the entire installation and its components on the basis of a technical safety assessment. No technical safety assessment shall be required if it has been carried out in the scope of a hazard assessment covered by section 3 hereof or section 3 of the

Allgemeine Bundesbergverordnung (General Federal Miners' Ordinance). The sentences 1 to 3 of section 14 (3) shall apply.

(2) The inspections referred to in subsection 1 sentence 1 shall comprise a technical inspection, to be carried out on the actual installation subject to the inspection rules, and an inspection of good order. For components of steam boilers, pressure vessels except steam boilers, installations for filling compressed, liquefied gases or gases dissolved under pressure, internally pressurized pipes for flammable, highly flammable, extremely flammable, corrosive or toxic gases, vapors, or fluids, inspections to be carried out shall comprise external inspections, internal inspections and strength inspections.

(3) In defining the inspection intervals referred to in subsection 1 hereof, the maximum time limits listed in subsections 5 to 9 and 12 to 16 for the components shall not be exceeded. The operator shall inform the competent authority within six months of the putting the installation into service of the inspection intervals for the components and the entire installation and shall attach - 15 -- 16 - installation-specific data to this information. The 2nd sentence hereof shall not be applicable to installations subject to monitoring which only comprise the components listed in section 14 (3) sentence 1, as well as all other installations subject to monitoring which may be subjected to recurrent inspections performed by competent persons.

(4) To the extent that the inspections must be performed by approved bodies pursuant to subsection 1 hereof, the determination of the inspection intervals by the operator shall be subject to a review by an approved body. If an inspection interval determined by the operator is longer than the interval determined by an approved body, the installation subject to monitoring may be operated until the end of the inspection interval determined by the approved body, and the approved body shall inform the competent authority of the discrepancy in inspection intervals. The competent authority shall define the inspection interval. The authority may obtain the expert opinion of another approved body to be selected by mutual consent with the operator for its decision. The costs of such opinion shall be borne by the operator.

(5) The inspections referred to in subsection 2 hereof shall be performed within the period of time indicated in the table, having due regard to the classification of the individual pressure equipment indicated in column 1.

In the field of prescription for pressure equipment, PED (97/23/EC), under which inspections during manufacturing are carried out by Notified Bodies, has been applicable since 29.11.1999. The PED was implemented by means of the 14th Ordinance on Equipment Safety (Pressure Equipment Ordinance) in conjunction with the Operational Safety Ordinance. Since 29.05.2002, only PED must be used as a reference for Pressure Equipment design. As prescribed under the PED, the Federal Government notifies the German inspection bodies to the EU Commission in Brussels following a national accreditation process with the Central Office for Safety Technology of the German States (Zentralstelle der Länder für Sicherheitstechnik - ZLS).
As a result of a resolution by the Bundesrat or Parliamentary Upper House, the individual responsibility for technical inspection during operation of plant subject to inspection is transferred to aforentiomentioned organisations. The Equipment Safety Act was amended correspondingly on 27 December 2000. The old, individual ordinances for plant subject to

inspection were made obsolete by the restructuring of operational and installations safety legislation. Instead the comprehensive Operational Safety Ordinance was created. It deals with plant subject to inspection, such as pressure vessel plant (including simple pressure vessels), elevators, plant in areas of explosion risk, as well as storage facilities for flammable, highly flammable or extremely flammable liquids.

In the last version of the German PED Transposition (ver.2004), the regulatory organism periodically checks the manufacturer in order to guarantee the best quality systems for the production of pressure equipment, furnishing an audit report to the manufacture in a time lapse of three years.

The regulation requires for vessel and piping periodical checks a timeframe of:

- External exam (joint, welding, creep…) every 2 years
- Internal exam (hydraulic or pneumatic test or CND test) every 5 years
- Integrity and strength examination (hydraulic/pneumatic test) every 10 years

There is an important sentence at point (10) of chapter 15 about periodic inspection of the *"Verordnung über Sicherheit und Gesundheitsschutz bei der Bereitstellung von Arbeitsmitteln und deren Benutzung bei der Arbeit, über Sicherheit beim Betrieb überwachungsbedürftiger Anlagen und über die Organisation des betrieblichen Arbeitsschutzes"* (Regulation on Safety and Health in the provision of equipment and its use at work, safety during operation of installations requiring supervision and on the organization of occupational health and safety) in which framework PED transposition is implemented.

"Bei äußeren und inneren Prüfungen können Besichtigungen durch andere geeignete gleichwertige Verfahren und bei Festigkeitsprüfungen die statischen Druckproben durch gleichwertige zerstörungsfreie Verfahren ersetzt werden, wenn ihre Durchführung aus Gründen der Bauart des Druckgeräts nicht möglich oder aus Gründen der Betriebsweise nicht zweckdienlich ist."

*(*For external and internal audits at the static pressure, samples are replaced by equivalent non-destructive methods by other suitable equivalent methods and strength tests, if their implementation operation is not appropriate).

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
Germany	Arbeitsschutzgesetz – ArbSchG - BGBl I 1996, 1246, 7.8.1996 (Law on Occupation Protection); Betriebssicherheitsverordnung – BetrSichV - BGBl I 2002, 3777, 27.9.2002 (Occupational Safety Order); Geräte- und Produktsicherheitsgesetz - GPSG - BGBl I 2004, 2 (219), 6.1.2004 (Law on the Safety of Devices and Products); Druckgeräteverordnung - 14. GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002 (Pressure	**Integrity check:** hydraulic test not mandatory. Non destructive testing, as the ultrasonic testing, can be performed instead of pressure test for the piping.	10 years	Accredited bodies
		PSV inspection: not described	3 years	Accredited bodies

	Devices Order) Other important notes in "Verordnung über Sicherheit und Gesundheitsschutz bei der Bereitstellung von Arbeitsmitteln und deren Benutzung bei der Arbeit, über Sicherheit beim Betrieb überwachungsbedürftiger Anlagen und über die Organisation des betrieblichen Arbeitsschutzes"			

Table 3-6: Germany-Procedure and timing for GAHP inspection procedures

3.2.2.4 National case 4: Belgium

The reference text is the normative *"Arrêté royal concernant la mise sur le marché des équipements sous pression – VERSION - 10/02/2006".*

No specific maintenance scheduling and inspection programs are presented in this law.

The maintenance and periodic inspections are ruled by *"Arrêté du 15/03/2000 modifié dont les conditions d'application sont précisées par la circulaire 06-080 du 06/03/2006"*: this decree defines the time scheduling of periodic inspections, the periodic control, requalification and repair.

The periodic inspection consist of an external control of the equipment, followed by the control of the emergency and security accessories and have to be made with this time scheduling:
- 12 months for pressure vessels for medical purposes
- 18 months for steam generators
- 40 months for the other pressurized vessels

The periodic requalification is composed by an inspection of the equipment, a hydraulic test and a control of the safety accessories. This requalification is requested:
- Every 2 years for pressure vessels for medical purposes
- Every 3 years for pressure vessels containing dangerous fluids
- Every 5 years for pressure vessels containing toxic fluids

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
Belgium	Arrêté royal of 13/06/1999 concerning the placing on the market of pressure equipments (MB of 08/10/1999) title amended by Arrêté royal of 06/12/2005 (MB of 07/02/2006)	**Integrity check:** not described	Not described	Accredited bodies
		PSV inspection: not described	3 years	Accredited bodies

Table 3-7: Belgium-Procedure and timing for GAHP inspection procedures

3.2.2.5 National case 5: The Netherlands

In the Netherlands the PED implementation has been recently updated and reported in the Warenwet Besluit Druk Apparatuur (WBDA), modified in January 2011.

With reference to the "Periodical Inspection" (Periodieke inspecties) section of the normative some important considerations can be done. The Dutch in-service inspection approach is different from other national regimes and it corresponds to the 'Putting into Service Inspection' (KVI) that is conducted in the Netherlands and it is delivered by the Appointed Inspection Agency (AKI). It is foreseen that the inspections are to be carried out after the pressure equipment has been placed on the market, but before being in operation. The inspection consists of different checks, as listed below:

- Verification of equipment through technical documentation and markings
- Inspection of the external condition of pressure equipment, assemblies and pressure systems
- Inspection of the operation of safety and pressure accessories
- Inspection of the arrangement and integration of pressure equipment.

It is worthy to underline that these requirements and audits are linked to the first start-up of the machine, but there were no specific instructions about the maintenance inspections. The latest modification of the Dutch transposition of the PED (1st January 2011), however, seems to indicate that after the first inspection, the next one is scheduled after six years, even if a specific request has to be made by the installer or by the final user.

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
The Netherlands	Warenwetbesluit Drukapparatuur. Decree on Pressure Equipment of 5 July 1999 (Stb. 1999, 311)	**Integrity check:** not described	Not described	Accredited bodies
		PSV inspection: not described	6 years	Accredited bodies

Table 3-8: The Netherlands-Procedure and timing for GAHP inspection procedures

3.2.2.6 National case 6: UK

According to UK Pressure Equipment directive, no detailed or precise indications are given by the technical normative, but the type and frequency of maintenance for the system should be assessed and a suitable maintenance program shall be fixed by the person responsible for the safety of the installation, with reference to the Approved Code of Practice and to the full text of the Pressure Systems Safety Regulations.

A suitable maintenance program should take into account:

- Age of the system
- Operating/process conditions
- Working environment
- Manufacturer's/supplier's instructions
- Previous maintenance history
- Reports of examinations carried out under the written scheme of examination by the competent person
- Results of other relevant inspections (e,g. for maintenance or operation purposes);
- Repairs or modifications to the system
- Risks to health and safety from failure or deterioration.

In the Pressure Equipment Regulations 1999 (SI No. 2001 of 1999), the temporal scheduling of the maintenance operation is reported in two tables provided in Schedule 3.

According to what exposed above, any maintenance and in-service inspection can be considered mandatory, but the normative generally refers to “good practice frequent checks”, even if no particular procedures are stated and no specific differentiation is made between functional tests and inspections/integrity checks .

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
UK	No specific requirements in UK regulations. any checks undertaken follow individual manufacturer instructions, having been manufactured to EU standards with installation and maintenance instructions.	**Integrity check**: Not Mandatory, but good practice requires checking on annual service visits	On annual service visit	Householder or Landlord to organise annual service visits for appliances
		PSV inspection: Not Mandatory, but good practice requires checking on annual service visits	On annual service visit	Householder or Landlord to organise annual service visits for appliances

Table 3-9: UK-Procedure and timing for GAHP inspection procedures

3.2.2.7 National case 7: Poland

In Poland the classical periodic checks of the pressure safety equipment are made together with other “Direct Evidence tests”, like the verification of the leakage and the functional verification which have to be made every 2-3 years.
The evidence periodic tests consist of: internal audits (every 6 years) and pressure tests (depending on the equipment every 6 to 12 years) even if no specific disposition about hydraulic test or PSV inspection is declared.

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
Poland	Regulation of the Minister of Economy, Labour and Social Policy on the essential requirements for pressure equipment and pressure units (Rozporzadzenie Ministra Gospodarki, Pracy i Polityki Spolecznej w sprawie zasadniczych wymagan dla urzadzen cisnieniowych i zespolow urzadzen cisnieniowych), of 8 May 2003 (Dz.U. No. 99, item 912).	**Integrity check:** hydraulic test not mandatory.	*Not identified*	Licensed boiler operator
		PSV inspection: test not mandatory.	*Not identified*	Licensed boiler operator

Table 3-10: Poland-Procedure and timing for GAHP inspection procedures

Important Keynote

On the 15th of May 2014 a new review of the PED directive was approved by the European Parliament (2014/68/EU, published on the Official Journal L189 of June 27th, 2014). This revision is part of a general effort aimed to ensure greater consistency throughout the EU in several industrial sectors, to facilitate the compliance in all areas and to increase the

effectiveness of product safety provisions. This initiative should help to overcome the conflicting or overlapping requirements for products covered by different pieces of legislation and different normative. The proposal should introduce more consistency in the legislation, also reducing compliance costs. Product safety will be improved through better traceability, allowing the recognition of defective or unsafe products. The authorities will have more tools to prevent the importation of hazardous products from third countries due to improved supervision of the national market.

In the Explanatory Memorandum supporting the proposal for this new Directive, it was highlighted that the lack of a real harmonisation process of the PED among the EU countries is an actual and huge barrier to the free movement of pressure equipment in the internal market. As stated in this document[1]:

"Experience with the implementation of Union harmonisation legislation has shown – on a cross-sector scale - certain weaknesses and inconsistencies in the implementation and enforcement of this legislation, leading to:

- *The presence of non-compliant or dangerous products on the market and consequently a certain lack of trust in CE marking;*
- *Competitive disadvantages for economic operators complying with the legislation as opposed to those circumventing the rules;*
- *Unequal treatment in the case of non-compliant products and distortion of competition amongst economic operators due to different enforcement practices;*
- *Differing practices in the designation of conformity assessment bodies by national authorities;*
- *Problems with the quality of certain notified bodies.*

Furthermore, the regulatory environment has become more and more complex, as frequently several pieces of legislation apply simultaneously to one and the same product. Inconsistencies in these pieces of legislation make it increasingly difficult for economic operators and authorities to correctly interpret and apply that legislation.

Article 45 of this proposal states:

In the interests of competitiveness, it is crucial that conformity assessment bodies apply the conformity assessment procedures without creating unnecessary burdens for economic operators. For the same reason, and to ensure equal treatment of economic operators, consistency in the technical application of the conformity assessment procedures needs to be ensured. That can best be achieved through appropriate coordination and cooperation between conformity assessment bodies.

It is now up of all EU Member States (and in their strong interest) to transpose the new directive into national laws by developing a real harmonization, clarifying all the areas of misalignment among the different countries.

[1] Proposal for a directive of the European Parliament and of the council on the harmonisation of the laws of the Member States relating to making available on the market of pressure equipment – Bruxelles, 8/6/2013

3.2.3 Conclusions

The Pressure Equipment Directive 97/23 does not include detailed indications on periodical inspections and integrity checks. This information has to be investigated at national level per each Member State.

Only the French legislation has a clear and specific set of provisions for absorption appliances:

- concerning integrity checks, French laws prescribe for equipment like the GAHP the first integrity check after 10 years and a functionality test on the safety equipment (PSV) after 15 years;
- concerning periodical inspections, thanks to the positive feedback from the large number of appliances deployed on the field without a single safety-related accident, French legislation is going towards a reduction of the inspection frequency, passing from yearly to once every second year.

The following table summarizes the inspection (visual) and the integrity check prescribed in the different national legislations analyzed in this study. As anticipated the situation indicates both the lack of specific legislation for GAHP technology (with the only exception of French legislation) and the large variety of prescriptions in the different local legislations.

EU country	Reference standard	Inspection procedure	Inspection timing	Responsible
Italy	**Art. 12 & Art. 13, Decreto Ministeriale n° 329del 01/12/2004** Regolamento recante norme per la messa in servizio e utilizzazione delle attrezzature a pressione e degli insiemi di cui all'articolo 19del decreto legislativo 25 febbraio 2000, n. 93.	**Integrity check:** hydraulic test not mandatory. Non destructive testing, as the ultrasonic testing, can be performed instead of pressure test for the piping.	10 years **(ANNEX A, DM329)**	End-user
		PSV inspection: (Art 13) the test can be carried out using test benches, simulations, or directly in operation, without affecting operational conditions. In particular, for PSV, the test can consist in the assessment of calibration pressure of the valve within the time interval established by the manufacturer and within the limits for the periodicity	2 years **(ANNEX A, DM329)**	End-user

		maintenance checks.		
France	Décret No. 99-1046 of 13/12/1999 on pressure equipment (JO 290 of 15/12/1999); Arrêté of 21/12/1999 on the classification and conformity assessment of pressure equipment (JO 300 of 28/12/1999) *(French transposition of PED directive)* CTP : « Cahier Technique Professionnel pour le suivi en service des systèmes frigorifiques sous pression » - July 07th, 2014	**Integrity check:** hydraulic test not mandatory. Non destructive testing, as the ultrasonic testing, can be performed instead of pressure test for the piping	Maximum intervals required between two periodic inspections are: 24 months if the machine is a Category 4 40 months if the machine is a category 2 or 3. Periodic requalification have to be performed : the first one at 10 years (maximum), the others every 5 years if all the technical criteria are obtained.	Responsible to do inspection : authorized person Responsible to do periodic requalification : accredited company
		PSV inspection: mandatory, valve dismantling is required	Verification every 5 years (the first verification can be performed at 15 years (maximum) under the conditions mentioned in CTP – part E.3)	Responsible to do inspection : authorized person Responsible to do periodic requalification : accredited company
Germany	Arbeitsschutzgesetz – ArbSchG - BGBl I 1996, 1246, 7.8.1996 (Law on Occupation Protection); Betriebssicherheitsverordnung – BetrSichV - BGBl I 2002, 3777, 27.9.2002 (Occupational Safety Order); Geräte- und Produktsicherheitsgesetz - GPSG - BGBl I 2004, 2 (219), 6.1.2004 (Law on the Safety of Devices and Products);	**Integrity check:** hydraulic test not mandatory. Non destructive testing, as the ultrasonic testing, can be performed instead of pressure test for the piping.	10 years	Accredited bodies
		PSV inspection: not described	3 years	Accredited bodies

	Druckgeräteverordnung - 14. GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002 (Pressure Devices Order) Other important notes in "Verordnung über Sicherheit und Gesundheitsschutz bei der Bereitstellung von Arbeitsmitteln und deren Benutzung bei der Arbeit, über Sicherheit beim Betrieb überwachungsbedürftiger Anlagen und über die Organisation des betrieblichen Arbeitsschutzes"			
Belgium	Arrêté royal of 13/06/1999 concerning the placing on the market of pressure equipments (MB of 08/10/1999) title amended by Arrêté royal of 06/12/2005 (MB of 07/02/2006)	**Integrity check:** not described	Not described	Accredited bodies
		PSV inspection: not described	3 years	Accredited bodies
The Netherlands	Warenwetbesluit Drukapparatuur. Decree on Pressure Equipment of 5 July 1999 (Stb. 1999, 311)	**Integrity check:** not described	Not described	Accredited bodies
		PSV inspection: not described	6 years	Accredited bodies
UK	No specific requirements in UK regulations. Any checks undertaken follow individual manufacturer instructions, having been manufactured to EU standards with installation and maintenance instructions.	**Integrity check**: Not Mandatory, but good practice requires checking on annual service visits	On annual service visit	Householder or Landlord to organise annual service visits for appliances
		PSV inspection: Not Mandatory, but good practice requires checking on annual service visits	On annual service visit	Householder or Landlord to organise annual service visits for appliances
Poland	Regulation of the Minister of Economy, Labour and Social Policy on the essential requirements for pressure equipment and pressure units (Rozporzadzenie Ministra Gospodarki, Pracy i Polityki Spolecznej w sprawie zasadniczych wymagan dla urzadzen cisnieniowych i zespolow urzadzen cisnieniowych), of 8 May 2003 (Dz.U. No. 99, item 912).	**Integrity check:** hydraulic test not mandatory.	***Not identified***	Licensed boiler operator
		PSV inspection: test not mandatory.	***Not identified***	Licensed boiler operator

Table 3-11: Summary of National PED Transposition and their directive about maintenance and inspection procedures – KQ2

3.2.4 Recommendation for KQ2

As anticipated in the previous paragraph "*Important keynote"*, a harmonization of the different national legislation is needed to facilitate the adoption of GAHP technology. As far as in-service inspections, the extension to all EU countries of the French guidelines specifically conceived for absorption appliances could represent an important step forward towards a common legislative framework across Europe.

Therefore, it is recommended to integrate in the norm EN12309 a dedicated part with provisions for in-service inspections on the basis of the French standard CTP2, to be regarded as a common European reference for all EU countries.

3.3 *Key Question No. 3: Installation norms*

ID No.	Key Question short description	Standard(s) of reference
KQ3	***Installation norms*** Analyse the applicability of installation norms to GAHP and the relevant implications in the residential sector.	*EN378 "Refrigerating systems and heat pumps*

3.3.1 Introduction

Gas Absorption *Heat Pump* appliances combine technological features which can be partly regarded as pertaining to the category of *Gas appliances (boilers)* and partly regarded as pertaining to the category of (*electrical) Heat Pumps*. Therefore, when coming to installation norms, in the absence of a specific regulatory frame tailored on the peculiarities of GAHP appliances, *both* installation norms for gas appliances *and* installation norms for electrical heat pumps are tentatively used as a reference; however, it turns out clearly that both sets of installation norms are not duly taking into account the fact that GAHP are in a certain way simultaneously belonging to both these different categories. This is resulting in grey areas of interpretation or contradictory indications. In order to encourage as much as possible the spread of GAHP on the market, it's important to identify and solve these unclear points in the legislation and technical normative, representing substantial regulatory barriers.

In the following paragraph, an analysis of the inconsistencies raising when the present normative is attempted to be applied to GAHP is reported, with particular reference to *EN 378"Refrigerating systems and heat pumps - Safety and environmental requirements - Part 1: Basic requirements, definitions, classification and selection criteria"*[2]. Even if the GAHP prototypes realized and field tests carried out in the frame of the HEAT4U project are actually conceived for an outdoor installation, since the scope of the HEAT4U project is to prove the feasibility of introducing GAHP in existing residential buildings for heating and DHW services, an analysis of indoor installation is also herein presented, being indoor versions one the possible major steps of future development in the deployment of the GAHP technology in the residential domain.

3.3.2 Analysis of Key Question

EN-378 comprehensively encompasses refrigerating and heat pumps equipment of very different sizes and purposes, which is by itself generating some difficulty of interpretation. Primarily, in the next sections the following topics are analyzed:

- Occupancy category
- Machinery room definition
- Simultaneous presence of GAHP and boilers in the machinery room

Occupancies

With reference to *EN378, § 4.2*, occupancies are classified on the basis of safety of people who may be directly affected in case of abnormal operation of the refrigerating system.

[2] EN378 is currently (2014) under revision

Safety issues related to refrigerating systems take into account the following aspects: site, number of people occupying the site and the categories of occupancy.
With reference to the categories of occupancies 3, the classification proposed in *EN378* herein follows:

- **CLASS A - General Occupancy**: where People may sleep or where the number of people present is not controlled or where people can have access without particular safety requirements
- **CLASS B - Supervised Occupancy:** rooms, parts of buildings or buildings where only a limited number of people may be assembled, some of them being necessarily acquainted with the general safety precautions
- **CLASS C- Occupancy with authorised access only:** occupancy not opened to the public, only authorised persons are granted access and they shall be acquainted with general safety precautions of the establishment

Categories	General characteristics	Examples *
General occupancy A	Rooms, parts of buildings, building where - people may sleep; - people are restricted in their movement; - an uncontrolled number of people are present or to which any person has access without being personally acquainted with the necessary safety precautions.	Hospitals, courts or prisons, theatres, supermarkets, schools, lecture halls, public transport terminal, hotels, dwellings, restaurants.
Supervised occupancy B	Rooms, part of buildings, buildings where only a limited number of people may be assembled, some being necessarily acquainted with the general safety precautions of the establishment.	Business or professional offices, laboratories, places for general manufacturing and where people work.
Authorised occupancy C	Rooms, part of buildings, buildings where only authorized person have access, who are acquainted with general and special safety precautions of the establishment and where manufacturing, processing or storage of material or product take place.	Manufacturing facilities, e.g. for chemicals, food, beverage, ice, ice-cream, refineries, cold stores, diaries, abattoirs, non-public areas in supermarkets.
** The list of examples is not exhaustive.*		

Table 3-12: – Category of Occupancy from EN 378

Machinery Rooms

In a typical detached house there aren't dedicated machinery rooms for the installation of heating systems like in larger buildings. In detached house the GAHP won't be installed in a dedicated room, but probably in part of a cellar or in a room in the basement.
With reference to *EN378*, the regulation defines that:

- **Machinery room** is a complete enclosed room or space only accessible to authorised person (i.e. a room with a locked door, where someone can have its

keys). Machinery room occupancy can be classified in two different ways (regulation grey area) :

- the Occupancy Class is C, if i.e. in the same room are present other equipment useful for building maintenance *(ref. fig.1).*
- if the machinery room is dedicated to the GAHP installation, even if its keys are owned by guardians or not competent staff, it can be considered an unoccupied place (ref. fig.2).

5.2 Occupation of machinery rooms

If machinery rooms are occupied for significant periods, e.g. used as a building maintenance workspace, they shall be considered as occupied spaces under occupancy class "C" "Occupancy with authorised access only".

Figure 3-2– Machinery Room Occupancy Class

4.2 Occupancies

4.2.1 General

Occupancies are classified in respect to the safety of the persons, who may be directly affected in case of abnormal operation of the refrigerating system. Considerations of safety in refrigerating systems take into account the site, the number of people occupying the site and the categories of occupancy. Machinery rooms (see 3.2.1 and 3.2.2) are regarded as unoccupied.

Figure 3-3– Machinery Room as Unoccupied

- **Special machinery room** it's a particular kind of machinery room intended only for the installation of the complete refrigerating system. It is accessible only to competent personnel for the purposes of maintenance and repair (i.e. a room with a locked door whose keys are only owned by the maintenance/installation staff)
  - These rooms have to be considered unoccupied places, as their access is strictly controlled.
  - Annex C.1 give the guidelines for installation of heat pumps in *EN378.*

Also, it is to be reminded that ammonia as a refrigerant (R717) is included within safety group B2 (Higher Toxicity, Lower Flammability). Thus, considering Table 3-13 in order to determine the charge limit, the system has to be classified according to the four categories:

- Safety group of the refrigerant (see Annex E)
- Occupancy (see 4.2)
- System category (direct or indirect — see 4.1)
- Location of the refrigerating system (see C.1).

On the basis of the identification of the aforementioned categories with regards to GAHP device and by means of the following Table 3-13 it is possible to determine charge limitations and potentially additional requirements applicable to the GAHP of interest. For easier reference these boxes are numbered. Air/water GAHPs must be located in Table 3-13 considering the following input data:

- Refrigerant safety group: B2
- The definition of "occupancy" is of course not relevant for outdoor installations or installations in machinery room and special machinery room

- Indirect System (ammonia is the refrigerant, but the cooling effect is provided by a secondary coolant fluid)
- Unit system (Sealed), implying “all refrigerant contained parts”, installed in the open air (outdoor appliance)

Cases 6, 12 and 18 show that no restriction applies to GAHP devices with regards to the maximum charge of refrigerant.

Refrigerant safety group – B2		
Location of the refrigerant system	**Occupancy** **General occupancy – Class A**	
	Direct Systems	Indirect Systems
Human occupied space and occupied machinery rooms	**1** Max. charge = 2.5 kg for sealed adsorption systems; for all other systems: max. charge = practical limit x room vol.	**2** Considered as direct system; see box nr. **1**
Compressor and liquid receiver in an unoccupied machinery room in the open air	**3** Max. charge = 2.5 kg for sealed adsorption systems; for all other systems: max. charge = practical limit x room vol.	**4** Max. charge = 2.5 kg for sealed adsorption systems; for all other systems: max. charge = practical limit x room vol.
All refrigerant containing parts in an unoccupied machinery room in the open air	**5** Max. charge = 2.5 kg	**6** No restrictions if exit to the open air and no direct communication with rooms to categories A and B
	Supervised occupancy – Class B	
	Direct Systems	Indirect Systems
Human occupied space and occupied machinery rooms	**7** Max. charge = 10 kg	**8** Considered as direct system; see box nr. **7**
Compressor and liquid receiver in an unoccupied machinery room in the open air	**9** Max. charge = 25 kg	**10** No restrictions if machinery room has no direct communication to occupied space
All refrigerant containing parts in an unoccupied machinery room in the open air	**11** No restrictions if machinery room has no direct communication to occupied space	**12** No restrictions if machinery room has no direct communication to occupied space
	Occupancy with authorised access only – Class C	
	Direct Systems	Indirect Systems
Human occupied space and occupied machinery rooms	**13** Max. charge = 10 kg or 50 kg if density of personnel is $<1/10m^2$ and sufficient emergency exits are available	**14** Considered as direct system; see box nr. **13**
Compressor and liquid receiver in an unoccupied machinery room in the open air	**15** Max. charge = 25 kg or no restriction if density of personnel is $<1/10m^2$	**16** No restriction
All refrigerant containing parts in an unoccupied machinery room in the open air	**17** No restriction	**18** No restriction

Table 3-13: –Annex C.1 for B2 Gases as R717 (ammonia) (ref. *EN378*)

More in general, *EN378* provides no substantial limitation to installation in open air, except common-sense criteria intended to avoid direct release of refrigerant towards inside the adjacent building in case of accidental leakage:

4.2 Refrigerating equipment located outside in the open air

Refrigerating equipment sited in the open shall be positioned to avoid refrigerant leaking into the building or otherwise endanger people. If sited on the roof the refrigerant shall not be able to flow across the roof into any ventilation fresh air opening, doorway, trap door or similar opening in the event of a leak. A shelter provided for refrigerating equipment sited in the open air shall be provided with natural or forced ventilation. Refrigerating equipment located in the open air shall be sited to avoid refrigerant leakage into adjacent buildings or other danger to people.

Figure 3-4– Outside installation in EN-378

It is worth pointing out that (according to part 3, paragraph 4.2) the definition of "open air" also applies to shelters or "semi-opened" rooms as defined below:

NOTE A room, where at least one of the longest walls is open to the outside air by means of louvres with 75 % free area and covering at least 80 % of the wall area (or the equivalent if more than one wall is to outside), is considered as being in the open air.

Figure 3.5– Outside installation, particular definition in EN-378

The above summary results in a quite exhaustive and clear picture of the safety provisions given by *EN378* as far as outdoor applications.

If the GAHP appliance has to be installed in a machinery room as defined below (Occupancy class C), it is important to underline that box 13 (Table 3-14) has to be considered. The norms are respected by GAHP appliance as the R717 provided the maximum charge rate is lower than 10 kg.

	Occupancy with authorised access only – Class C	
	Direct Systems	Indirect Systems
Human occupied space and occupied machinery rooms	**13** Max. charge = 10 kg or 50 kg if density of personnel is <1/10m^2 and sufficient emergency exits are available	**14** Considered as direct system; see box nr. **13**
Compressor and liquid receiver in an unoccupied machinery room in the open air	**15** Max. charge = 25 kg or no restriction if density of personnel is <1/10m^2	**16** No restriction
All refrigerant containing parts in an unoccupied machinery room in the open air	**17** No restriction	**18** No restriction

Table 3-14: - Particular of Table 3-13

In the installation room, other machinery could be present like boilers or other gaseous fuelled machines. Thus, it's also important to investigate on the possibility/impossibility to have in the same room both a boiler and a GAHP; of course, a limitation in that sense would not be reasonable, since the GAHP consists both of a refrigeration cycle and a combustion chamber.
With reference to *EN378* regulation some indications can be found:

5.17.4 Combustion equipment

Combustion equipment shall not be installed in a machinery room containing an A2/A3 and B2/B3 refrigerating system.

Figure 3.6– Contemporary presence of GAHP and combustion system in the same place in EN-378

Of course, a GAHP system combines by definition a refrigerant system with combustion equipment and the above paragraph seems nonsense for an absorption heat pump; the presence of another boiler in the same installation room shouldn't make any difference and a literal interpretation of the above paragraph should be rejected. In fact, Annex C of part 1 is partially eliminating the incoherence of paragraph 5.17.4, recognizing an exemption for R717:

For sealed refrigerating systems using flammable refrigerants (A2, A3, B2, B3), but excluding R717, no sources of ignition shall be associated with parts of the equipment that could come into contact with leaked refrigerant. All potential sources of ignition shall be sealed according to the methods detailed in EN 378-2.

Figure 3.7– Contemporary presence of GAHP and combustion system in the same place in EN-378, details for ammonia

Important Keynote

It appeared that while this report was in preparation, EN378 was undergoing a revision process. In the next *EN378 – A2014*, some of the inconsistencies analyzed in this chapter might be better defined, allowing a future better understanding (i.e. machinery room, occupancy categories and refrigerant charge definition).

In the *prEN378 draft* the peculiarities to the new absorption gas technology is going to be taken into account, especially with regards to safety requirements.

As reported in HEAT4U D.7.1 on Risk Assessment of the GAHP technology, the risk level referred to the use of ammonia as refrigerant fluid is limited, even lower to the risk of the use as methane and natural gas as fuel of the GAHP (a fuel used without any safety issues and problems in indoor installation too).

According to the GAHP application is important to study future modifications and implementations of all the technical normative related to the GAHP technology (i*.e. EN378-PED, EN378-EN12309, EN378 - GAD)* in order to have a contemporary advancement of the regulatory process.

All the notes reported in this deliverable have to be taken into account in this improvement and modification of the whole legislative framework particularly according to:

- The definition of machinery room and the limitations about the presence of combustion equipment;
- The new flammability classification of the fluids (ammonia would benefit of higher correction factors);
- As ammonia is lighter than air, there wouldn't be problems in installing machinery exploiting ammonia as refrigerant fluid for indoor installation in basement or cellars
- As no accidents occurred among installed heat pumps, the updated normative wouldn't strengthen safety requirements and limitations;

- As GAHPs don't work exploiting electrical input, the emergency shutdown required for a GAHPs unit has to be considered and prescribed. Till now the shut down instructions are referred to electrical heat pumps and they impose a sudden disconnection from the electrical power supply.

A dedicated procedure that consider a gas feeding-line interruption is required

- As ammonia is classified in class 2L (the less-inflammable refrigerant fluids), it's strange that the prEN-378 impose a anti-deflagration building for the electrical equipment present in the machinery room;

The in-service inspection criteria have to be harmonized to the PED prescribed ones. (see. §3.2).

3.3.3 Conclusions

The existing installation norms conceived either for gas appliances or for electrical heat pumps are not taking into account the peculiarities of GAHP appliances, which do have some features in common with both these categories, but in fact represent a different category on its own.

This situation is resulting in unclear provisions for the installation of GAHP, especially for the indoor applications, representing a significant barrier against the deployment, in particular in the residential sector.

3.3.4 Recommendation for KQ3

In order to reduce the barriers due to the ambiguity and limitations of the current installation norms, it is recommended that specific installation rules for GAHP are directly included in a dedicated section of the product norm EN12309; to this aim, it is also recommended that **a *formal liason* is set up between Technical Committees in charge of EN378 and EN12309:**

- CEN/TC 299 "*Gas-fired sorption appliances, indirect fired sorption appliances, gas-fired endothermic engine heat pumps and domestic gas-fired washing and drying appliances*";
- CEN/TC 182 *"Refrigerating systems, safety and environmental requirements".*

3.4 *Key Question No. 4: Measurement of emissions*

ID No.	Key Question short description	Reference Standard(s)
KQ4	***Measurement of emissions*** Compare different approaches for the calculation of emissions in the frame of the *Gas Appliance Directive (GAD).*	*Gas Appliance Directive 2009/142/EC*

3.4.1 Introduction

Emissions produced by appliances burning gaseous fuels are referred to by the *Gas Appliance Directive* (GAD). Usually, in the calculation methods adopted for measuring the pollutants production (e.g. NOx, CO, CO2), the emission factor for each pollutant is expressed in terms of mg/Nm^3 (ppm) of flue gas, thus in strict connection to the input thermal energy/gas consumption. Considering that GAHP technology produces the same useful effect (heating) with less gas consumption, it would be more appropriate to introduce a new method for calculating the specific emission factor for each pollutant of interest by referring it to the GAHP useful effect (i.e. produced thermal energy provided to the end-user [mg/kWht]).

3.4.2 Analysis of Key Question

In common practices, pollutants emissions are calculated in ppm (parts per million) by means of conversion factors from mg/Nm^3 to ppm, as shown below.

$$mg/Nm^3 \times 0.022414\ Nm^3/mol \times 1\ mol/molar\ mass = \mu mol/mol\ (or\ ppm) \quad (1)$$

Molar mass values are herein listed:

- CO_2: 44 g/mol
- CO: 28 g/mol
- NO: 30 g/mol
- NO_2: 46 g/mol

Moreover, 0.022414 Nm^3/mol is the normal molar volume (constant for all the fluids).

As the last version of the "*Directive 2009/142/EC of the European Parliament and of the Council of 30 November 2009 relating to appliances burning gaseous fuels*" doesn't give any detailed indication on methods to be adopted for emissions calculations, it's important to analyze norms related to gas applications or domestic heat burners fired by gaseous fuels. With reference to the regulation *EN 676 – Automatic Forced Draught Burners for Gaseous Fuels – Annex A*, the NOx content of the dry flue gas is calculated as follow.

$(NO_x)_M$ measured NO_x- emission in ppm, volumetric

$(O_2)_M$ Oxygen concentration in the gaseous combustion products in % - volume

2,05 NO_2-density in kg/m³

$V_{at,tr}$ theoretical reference flue gas volume, dry, in m³/m³

H_i net calorific value in kWh/m³ (referring to 15 °C and 1 013,25 mbar)

Determination of the arithmetical NO_x mean value of the working diagram:

$$(\overline{NO_x})_M = \sum_{i=1}^{n}\left(\frac{(NO_x)_{mi}}{n}\right)$$

where

$(\overline{NO_x})_M$ is the arithmetical mean value of the measured nitrogen emission limits in the working diagram

$(NO_x)_{mi}$ is the measured NO_x-concentration at the points in the working diagram

n is the number of points in the working diagram.

Figure 3.8- EN 676 – Pollutants Calculation Methods - NOx

Considering CO and CO_2 emissions the related values are calculated as follows.

For range-rated burners the tests are carried out at the maximum and the minimum heat input stated by the manufacturer.

Modulating burners are tested at the maximum and the minimum heat input given by the controls.

A representative dry sample of the combustion products is taken when the burner has reached thermal equilibrium.

The CO content of the dry, air-free combustion products is given by the formula:

$$(CO)_N = (CO_2)_N \frac{(CO)_M}{(CO_2)_M} \quad (A.1)$$

where:

$(CO)_N$ is the carbon monoxide content in ppm by volume of the dry, air-free combustion products;

$(CO_2)_N$ is the maximum possible carbon dioxide content in % by volume of the dry, air-free combustion products;

$(CO)_M$ is the measured concentration, expressed in ppm by volume of carbon monoxide in the sample taken during the combustion test;

$(CO_2)_M$ is the measured concentration, expressed in % by volume of carbon dioxide in the sample taken during the combustion test.

The CO content in % by volume of the dry, air-free combustion products can also be calculated by the formula:

$$(CO)_N = \frac{21}{21-(O_2)_M} (CO)_M \quad (A.2)$$

where:

$(O_2)_M$ is the measured concentration, expressed in % by volume, of oxygen in the sample taken during the combustion test.

$(CO)_M$ is the measured concentration, expressed in % by volume, of carbon monoxide in the sample taken during the combustion test.

The use of this formula is recommended where it gives greater accuracy than the formula based on the CO_2 content.

Figure 3.9- EN 676 – Pollutants Calculation Methods – CO_2 – CO

The same approach for CO_2 – CO emissions calculation is proposed in *EN 15502-1 Gas Fired Heating Boilers – General Requirements and Tests* in §8.12.

More articulated NOx calculation methods, taking into account different operating conditions (i.e., partial heat input, starting up the plant etc.), are reported in *EN 15502 – 1*, §8.13.

All these calculation methods are referring to the content of pollutants per unit (volume or mass) of exhaust flue gas, which is directly related to gas consumption, or thermal input. But as a matter of fact, this approach is just considering the “cleanliness” or “efficiency” *of the combustion process itself*, not taking into account that the *overall efficiency of the appliance* (including all the energy processes downstream of the combustion) plays a significant role. In fact, gas appliances are used *to fulfil a need*: the useful effect produced by a heating appliance is the amount of heat delivered to the building (not just the heat

produced during the combustion). An approach more adherent to reality (already well established in Life Cycle Analyses) is to consider the amount of resources used and the environmental impact produced *to obtain a given useful effect*; by example, in the automotive industry, it is common practice to declare the emissions of a model of car in terms of amount of pollutants *per kilometre of road driven*, and not per volume of exhaust gases or per litre of gasoline consumed. In the case of space heating, for a given useful effect, which means for a fixed amount of heat requested by the building, it is evident that gas consumption and pollutants production is lower if the overall efficiency of the heating appliance is higher. Even if for gas boilers the difference between the two approaches might be in fact quite negligible, the above mentioned calculation methods are definitely not suitable to reflect the fact that for a GAHP appliance the useful effect is not deriving *only* by the energy resulting from the combustion process, but *also* from the amount of renewable energy recovered from the external environment and delivered to the building.

In *prEN12309 – 2:2014*, §4.2.6.1, a new calculation method of NO_x emissions referred to the thermal output is reported, converting emissions measured in the exhaust into the corresponding value based on thermal input, passing through the GUE (Gas Utilization Efficiency), which is the parameter measuring the overall efficiency of the appliance. In ANNEX C an example of the calculation method is reported.
In principle, this method can be used for any gas appliance just by replacing the GUE by an equivalent efficiency parameter.

3.4.3 Conclusions

The calculation of specific emissions on the basis of the thermal output, instead of thermal input, is a more appropriate approach for a fair comparison of environmental performances of gas appliances, in particular when GAHP is considered.

prEN12309-2:2014 already includes suitable calculation methods aligned with this approach.

3.4.4 Recommendation for KQ4

In order both to better reflect the actual environmental advantages related to the adoption of GAHP technology as a solution for satisfying the European thermal needs, it is recommended to **include in GAD a clause to impose the calculation of emissions with reference to thermal output**, instead of thermal input, through a cross-reference to methods already described in EN12309.

3.5 *Key question No. 5: Flueless installation*

ID No.	Key Question short description	Standard(s) of reference
KQ5	***Flueless installation*** Search and evaluate the existing regulations and requirements among the Member States for this new category of installation (as defined by *prEN12309:2014*) made possible by the GAHP technology.	*Gas Appliance Directive 2009/142/EC and prEN12309:2014*

3.5.1 Introduction

Beyond flue gases, air-water GAHP appliances also produce a flow of "exhaust" air from the evaporator coil. For the sake of clarity, this is pure air, perfectly clean, and "exhaust" must be intended just as "energetically-exploited" to recover the amount of renewable energy that GAHP will deliver to the building. The circumstance of having a combination of flue gases from the combustion chamber and exhaust air from the evaporator coil allows a new type of installation, defined "flueless" by EN12309, consisting in mixing the two streams:

7.3.1.2.4 Flue less appliances (EN12309-2:2014):

> *"Chillers and heat pumps using air as source designed for outdoor installation may feature a flueless system provided that combustion gases are mixed with condensation/evaporation air and the percentage in volume of combustion gases in the mixed air flow remains lower than 10 % of total air flow in all operating conditions. Appropriate design solutions have to be applied on the appliance in order to prevent any recirculation of the combustion products into the combustion air inlet. For testing purposes, the combustion products shall be sampled before any dilution"*

The point to be highlighted is that for GAHP the amount of air flow discharged by the evaporator is two orders of magnitude higher than the amount of the flue gases, so that the flues are extremely diluted in the resulting mix, up to the point that pollutants are well below the threshold of detection of ordinary measuring instruments, and can be evacuated from the appliance without needing a dedicated chimney, so as to simplify and reduce the cost of the GAHP installation.

In the following paragraphs, investigations are carried out in the framework of the *Gas Appliance Directive* (GAD) to verify the existing requirements for this flueless installation, both for indoor and outdoor applications.

3.5.2 Analysis of Key Question

In the framework of the *Gas Appliance Directive* and of the *Council Directive 90/396/EEC of 29 June 1990 on the approximation of the laws of the Member States relating to appliances burning gaseous fuels*, there are no prescriptions about the possibility to mix boilers flue gas with diluents (e.g. air). Considering unburned gas release, it is however remarked that: "Appliances must be so constructed that gas release during ignition and re-ignition and after flame extinction is limited in order to avoid a dangerous accumulation

of unburned gas in the appliance." In flueless installation, this possibility is eliminated by the forced draft provided by the air fan, remaining operational both before the flame-on (purge cycle) and after the flame-off (cooling down cycle).

With reference to the flue gas system, EN 12309-1 makes reference to flue gas systems of both type B and type C, according to CEN/TR 1749.

The *CEN/TR 1749* presents the scheme for the classification of gas appliances according to the method of evacuation of the combustion products (types). In particular:

- **Type B:** An appliance intended to be connected to a flue that evacuates the products of combustion to the outside of the room containing the appliance. The combustion air is drawn directly from the room.
- **Type C:** An appliance in which the combustion circuit (air supply, combustion chamber, heat exchanger and evacuation of the products of combustion) is sealed with respect to the room in which the appliance is installed.

It is worth to be noted that, strictly speaking, the above mentioned classification is relevant *only* for an indoor installation.
The main difference between type B and type C is related to the source of the combustion air: from the installation room for type B or from another source (typically the external environment) for type C. With reference to the evacuation side, Type B and C can be considered similar, especially for the evacuation types described in appendix A5 of UNI CEN/TR 1749 (see APPENDIX C to this deliverable) for which a combustion blower is used. However, also for CEN/TR 1749, the flueless installation is never considered.

The possibility to mix the flue gas to other diluents is contemplated by norms in case of collective flue systems (i.e., a chimney which collects, with direct mixing, flues from more than one source). Italian standard *UNI 11071:2003*, by example, prescribes that the appliances which use the same chimney must be similar, with nominal heat power differing less than 30% and with the same fuel used. Therefore, this norm is not directly applicable to the mixing of flue gases with the air discharged from the evaporator. Moreover it is also to be considered that for collective flue systems:

- It is not possible to use mechanical ventilation systems in the chimney;
- If the pressure of the chimney is positive the relative pipe must be installed outdoor;
- The connection pipe between the gas appliances and the chimney (flue pipes) cannot be equipped with regulation devices (e.g. damper).

A further analysis of the legislative framework has been carried out with respect to the Energy Recovery Ventilation systems (ERV) in order to find out if standards are mentioning the possibility to mix the combustion flue gases with the exhausted air from the building upstream of the air-air recovery exchangers, but no useful indications have been identified.

In the following paragraphs, considerations related to both indoor and outdoor GAHP installations are presented.

Indoor Installation

Considering an indoor installation, at present, the mixing of the flue gas with the flow rate of air discharged from the GAHP evaporator, avoiding the installation of a dedicated chimney to disperse flue gas, is not covered by current European standards. As a matter of fact, in indoor installations, the interest for a flueless solution should be further investigated, since especially in retrofit applications the exhaust fume system is likely to already exist.
An alternative solution could be obtained by the insertion of the flue gas pipe inside the evaporator air discharge duct; this solution would allow the installation of the GAHP indoor avoiding dedicated paths for flue the gas pipe.

Outdoor Installation

Considering an outdoor installation, the possibility of mixing the flue gas with the flow rate of air discharged from the GAHP evaporator is instead of major interest.
With reference to an existing commercial-size gas absorption heat pump appliance (i.e., Robur GAHP type A-LT) and the related technical data reported in the "Installation, user and maintenance manual" herein, an estimation of the pollutants dilution is presented.

			GAHP-A LT	GAHP-A LT S
OPERATION WHEN HEATING				
OPERATING POINT A7W50	G.U.E. gas usage efficiency	%	151 (1)	
	Thermal power	kW	38,0 (1)	
OPERATING POINT A7W35	G.U.E. gas usage efficiency	%	165 (1)	
	Thermal power	kW	41,7 (1)	
Thermal capacity	Nominal (1013 mbar - 15°C)	kW	25,7	
	true peak	kW	25,2	
NOx emission class			5	
NOx emission		ppm	25	
CO emission		ppm	36	
Hot water delivery temperature	maximum for heating	°C	55	
	maximum for ACS	°C	70	
Hot water return temperature	maximum heating	°C	45	
	maximum for ACS	°C	60	
	minimum temperature in continuous operation**	°C	20	
Hot water flow rate	nominal	l/h	3000	
	maximum	l/h	4000	
	minimum	l/h	700	
Hot water pressure drop	nominal water pressure (A7W50)	bar	0,43 (2)	
Ambient air temperature (dry bulb)	maximum	°C	45	
	minimum	°C	-20 (7)	
Thermal differential	nominal	°C	10	

			GAHP-A LT	GAHP-A LT S
gas consumption	methane G20 (nominal)	m3/h	2,72 (3)	
	methane G20 (MIN)	m3/h	1,34	
	G25 (nominal)	m3/h	3,16 (9)	
	G25 (MIN)	m3/h	1,57	
	G30 (nominal)	kg/h	2,03 (4)	
	G30 (MIN)	kg/h	0,99	
	G31 (nominal)	kg/h	2,00 (4)	
	G31 (MIN)	kg/h	0,98	

Figure 3-10: Technical data for GAHP type A-LT

The estimation has been carried out considering the following technical features of the ROBUR GAHP:

- Exhaust chimney diameter: 80 mm
- Gas consumption (methane G20): 2,72 m^3/h
- Flue gas flow rate: 35 m3/h (datum provided by the manufacturer)
- Air flow rate through the evaporator fan: 11000 m3/h (datum provided by the manufacturer)

It can be noticed that the flue gas flow rate and the air flow rate differ for three orders of magnitude.

As an example, the table below reports the pollutant dilution obtained through the mixing of the exhaust flue gas with the evaporator air. Pollutant content is shown for standard configuration and than calculated for a flueless version.

Pollutant	Units	Standard GAHP-AR	Flueless
NOx emission (with respect to EN 1020)	ppm	30	0.09
CO emission	ppm	23	0.07
CO2 content	%	8.7	0.03

Table 3-15- Pollutant dilution in evaporator air

In case of modulating appliances, provided that the burner is modulated linearly with the ventilation, the concentration in the air mixed after evaporator will substantially remain extremely low. Of course, to avoid the possible presence of flue gas in the evaporator area, the ventilation system must be controlled in parallel with the operation of the combustion chamber.

The figures in Table 3-15 clearly show that the mixed flue-air exhaust of a flueless installation should be regarded as substantially equivalent to clean air, therefore not implying any risk of intoxication or of any other sort.

Important Keynote

It is worth underlining that, even if EN12309 would set provisions for flueless, the installation of a gas appliance needs to be authorized by local authorities and to follow the local Safety Regulation (i.e., Local Fire Department Instruction, considering the Italian situation). Thus, a huge attempt in harmonizing all these regulation would anyway be required in order to avoid bureaucratic barriers to the deployment of GAHP all over Europe.

For example, in the Italian normative framework, the reference technical standards are *UNI CIG 7129-3, 2008* and *12/4/1996 Governmental Decree*. The normative rules all the gas combustion machinery for thermal generation (excluding the condensing boiler and other special equipment) providing different installation prescriptions on the basis of the device's nominal power:

- Maximum nominal power of 35 kWt: installation requirements and compliancy to *UNI CIG 7129-3* are under responsibility of machinery's installer
- Nominal power higher than 112 kWt: installation requirements and compliancy to *UNI CIG 7129-3* have to be approved by the local Fire Department.

3.5.3 Conclusions

The possibility of mixing the flue gas with the flow rate of air discharged from the GAHP evaporator, avoiding the installation of a dedicated chimney to disperse flue gas, is

mentioned by the standard *EN12309-2:2014*, setting provisions for GAHP flueless appliances. No other mention in other EU standards or norms was found.

As the dilution factor between the flue gas and the air from the evaporator is of the order of 300 times, the resulting mixed flow would feature concentration levels totally negligible and could be substantially treated as standard air. Therefore, installation rules for flueless appliances should be shaped accordingly.

3.5.4 Recommendation for KQ5

In order to integrate the existing regulatory framework and prepare the conditions for a possible introduction on the market of flueless appliances, it is recommended that **EN12309 is extended to include** not only the definition and design requirements, but also **installation requirements for flueless appliances**.

3.6 *Key Question No. 6: Calculation software*

ID No.	Key Question short description	Standard(s) of reference
KQ6	***Calculation software*** Ascertain if the GAHP is included in the regional-specific software-programs issued by local Technical Bodies for assessing and certifying the *Energy Performance of the Buildings* according to the national implementations of the relevant European *Energy Performance Building Directive EPBD*	*Energy Performance Building Directive 2002/91/EC*

3.6.1 Introduction

The implementation of the EPBD directive in the National legislative framework is regulated by different National technical bodies that are usually leveraging (regional-specific) dedicated software for assessing the Energy Performance of the Buildings and consequently for issuing Building Energy Performance Certificates. The purpose of the current analysis is to investigate the status about the presence of GAHP technology and appliances in the set of technologies already made available in these software to the use of planners / specifiers / certifying agents and, in case of negative outcome, to assess the procedures required in order to include the GAHP technology in the aforementioned software. In particular, in several instances, these national procedures to be included in these certification schemes and software are requiring a third-party performance certificate issued by local accredited laboratories, not accepting equivalent performance tests carried out by other laboratories not accredited by the single national certifying agent (although well recognized or accredited by the national certifying agent of other Member State).

Hereby the accredited National laboratories and the National normative about Building Energy Performance Certificates are reported.
As the EPBD directive focuses more on qualitative aspects related to the definition of energy certification scheme for buildings, International Standard Organization (ISO) and related standards shall be considered as reference points for more quantitative indications. The Technical Committee of interest in the framework of building energy efficiency is ISO/TC 163, *Thermal performance and energy use in the built environment*, in collaboration with Technical Committee ISO/TC 205, *Building environment design*. The international standards resulting from the activities of the aforementioned committees concern definitions and general procedures for the overall building energy performance rating and certification and are listed here below:

- ***ISO 16343 -*** Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings;
- ***ISO 16346*** - Energy performance of buildings — Assessment of the overall energy performance.

Hence, the first step of the work could be to contact ISO organization to get a first accreditation of the GAHP technologies.

3.6.2 Analysis of Key Question

In the following paragraphs, accredited national laboratories and national normative about Building Energy Performance Certificates are reported, with reference to the European countries of interest: Italy, France, Germany, Belgium, The Netherlands, UK and Poland.

3.6.2.1 National case 1: Italy

The EPBD was transposed to the Italian technical normative UNI TS – 11300, divided in four different parts as listed below:

- **Part 1:** Determination of the thermal energy demand of the building for air conditioning in summer and winter[3]
- **Part 2:** Evaluation of primary energy need and of system efficiencies for space heating and domestic hot water production
- **Part 3:** Evaluation of primary energy and system efficiencies for space cooling
- **Part 4:** Renewable energy and other generation systems for space heating and domestic hot water production

Nowadays the part where the GAHP procedures are inserted is part 4 (as a new kind of generator different from traditional heat pumps and electric heat pumps), but as it exploits fossil fuel it could have to be inserted in part 2 inserting a new kind of conventional fossil heating system with high efficiency (using a calculation method similar to that one for condensing boiler) better evaluating directly the fossil fuel consumption for heating purposes.

Nevertheless it's important to underline that the software used for developing energy performance certification are under responsibility of the different Italian Regions.

UNI TS 11300 implementation has been carried out with the supervision of the CTI (*Comitato Termotecnico Italiano*) and the UNI Technical Committee on *Heat Transfer and Fluid Dynamics.*

Country	GAHP included in the software?	Consequences	How to include GAHP?
Italy	**NO**	**Installation:** No consequences, installation is possible. **Performance certification:** Considering GAHP as a different high efficiency boiler **Incentives applicability:** Yes as it is going to be	**Reference standards:** UNITS11300 **Reference software:** different software are available for each Italian region **Procedure:** 1. UNITS11300 is the reference standard for the buildings energy efficiency calculation included in the software. This standard is under responsibility of CTI (Comitato Termotecnico Italiano), thus it would be necessary to contact CTI in order to modify UNITS11300 by including specific calculations

[3] Out of scope as this part of the technical normative describes:
- the thermal flows and exchanges for transmission and ventilation of the building when it is heated or cooled at an internal temperature constant;
- the contribution of internal and solar heat input to the heat balance of the building;
- the annual requirements of thermal energy for heating and cooling, in order to maintain the predetermined temperature adjustment within the building.

		described in KQ7**.**	for GAHP devices. 2. Since in Italy, software for building energy efficiency calculations are regulated by regional legislation that is implementing UNITS 11300 indications, it would be necessary to implement changes applied to UNITS 11300 also to these regional laws.

Table 3-16: Italy- Procedure to include GAHP in in the regional-specific software-programs for assessing and certifying the Energy Performance of the Buildings

3.6.2.2 National case 2: France

Since 1974 several regulations have progressively strengthen thermal performances of buildings in France. The latest one called RT 2012 based on requirements settled by the 2008 National convention "Grenelle de l'Environnement" is a significant step towards nZEB buildings.
RT 2012 which has been in force since January 1st, 2013 applies to all new heated or cooled buildings, except

- Provisional buildings
- Buildings heated with an indoor temperature lower than 12°C
- Buildings heated or cooled for other reasons than comfort, for example industrial processes
- Farms
- Churches
- Buildings located in French overseas territories.

RT 2012 building regulation includes mainly three major requirements which must be respected simultaneously.

1. The first one deals with the intrinsic features of the structure and the envelope of the building without considering the HVAC system and other technical facilities. Such features are specified with the Bbio Factor (bioclimatic needs factor).

2. The second one involves the maximum permitted annual consumption of primary energy of the building taking into account performances of HVAC system, DHW production and, if any, artificial lighting through the Cep factor.

3. The third corresponds to requirement for thermal comfort in summer based on the compliance with a maximum comfort calculated temperature Tic.

RT2012 also includes some specific prescriptive requirements (see example in the end of the article). The basic calculation methodology for the Energy Performance Certificate (EPC) is called 3CL (Conventional Consumption Calculation in Housing). All calculation must be compulsorily performed by authorized software based on the official rules The "BCE-2012" established by ***Centre Scientifique et Technique du Bâtiment (CSTB).***
In France, two types of existing building energy assessment methods cohabit. The energy audit
method, required to validate construction or energy renovation project and energy diagnosis method

used to generate Energy Performance Certificate (EPC), mandatory document to sell or rent a
building. Diagnosis Methods:

- **DPE-3CL methods:** Two versions of this conventional algorithm have been used by policies to establish Energy Performance Certificate (DPE). The first one from 2006 uses approximately 30 entry parameters to assess energy performance regarding the following systems: heating, Cooling, Domestic Hot Water (DHW). The second one replaces the first one since 2012 and uses twice this number of entry parameters in order to satisfy citizen confidence. These methods are based on annual energy balance calculated with Day Degree. The time step is then, an annual period.

- **Energy bills method:** the previous type of diagnosis methods cannot be applied to some specific building typologies (those built before 1948, tertiary building…). In these particulars cases, the French national policies recommend using energy bills methods. Annual energyconsumption is deduced from energy bills (gas, oil, and electricity) and an EPC is generated.

Audit Methods:

- **Conventional method:** processed by a calculation engine, this conventional method – hereafter called Th-C-E Ex method – allows computing annual energy consumptions for the following systems: heating, cooling, DHW, electrical lighting, mechanical ventilation and photovoltaic production. Th-C-E Ex uses a hourly energy balance of each heated volume modeled (heating needs = energy gains as solar radiations and occupants heat loads minus thermal losses due to heat transfers through heated envelope elements and air exchange rates). Meteorological files (each based on a fictive year computed from averaged climatic data from last 30 years) are used to feed climatic data required to process calculation engine. Only eight files cover all French metropolitan territory.

- **Element by element method:** as diagnosis algorithms described before, Th-C-E ex method cannot be applied to some specific building typologies (those built before 1948, ground area < 1000m² …). In these cases, the French national policies recommend using element by element method. This method does not impose annual energy consumption assessment but gives minimal (or maximal) threshold values on thermal properties of retrofitting technical solutions. For example, the heat transfer coefficient of windows cannot exceed 2.3 W.m-2.K-1. Same types of threshold values are applied to insulation panels, boilers and heat pumpsenergy efficiencies.
-

Country	GAHP included in the software?	Consequences	How to include GAHP?
France	YES	**Installation:** No consequences, installation is possible. **Performance certification:**	**Reference standards:** RT 2012, National Convention “Grenelle de l’Environnement Calculation method for building Energy efficiency certification: 3CL-DPE “Calcul Conventionnel des

		Applicable but with significant penalty	Consommations des Logements" **Reference software:** Calculation spreadsheets made available by Ministère du Logement **Procedure** 1. To obtain GAHP performance certification: French certification organisation AFNOR (Association Francaise de Normalisation) delivers a certification label for heat pumps called NF PAC ensuring their compliances to the European and French standards and to the technical and energetic performances requirements by the NF PAC technical committee. This certification has its issuing and renewal costs. For example to obtain this kind of certification there are some direct costs that can be quantified: - For the certification authority: 10000 € - For the test laboratory: 14000 € - Yearly renewal costs: for the certification authority: 6000 € - Eventual cost for new test demonstration to revaluate any changes in the machine: 14000 € 2. Verification of compliance of the Calculation method for GAHP to be included and the official rules Th-BCE 2012 established by CSTB

Table 3-17 France- Procedure to include GAHP in in the regional-specific software-programs for assessing and certifying the Energy Performance of the Buildings

3.6.2.3 National case 3: Germany

In Germany, the transposition of the recast Energy Performance of Buildings Directive (EPBD) is mainly processed via an amendment on the Energy Saving Ordinance (EnEV). In 2011, the German Federal Government decided on the "trasformation of the energy system" (known in German as the "Energiewende und ENergiekonzept der Bundesregierung") referring to the move towards the age of renewables and energy efficiency in Germany. This decision added an additional task to be included in the amendment, which resulted in an unforeseen delay in the implementatio process. The amendment was adopted as "Governamental draft" on the 6th of February 2013.

The new aspects of the German Energy saving legislation are mainly a first approach to Nearly Zero-Energy Buildings (NZEB), as well as the implementation of an independent control system for Energy Performance Certificates (EPCs) and the compulsory Energy Performance (EP) indicator in commercial advertisements.

Furthermore, the calculation method DIN V 18599 has been adapted to future needs such as the integration of a larger variaty of renewables. In Germany the Federal Ministry of

Transport, Building and Urban Development, together with the Federal Ministry of Economics and Technoogy are responsible for the implementation of the EPBD.
The Renewable Energy Heat Act, which sets a quota for renewable energy used for heat in generation in buildings, as well as some aspects of the “Energiewende”, are the responsibility of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.
The holistic German method of calculation is described in the pre-standard DIN V18599 (***Deutsches Institut für Normung),*** which mainly follows an approach similar to the CEN standards. It is used to prove that the Energy Saving Ordinance requirements have been met, and provides the EP values for Energy Performance
Certificates (EPC) based on energy demand (the German system foresees 2 types of EPC: demand-based EPC with information mainly on primary and final energy demand, and consumption-based EPC with information mainly on final energy consumption, in future also primary energy consumption). The German pre-standard DIN V 18599 is a uniform assessment method for the building envelope, the built-in lighting and the systems for heating, ventilation, cooling and hot water. The basic conditions of climate and use, to be applied in line with the calculations in the Energy Saving Ordinance, are also part of this standard, as well as the boundaries of assessment and the primary energy factors. DIN V 18599 is applicable to all buildings. For residential buildings, additional options are available: a simpler calculating method of DIN V 4701 and DIN V 4108 (in place since 2002) and a new table-based method for standard configuration of simple residential buildings. In addition to the requirements limiting the primary energy demand and the heat loss of the building fabric, and in accordance with article 8 of the EPBD. Ordinance also contains a set of requirements for heating, hot water, ventilation and AC systems. The system requirements for heating and hot-water already have a fairly long tradition, for details see table in Chapter 4. They concern new buildings, as well as new, or extended systems and replacements in existing buildings, some of which are retrofitting obligations. The requirements for AC systems follow an equivalent approach. They were introduced in 2007 and amended in 2009 and concern the Specific Fan Power, controls, duct insulation and heat recovery in certain systems.
The new generation of CEN standards is expected in 2016. The transition to the direct use of CEN standards – probably as an alternative calculation method to the established German standards – will be another important, but difficult task for the foreseen next amendment
An important organization that has to be taken into account for new technical normative could be the Fachverband Gebäude-Klima.
Fraunhofer Institut and its Biophysik Institut developed a simple excel tool which is free download on Fraunhofer website. Excel-based calculation tool for the German DIN V 18599 is a holistic performance assessment tool for all energy types required by the EPBD (heating, ventilation, cooling, lighting, DHW). Calculation according to the German energy performance of buildings standard DIN V 18599 featuring a multi-zone model, lighting, complex configurations of heating, air-conditioning and cooling technologies. The tool allows the assessment of all building energy shares such as energy need, energy use and primary energy. Detailed input for usage zones, lighting zones, building components, solar shading, heating, ventilation, cooling and lighting systems, energy carriers, etc. Different variants can be compared and an energy certificate can be printed. Detailed energy consulting is possible as well.
The calculation core is the IBP18599kernel which is used in about half of the computer tools for calculations according to DIN V 18599.Developed for the German field test study

for non-residential buildings of the Federal Ministry for Buildings, it could be easily integrated with GAHP specification.

3.6.2.4 National case 4: Belgium

In Belgium, as reported for other technical and environmental normative, EPBD transposition to local legislation is a regional responsibility.
For the Flemish region the Minimum requirements and calculations had been transposed in 2004, revised in 2006. The Energy Performance Certificates has come into force in 2007 and is spreading from public to residential buildings in 2008.
In the Flemish Region, the Flemish Energy Agency is responsible for the transposition of EPBD together with The Department of Environment, Nature.
In the Brussels Region the Minimum requirements and calculation have been transposed since 2007. The calculation method and scheme for building certification and further inspection of HVAC has been in force since 2009.
In the Walloon region, the “Construire avec l'énergie” (build with energy) principle has been applied since 2004 and since September 2006 Energy Advise Procedure have been voluntary actions for new dwellings, aiming to provide the building sector with future statutory requirements and certification.
The calculation procedure was defined in the execution order of December 2007. The method is identical to the one established in the Flemish Region and very close to the one in the Walloon Region. A study to revise and extend the calculation procedure for cooling and overheating was incorporated into the calculation procedure during 2011. The software tool, developed in collaboration with **VEA (Vlaams Energieagentschap - Flemish Region Energy Agency) and BBRI (Belgian Building Research Institute – National),** that enables the calculation of the energy performance of buildings and the verification of whether the main requirements are met, is operational and has been available since March 2007.
An integrated calculation tool with 3D construction graphical views, product databases and administrative forms has been developed, in collaboration with the Walloon Region and replaced the software tool in July 2011.
In March 2006, the Government of the Walloon Region approved a project of decree, regarding the transposition of the EPBD in to regional law. The decree has been adapted following the comments received from the public consultation. In April 2007, the Parliament approved the decree.
The decree has been integrated into the CWATUP (regulation on country planning and town planning) that became CWATUPE (E for "Energie"). The decree is a framework that translates the EPBD in to a regional decree. Orders have to be taken to define the mode of enforcement of the law. The decree establishes the minimum requirements that must be achieved for new buildings and for major renovations of existing buildings. Major renovations of existing buildings are defined in the enforcement order as the renovations of buildings of over 1,000 m^2 of total useful surface, where the total cost of the renovation related to the building shell or energy installations is higher than 25% of the value of the building, excluding the value of the land upon which the building is situated. The person in charge of the conception, description of measures for fulfilling the EPB requirements and control of building works has been identified in the decree.
He/she is called an "EPB responsible" and these accredited technicians are present on the Wallon Energy Agency Website.
The EPB software are the same in the three Belgian region (even if the technical normative are a little bit different) and they are called “EPB-Software”, or “Logiciel-EPB”

and they were developed by the local regional energy agencies: IBGE (Brussels Region) et de la VEA (Flemish Region), Enèrgie en Wallonie (Wallon Region)

3.6.2.5 National case 5: The Netherlands

In December 2006 the Decree Energy performance of Buildings' (BEG) as well as the 'Regulation on Energy Performance of Buildings' (REG) was legally implemented. The Netherlands already meets the Directive on a number of issues. The missing issues are being adapted and incorporated into Dutch law (Article 7 - Energy performance certificate), or measures are brought under the attention of the end-users via another route. The Dutch government completed the implementation of the EPBD in the Netherlands in 2008. Currently a substantial part of the EPBD has already been integrated into Dutch law. The methodology for new buildings already complies with the current Energy Performance Standard (EPN). For the existing building stock the actual Energy Performance Advice (EPA) methodology is being simplified. A general description of the current calculation method for new buildings is given by *SenterNovem* is an agency of the Dutch Ministry of Economic Affairs. They promote sustainable development and innovation, both within the Netherlands and abroad. Part of the Energy Performance Standard for new buildings (and major renovations) is the calculation of a so-called Energy Performance Coefficient (EPC), since 1995.For each existing building or building unit, e.g., an apartment, an Energy-Index is calculated according to a fixed methodology. An energy certificate class is then assigned based on the Energy- Index and building type. Certificates can only be issued by qualified assessors. There are voluntary educations for assessors, but examination by a National board is mandatory. The list of qualified assessors is permanently updated and always available online for the public at the ***KVinL*** website *(Kwaliteit voor Installies in Nederland - http://kvinl.nl/)*, the Dutch quality assurance association and on the Dutch Environment Agency(AgentSchnapl).The calculation method for existing buildings is based on Energy Performance Advice (EPA) methodology. For existing buildings, the existing voluntary EPA methodology was simplified and enhanced and made mandatory for the calculation of an Energy Performance Certificate by publishing a Building Decree in 2006. The methodology calculates the total annual primary energy use of a building for the components heating, hot water, ventilation and lighting (including renewable energy). Cooling is only considered for non-residential buildings. Each calculation is performed under average annual climate conditions, average number of occupants and occupant behavior. This method is currently being adapted to meet CEN standards.

In 2011, a new calculation methodology has been adopted in The Netherlands, the so-called Energy Performance of Buildings (EPG), combining a methodology for new and existing buildings, residential and non – residential buildings, into one package, taking into account existing CEN standards as much as possible. It is likely that this methodology will first be adapted to replace the current EPN methodology for new buildings.

As of the effectuation of the EPBD Recast starting from 2013, the new EPG methodology was adapted for new and existing buildings, residential and non - residential buildings as the methodology to determine the Energy Performance Certificate

As you can read in fig.3.2, the Energy Performance Certification Normative has different responsible and members (governmental entities, normative and technical authorities)

In order to issue an Energy Performance Certificate, the qualified assessor has to use accredited software. This software is developed by commercial companies but tested and accredited according to a software assessment guideline, BRL9501. All commercial software products communicate the same defined XML file to the central database which

is operated by NL Agency. Only when an Energy Performance Certificate is composed by a qualified assessor and calculated with accredited software, can it be sent to the central database. And only under these circumstances a unique number is issued for the Energy Performance Certificate.
Without this number the Energy Performance Certificate is not valid. When working under the BRL9500 guideline a qualified assessor is regularly checked by a certification institute which includes a full review of a certain number of Energy Performance Certificates issued.
As far as they are available all CEN-standards will be implemented and this will guarantee a high compatibility of the Dutch calculation methodology to a future harmonized European methodology.

3.6.2.6 National case 6: UK

The implementation of the EPBD in England & Wales is the responsibility of the Department for Communities and Local Government (CLG). Implementation in Northern Ireland and Scotland is the responsibility of the devolved administrations, respectively: the Department of Finance and Personnel (DFPNI) (supported by the Department for Social Development, DSDNI) and the
Scottish Building Standards Division (part of the Directorate for Communities and Local Government).
In England & Wales, transposition is achieved through:

- Building Regulations (amendments) Regulations 2012 (SI 2012/3119)
- Energy Performance of Buildings (England &Wales) Regulations (SI 2012/3118).

Responsibility for the Welsh Building Regulations has been devolved to the Welsh Government, and new regulations were issued in 2013.

In Scotland, the relevant regulations are:

- Building (Scotland) Act (2003)
- Building (Scotland) Regulations (2004),
- Building (Procedure) (Scotland) Regulations (2007)
- Building (Forms) (Scotland) Regulations (2007)
- Energy Performance of Buildings (Scotland) Regulations (2008)

The latter regulations were amended in 2012.

In Northern Ireland, the governing legislation is the Building Regulations (Northern Ireland) (SR 2012 No 192), and The Energy Performance of Buildings (Certificates and Inspections) Regulations (Northern Ireland) (SR 2008 No 170) (as amended). New regulations came into force in February 2013 to implement requirements of the EPBD recast.

The procedures for a *National Calculation Methodology (NCM)* have been established. For dwellings the NCM is the *Standard Assessment Procedure (SAP)* which includes a procedure for existing buildings (Reduced SAP–RdSAP). An updated version (SAP - 2009) was released in 2010. For non-residential buildings, the NCM is the *Simplified Building Energy Model* (SBEM) which was updated in 2010. Both procedures (for dwellings and non- residential buildings) are based on an asset rating approach, i.e., predicted energy consumption calculated based on standard conditions. A separate procedure has been set to produce Energy Performance Certificates (EPCs) for display: the Operational Rating Calculation (ORCalc). This procedure is based on an operational rating approach, i.e., a measured energy consumption which has been normalised to allow cross sector comparison of performance. EPCs for display are referred to as Display Energy Certificates (DECs). Compliance with the NCM to assess the building energy performance and produce EPCs and DECs is achieved through a suite of software tools approved by Government. Software tools include SBEM and ORCalc which have been developed by Government. Other software packages
(e.g., Dynamic Simulation Models – DSMs) and software interfaces may be used, provided they have been approved by Government. DSMs are typically used for complex buildings. The above procedures and software tools are available for use in Scotland and Northern Ireland too.

All these calculations methods are approved by the central government, but local authorities competent and responsible about these procedures could be:

- BRE (Building Research Establishment)
- NHBC (National House-Building Council)
- GAHP technology is in the process of being included in these kind of software and most of all it is going to be inserted into the "Microgeneration Certification Scheme for Heat Pumps as a Product and Installers", which will enable the technology to receive government support for incentive schemes if detailed by government as a technology in those schemes. However this does not stop the technology being sold and installed in the UK providing it meets EN Standards on manufacturer and safety, but does stop it receiving fiscal support from government.

Country	**GAHP included in the software ?**	**Consequences**	**How to include GAHP?**
UK	NO	**Installation**: No consequences, installation is possible. **Performance certification:** Technology is in the process of being included in the Microgeneration Certification Scheme for Heat Pumps as a Product and Installers, which will enable the technology to receive government support for incentive schemes if detailed by government as a technology in those schemes. However this does not stop the technology being sold and installed in the UK providing it meets EN Standards on manufacturer and safety, but does stop it receiving fiscal support from government. To be included in SAP & Rd SAP, the manufacturer must submit the technology through a procedure detailed in SAP Appendix Q, providng	**Reference standard:** Official methodology for building Energy efficiency certification: Standard Assessment Procedure for Energy Rating of Dwellings (SAP), mandatory for new buildings since 1995 and based on the calculation method British Research Establishment Domestic Energy Model(BREDEM), that refers to CEN indications. For existing buildings there is a simplified methodology: Reduced Data SAP (RDSAP). **Procedure** Apply to Building Research Establishment (BRE) and National House Building Council (NHBC)

		evidence and test data on products performance and carbon benefits, via the BRE. **Incentives applicability:** GAHP is not currently supported by UK Government, but is currently under formal review by Department of Energy & Climate Change	

Table 3-18: UK - Procedure to include GAHP in in the regional-specific software-programs for assessing and certifying the Energy Performance of the Buildings

3.6.2.7 National case 7: Poland

The implementation of the EPBD in Poland is executed by the Ministry of Infrastructure, under the supervision of the Ministry of Economy.

The legal framework of implementation is based on a National act (the Construction Act) and secondary legislation (accompanying Ministerial Ordinances).

The implementation started on the 19th of September 2007, when the Polish Parliament accepted the changes to the Construction Act. The changes defined rules for the creation of an energy assessment and certification system for buildings, and for the inspection of energy efficiency of building systems.

Moreover,delegations were established in order to prepare the secondary legislation.

In 2008, based on the work of these delegations, the following regulations were prepared:

- An ordinance on the training and examination of experts requesting to have the authority to issue energy performance certificates for buildings, apartments and building parts constituting separate technical/functional areas.
- An ordinance on the methodology of energy performance calculations for whole buildings, separate apartments or building parts constituting separate technical/functional areas, along with the scope of and a template for energy performance certificates.
- An ordinance on amendments to the Ordinance of the Ministry of Infrastructure dating from the 12th of April 2002, on the technical criteria to be met by the buildings and their location.
- An ordinance on amendments to the Ordinance of the Minister of Infrastructure, dating from the 3rd of July 2003, on the detailed scope and form of buildings' design.
- On the 27th of August 2009, the Parliament approved additional changes to the Construction Act. The goal of the changes was to eliminate identified legal mistakes in the implementation of the EPBD, and to introduce the code for experts issuing energy certificates for buildings.

Additionally, the legal circumstances for suspending the obligation for energy certification of individual apartments in multifamily buildings were defined (in multifamily buildings with centralized heating system , the certificate may from then onwards be issued for a defined apartment representative of a group of apartments).

The Ordinance on the methodology of energy performance calculations and template of certificates defines the energy performance requirements (different for new and existing buildings) and the methodology for the energy assessment of buildings/apartments that quantifies the essential parameters needed for the preparation of the energy performance certificate, according to the results of a detailed assessment. Additionally, the Ordinance determines the scope of and a template for the energy performance certificate.
The Ordinance on the methodology of energy performance calculations for whole buildings, separate apartments or building parts constituting separate technical/functional areas, along with the scope of and a template for energy performance certificate s, defines 4 types of certificates:

- Certificate of energy performance for residential buildings.
- Certificate of energy performance for other building s (non -residential).
- Certificate of energy performance for apartments
- Certificate of energy performance for building parts constituting separate technical / functional areas (non-residential)

All types of certificates are similar in form and contain:

Page 1: Basic information about the building; Calculated specific non - renewable primary energy use; Energy Performance with information on reference buildings; Information on the expert issuing the certificate.

Page 2: Technical characteristics of the building and its system; Calculations of energy performance: primary energy use, end – use energy and non- renewable primary energy.

Page 3: Recommendations for possible improvements in the energy performance of the assessed building or apartment (building envelope, energy source and installations, lighting, reduction of calculated specific non - renewable primary energy use).

Page 4: Descriptions; Additional information. The assessment procedure does not use energy classes. The results of the assessments are presented on a linear analogue scale. Two additional arrows (below the scale) indicate the energy performance for a building similar to the one assessed , assuming that only the minimal requirements are met (case one for a newly constructed building, and case two for a renovated building.

The calculation methodology is described in the building regulations, and includes heating, cooling and DHW needs, expressed in terms of primary energy.
For non-residential buildings, lighting and equipment consumption are also included in the calculation methodology.
The assessment methodology is based on the monthly balance method as described in PN-ISO- EN 13790.
However, the methodology contains some mistakes that have not yet been corrected: the certificates issued strictly using the methodology described in the secondary ordinance provide results with a huge error, and the assessed buildings do not meet requirements. In practice, experts correct the mistakes on their own, but such behaviour raises legal questions regarding the validity of the certificate.
The Ministry is currently collecting opinions and plans to introduce changes with the transposition of the Recast of the EPBD.

During the effort of transposition of the EPBD, different options of calculation were discussed countrywide. Therefore, in spite of the final decision about using the monthly balance method, adequate “infrastructure”/ climate data have been prepared for accommodating a future implementation of the simplified hourly method, as described in PN- EN- ISO 13790.
As no decision has been made regarding the National calculation software, few companies provide tools for calculation and certification. One of them is using an internet engine, together with a database of issued certificates.
Unfortunately, there is no validation procedure for the software. Concluding, such a situation provides great opportunities for future work towards the transposition of the EPBD Recast.

3.6.3 Conclusions

Nowadays Energy Performance Certification of buildings is carried-out through different local calculation methods and software in each Member State; it would be important to have a common directive and calculation method in order to compare the Energy Performance Certificates of different countries and calculate the performances of the heating systems and their efficiencies in the same way.
EU Commission made a lot of efforts to harmonize the local standard for Building Energy Performance Certification. A European common vision about Energy Performance Certificate can be found in **EN- ISO 13790**, while the technical Normative **prEN 15603** (today under construction as a living document) goes in such this direction; the CEN committee (CEN TC371) is trying to create a European Normative that could be used in all the countries, making easier the comparison of the efficiency of different countries buildings. As the Normative is still in construction it would be great to convey with the CEN Standard Committee how to insert GAHP in the calculation standards and methods. A possible approach could be to insert GAHP in the part of the normative where the Evaluation of primary energy need and of system efficiencies for space heating and domestic hot water production is made, considering the GAHP as a conventional gas fuelled heating system with high efficiency ($\eta > 1$) using an approach similar to the one used to analyze condensing boiler and referring its performance to the average temperature in the installation region.
It’s important to underline that GAHP can’t be considered and analyzed with the same approach used for typical heat pump as their COP is based on electrical consumption and not on gas. Another possible approach could be to insert the GAHP inside the framework of the Renewable energy and other generation systems for space heating and domestic hot water production, preparing a particular and dedicated calculation method similar to that one used for condensing boiler.
As part of this question it is worthy to highlight how, as a result of fragmentation at the national level due to different implementations of the EPBD, there is some national protectionism in favour of laboratories accredited at national level for the certification of generators and equipment that are going to be inserted inside the overall evaluation of an EPC and the choice of the data to be included in software for the calculation of the energy certificate of the buildings.
If a manufacturer wants to certify a new product as part of the national EPC tool and legislation, currently, even if of all the countries follow the same EU EPBD directive, the process is to certify the product in each member state. This certification has a non negligible cost and time schedule due to the national accreditation laboratory work taking into account the necessity of having to repeat the process in each country, and possibly

more than once (in relation to technological improvements that may be made to the new product).
It is worth to underline that the current situation would create a barrier to the diffusion of GAHP and other new innovative technologies. Therefore it is important to propose a harmonized accreditation program so that the results of the laboratory of each Member State can be endorsed also by national agencies in charge of the certification of the building performances in other Member States.

The following table summarizes the Energy Performance Certification schemes prescribed in the different national legislations analyzed in this study. As anticipated the situation indicates both the lack of specific legislation for GAHP technology and the large variety of prescriptions in the different local legislation.

EU country	National Transposition of the EPBD	EPC Certification National Authority	GAHP included in the software?
Italy	UNI TS 11300	CTI (Comitato Termotecnico Italiano) Local Regional Authority	NO
France	RT 2012-National Convention "Grenelle de l'Environnement"	CSTB	YES
Germany	EnEV 2013 DIN V 18559	Fachverband Gebaude Klima	NO
Belgium	CWATUP-E	VEA BBRI IBGE Energie en Wallonie	NO
The Netherlands	BEG	Sentemoven KVinL	NO
UK	Regional Building Regulation for Scotland, Wales, England New Calculation Method – NCM Standard Building Energy Method – SBEM SAP Standard	BRE NHBC	NO
Poland	PN-ISO-EN 13790	*Not identified*	NO

Table 3-19: – Summary of National EPBD Transposition and their certifying organization – KQ.6

Important Keynote

It is worth to underline that the current situation has also a substantial impact from an economic point of view related to costs incurred to certify a new product in order to have it included in the national Energy Performance Certification tools. These costs can reach the level of some tens of thousands of Euros per each certified model (see by example the case of France).

Multiplying those costs for each of the EU State Member in which the GAHP technology commercialization is foreseen, it results clearly how an harmonization process is urgently required to eliminate a huge barrier to the spreading of the GAHP in the early-market phases. An estimation of the total cost aforementioned is presented in tables below with reference to 1, 7 and 28 EU Member States.

Order of magnitude of Total Costs for certifying new products		
1 EU Member State	**7 EU Member States** *(the countries of interest for the present deliverable***)**	**28 EU Member States**
30000€	210,000€	840,000€

Table 3-20: Order of magnitude of total costs for certifying new products

On top of that, it also has to be taken into account that the aforementioned procedures have not only an economical impact on the commercialization of new products, but also a time impact potentially delaying the introduction on the market, since (on average) these certification processes take very long times.

The considerations above underline the need of creating a common program of accreditation for laboratories and a stronger convergence towards a unique European EPBD certification and unique European criteria to assess and include the performance of heat generators in all the EU Member States software and tools for the Energy Performance Certification.

3.6.4 Recommendation for KQ6

As discussed in the above analysis, in order to reduce the intangible barriers due to the fragmentation of the EPBD implementation in the national legislation, it is recommended:

- To create a liaison between CEN TC299 responsible for norm prEN12309 and CEN TC371 responsible for norm prEN 15603 (expected to become the European Normative that could be used in all the countries) in order to include GAHP technology in the calculation standards and methods;
- To interface with CTI in Italy to ensure proper inclusion of GAHP technology in UNI-11300 and associated implementing measured norms;
- To work toward the adoption in Germany of EN12309 in ENEV, BAFA, MAP legislation tool in replacement of the temporary guidelines currently used (VDI4650-2) for GAHP performance;
- To ensure that in UK *Standard Assessment Procedure (SAP)* includes GAHP technology for existing buildings (Reduced SAP–RdSAP) and for non-residential buildings (*Simplified Building Energy Model* - SBEM).

- To enforce a **common accreditation program for laboratories** and **mutual recognition among Technical Bodies** in order to reduce fragmentation and costs.

3.7 *Key Question No. 7: Incentive schemes*

ID No.	Key Question short description	Standard(s) of reference
KQ7	***Incentive schemes*** Analyse the incentive programs in force in the Member States and verify if the GAHP technology is listed as being eligible to subsidies.	*Different national incentives schemes*

3.7.1 Introduction

In this Key Question a framework of the EU-Countries National Feed-in Tariff Plan is presented, in order to evaluate if GAHP installation and use is promoted by local authorities and utilities thanks to discounts and special tariffs. It's important to underline that, as GAHP is by definition a heat pump and that the RES Directive include Heat Pumps as renewable energy sources with specific mention of the gas absorption technology. In addition, GAHP has a very high efficiency and promotes an efficient use of energy, a reduction in emissions and primary energy consumption. With reference to the European Subsides Policy Framework, a short analysis is presented (Figure 3-11).

Legislative Acts	Impact on Heat Pump Technology
RES Directive	Positive Impact
EPBD	Positive Impact
Ecodesign for ErP - Framework Directive; Lot 1	Positive Impact
Energy labelling Directive	Positive impact
Energy Efficiency Directive	Rather positive Impact
EU Energy Roadmap 2050	No significant Impact
Renewable energy communication	No significant Impact
F-Gas Regulation	Depends on Decision
EU Commission decision on an Ecolabel for heat pumps	Positive Impact

Figure 3-11- Summary of the main legislative acts and their impact on heat pump technology

Some of this information can be easily found and analyzed on International Energy Agency website, IRENA section (International Renewable Energy), at the RES-LEGAL EU website or at the website of the RES-H FP7 Intelligent Energy Project (www.res-h-policy.eu).
In order to have a satisfying analysis of the National feed-in policies it's important to take into account the prices of electricity and gas in the EU national market to evaluate the impact of the incentives.(Figure 3-12).

	Electricity prices (per kWh)						Gas prices (per kWh)					
	Households (1)			Industry (2)			Households (3)			Industry (4)		
	2011 s1	2012 s1	2013 s1	2011 s1	2012 s1	2013 s1	2011 s1	2012 s1	2013 s1	2011 s1	2012 s1	2013 s1
EU-28	0.179	0.189	0.200	0.110	0.115	0.120	0.056	0.063	0.066	0.035	0.040	0.041
EU-27	0.180	0.189	0.201	0.110	0.115	0.120	0.056	0.063	0.066	0.035	0.040	0.041
Euro area	0.189	0.199	0.213	0.116	0.122	0.127	0.062	0.062	0.074	0.037	0.037	0.043
Belgium	0.214	0.233	0.217	0.110	0.108	0.108	0.063	0.063	0.066	0.033	0.033	0.040
Bulgaria	0.083	0.085	0.092	0.065	0.069	0.081	0.043	0.043	0.051	0.029	0.029	0.036
Czech Republic	0.150	0.150	0.153	0.111	0.104	0.102	0.054	0.054	0.064	0.031	0.031	0.034
Denmark	0.291	0.300	0.300	0.099	0.097	0.105	0.116	0.116	0.113	0.067	0.067	0.073
Germany	0.253	0.260	0.292	0.125	0.128	0.143	0.059	0.059	0.066	0.046	0.046	0.048
Estonia	0.097	0.110	0.135	0.072	0.078	0.097	0.042	0.042	0.052	0.028	0.028	0.038
Ireland	0.190	0.216	0.230	0.116	0.132	0.136	0.051	0.051	0.065	0.038	0.038	0.040
Greece	0.125	0.139	0.156	0.105	0.118	0.125	:	:	0.077	:	:	0.053
Spain	0.198	0.219	0.223	0.114	0.121	0.122	0.054	0.054	0.073	0.029	0.029	0.039
France	0.138	0.139	0.147	0.085	0.095	0.096	0.058	0.058	0.068	0.037	0.037	0.041
Croatia	0.114	0.121	0.137	0.091	0.090	0.095	0.038	0.038	0.047	0.041	0.041	0.046
Italy	0.199	0.213	0.229	0.152	0.165	0.168	0.069	0.069	0.083	0.031	0.031	0.042
Cyprus	0.205	0.278	0.276	0.167	0.224	0.208	:	:	:	:	:	:
Latvia	0.117	0.138	0.138	0.098	0.110	0.113	0.039	0.039	0.051	0.029	0.029	0.038
Lithuania	0.121	0.126	0.137	0.105	0.114	0.123	0.044	0.044	0.060	0.035	0.035	0.044
Luxembourg	0.168	0.170	0.165	0.100	0.105	0.110	0.051	0.051	0.061	0.042	0.042	0.054
Hungary	0.168	0.155	0.140	0.100	0.095	0.096	0.056	0.056	0.043	0.031	0.031	0.041
Malta	0.170	0.170	0.170	0.180	0.180	0.180	:	:	:	:	:	:
Netherlands	0.174	0.186	0.196	0.098	0.097	0.096	0.064	0.064	0.081	0.034	0.034	0.040
Austria	0.199	0.198	0.208	0.113	0.110	0.111	0.069	0.069	0.077	0.035	0.035	0.045
Poland	0.147	0.142	0.148	0.101	0.092	0.093	0.046	0.046	0.047	0.033	0.033	0.036
Portugal	0.165	0.199	0.208	0.099	0.114	0.115	0.061	0.061	0.084	0.034	0.034	0.042
Romania	0.108	0.105	0.132	0.080	0.083	0.090	0.028	0.028	0.029	0.023	0.023	0.028
Slovenia	0.144	0.154	0.161	0.099	0.095	0.097	0.067	0.067	0.067	0.045	0.045	0.049
Slovakia	0.168	0.172	0.170	0.128	0.132	0.129	0.047	0.047	0.050	0.035	0.035	0.037
Finland	0.154	0.155	0.158	0.076	0.076	0.075	:	:	:	0.042	0.042	0.049
Sweden	0.209	0.203	0.210	0.089	0.081	0.080	0.119	0.119	0.123	0.051	0.051	0.055
United Kingdom	0.143	0.168	0.174	0.098	0.115	0.118	0.043	0.043	0.053	0.025	0.025	0.035
Iceland	:	0.111	0.105	:	:	:	:	:	:	:	:	:
Norway	0.213	0.188	0.191	0.111	0.092	0.097	:	:	:	:	:	:
Montenegro	0.087	0.091	0.102	0.061	0.065	0.073	:	:	:	:	:	:
FYROM	:	:	0.081	:	:	0.080	:	:	:	0.038	0.038	0.041
Turkey	0.122	0.131	:	0.079	0.086	:	0.029	0.029	:	0.022	0.022	:
Albania	0.115	0.116	0.116	:	:	:	:	:	:	:	:	:
Bosnia and Herzegovina	0.075	0.080	0.080	0.061	0.065	0.065	0.045	0.045	0.056	0.048	0.048	0.057

(1) Annual consumption: 2 500 kWh < consumption < 5 000 kWh.
(2) Annual consumption: 500 MWh < consumption < 2 000 MWh.
(3) Annual consumption: 5 600 kWh < consumption < 56 000 kWh (20 - 200 GJ).
(4) Annual consumption: 2 778 MWh < consumption < 27 778 MWh (10 000 - 100 000 GJ).

Figure 3-12– Gas and Electricity Prices in European Countries

Before analyzing the national incentive schemes, it's also important to define the different categories related to incentives. Generally they are differentiated between price-based and volume-based support schemes. In price-based support schemes, the government sets the price and the corresponding volume evolves depending on the respective cost-potential curve. In contrast, volume-driven support schemes predetermine the price and the volume develops according to the existing resource conditions and technology costs. It's also important to note the difference between Feed-in Tariff (FIT) and Feed-in Premium. In a Feed-in Tariff approach (i.e. current Italian "Conto Energia" for PV panels) the producer receives a fixed payment for each unit of electricity generated independent of the electricity market price: this is a high effective and low risk premium, but it's not sufficiently cost-effective.

In a Feed-in Premium approach (i.e. current Italian "Tariffa Omnicomprensiva") plant operators have to market electricity generated directly at the electricity market and receive an additional payment on top of the electricity market price. Quota obligations (i.e., old Italian "Certificati Verdi" approach) constitute a fully distinct support scheme: power plant operators receive certificates for their green final energy, which they may sell

to the actors obliged to fulfil the quota obligation. Selling the certificate provides an additional income on top of the common market price of the final energy sold. In addition to those support schemes investment support, low interest loans, "own-consumption" special regulation and tax exemptions can be used to support renewable.

3.7.2 Analysis of Key Question

Here below the National policies to support the spreading and the decreasing of the technology cost of renewable energy in the countries of interest are reported.

3.7.2.1 National case 1: Italy

In Italy GAHP purchasing is encouraged by different kind of policies. Herein the National policies are reported, but it's important to underline that there are also local and regional feed-in tariffs and facilitations/subsidies for GAHP installations.

Both, heating and cooling are requested with high seasonal demand in Italy due to prevailing Mediterranean climate throughout the country. Heating and air conditioning systems constitute about one-third of total energy needs. Heat pumps are therefore considered to play an increasingly important role, as they can be used for both heating and cooling.

Regulations governing Renewable Energy Sources (RES) derive from International regulations and European Commission directives. In June 2010, Italy submitted its *National Renewable Energy Action Plan*. In March 2011 the *RES Directive* was implemented by National Legislative Decree n°28. The Decree sets specific targets in order to achieve the overall National target of 17% share of energy from renewable sources in the gross final consumption of energy in 2020. The Decree also reforms the whole system of incentives for RES and introduces some changes in the administrative procedures.

National laws are interdependent with regional, provincial and municipal legislative authority. The Legislative Decree provides the general framework, whereas the definition of the specific norms remains under the responsibility of further Ministerial Decrees to be adopted namely by the Ministry of the Economic Development (usually in concert with the Ministry of the Environment and Land and Sea Protection) and in some cases with the agreement of the so called "Unified Conference" of regions, provinces and towns. For example, water discharge resulting from heat pumps is regulated by the municipalities. The new law will require the adoption of 14 Ministerial Decrees. Additional decrees are required for the mandatory use of renewables in new or restructured buildings (article 11), for the certification of installers (in accordance with EU Cert scheme Art. 15 and Annex 4), for incentives to "thermal renewable systems" for small installations (up to 500 kW) for heat pumps, biomass and solar thermal (Art. 28). Furthermore, a decree is needed for revision of Annex 3 concerning the total demand for heating, cooling and hot water. Annex 3 states three suggestions for renewable shares as 20% from May 2012, 35% from January 2014 and 50% from January 2017.

White Certificate schemes or Energy Efficiency Titles (EET) are important market oriented instruments in force in Italy, which represent marketable documents issued by the Energy Market Administrator testifying the energy saved by the energy distribution companies, as well as by their controlled partnerships, and by the Energy Service Companies (ESCO). This incentive scheme has been introduced in the National Decree no 28/2011 also to promote renewable energy sources.

Currently GAHP are eligible of EET by means of "Scheda analitica" a procedure that implies specific measurements takean at every single installation. On the contrary Condensing boilers and Electrical heat pumps already enjoy a standardized approach ("Scheda

standardizzata") where the energy saving is estimated an the bases of few design parameters. It is recommended that the same procedure is adopted also for GAHP in order to encourage the technology deployment.
Similarly to the adoption of the RES Directive, the implementation of the EPBD in Italy is a shared task between the state and the 21 regions and autonomous provinces. Implementation started in 2005, with a National transposition decree, which established a transitional period during which:

- The minimum requirements were tightened by about 30%, with respect to previous levels
- Methodologies for determining energy performance of buildings were confirmed, in reference to the already existing advanced regulations Energy Certification of Buildings (ECB) was replaced by a declaration produced by a professional designer (assessor accreditation was not available yet), which was limited to new or renovated buildings, and then in 2006 was also extended to buildings on sale and rental
- Boiler inspection procedures were slightly improved, in respect to the already existing regulation from 1993.

The implementation of ErP for Lot 1 (generators for space heating) will happen on September 2015 as per the rest of Europe being adopted as a European regulation.

Italy as a Member State also undertakes requirements of the Energy Efficiency Directive. However, as the directive is relatively new (September 2012) there are no regulations in Italy for its National implementation yet. Nonetheless, it is highly possible that the directive will have a positive influence on the heat pump market with its requirement of 3% renovation of heated and cooled buildings owned and occupied by the government.
Several regulatory laws and financial incentives with medium impact are in place or being planned in Italy.

- ***Ecobonus:*** According to the recent legislation (D.Lgs: 90/2013), the Italian "Agenzia delle Entrate" has recently issued a circular that summarizes the operation of the "ecobonus" present in that decree about the substitution of old inefficient heating system with condensing boilers or high efficiency heat pump (including GAHP technology). The replacement of winter heating systems with systems equipped with condensing boilers or heat pumps with high efficiency (up to 30,000 €), the replacement of traditional water heater with heat pump water heat dedicated to the production of domestic hot water (max 30,000 €) is encouraged thanks to the tax applies in the tax return, an amount equal to 65% of the costs incurred and must be divided into ten equal annual installments. Possible deduction expenses include the costs for construction work related to the intervention of energy savings, both for the professional services necessary to design and implement the intervention and acquire energy certification request.

- ***Conto Termico:*** Today when replacing the heating system and domestic hot water production by installing heat pumps or high efficiency thermal power generators (including GAHP technology) it is possible to access to significant incentives. GAHPs are eligible for incentives for both public administrations that private (individuals or owners of business income). The incentives granted for heat pumps are

proportional to the total rated thermal power, thermal efficiency of the heat pump and the climate zone installation. Incentives are paid annually for a period varying between 2 and 5 years. Another important feature is the method of payment of contributions: with the Conto Termico, you do not need to have taxes to be payable to deduct the costs of the intervention, because the contributions are made annually by the GSE directly through wire transfer to bank accounts. It's important to remember that the incentives of the Conto Termico cannot be combined with other public incentives on energy saving and energy improvement. The incentives provided in the case of installation of air conditioning systems with heat pumps do not depend on the cost of the intervention, but are calculated on the basis of some technical factors and installation of equipment, in particular on the basis of their nominal heat output and 'thermal efficiency, including the climatic zone in which the intervention is made. The efficiency of gas absorption heat pumps was calculated according to the EN 12309 – T1 test conditions.

- It's important to underline that nowadays this feed-in tariff is not enough exploited and there are many possibilities to get funded, even if the GAHP is not directly considered in the available solution as the text of the policy define "Condensing boiler" and "Heat Pump Water Heater" (where the GAHP can be considered).

- ***Deductions For Renovations***

  Building renovations are considered as all those interventions that target the upgrading, improvement and adaptation of the property for residential use, both for a single detached house or a block of flats. Interventions that may qualify for this tax deduction are different, such as the maintenance carried out on individual units, routine maintenance carried out on the common parts of apartment buildings and, among other measures, including those aimed at energy saving. End users can deduct from (income tax a portion of the costs incurred to renovate the homes and common areas of residential buildings. The deduction must be divided into ten equal yearly amounts in the year in which the expenditure is incurred and in future ones. The tax advantages are also awarded to interventions related to heating and cooling systems, as their target is the improvement of energy savings. The implementation of measures aimed at energy savings is equivalent to the construction of renewable energy plants. Therefore these interventions include those that involve the use of GAHP or aero thermal, hydrothermal and geothermal pumps. The adoption of this incentive scheme is very often preferred over the Ecobonus and the ContoTermico since it implies significantly less paperwork.

- ***TEE***

  GAHP can also be granted the "Titoli di Efficienza Energetica" (Title of Energy Efficiency), issued by GSE for the installation of these kinds of system in factories to improve their energy performance. To receive such kind of feed in tariffs, the owner has to fill in the sheet "Scheda 26T" - "Installation of centralized systems for space heating/conditioning of buildings for civil use." These kind of feed in tariffs can be received in the case of installation of new generators of heat / cold, either with or without temperature control systems, as part of new buildings or existing buildings. The application of the "Scheda analitica - Scheda 26" implies the use of heat metering.

  As anticipated GAHP technology does not enjoy yet a standardized procedure for the estimate of energy consumption ("Scheda standardizzata").

REFERENCE DOCUMENTS

D.Lgs. 3/8/2013

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
Italy	Eco bonus	Yes	GAHP has to substitute a less efficient heating system	An amount equal to 65% of the costs incurred and must be divided into ten equal annual installments
	Conto termico	Yes, incentive proportional to efficiency, thermal power production	Efficiency evaluated according to EN 12309 – T1 requirements GUE > 1,5 Substitution of less efficient heating system with a Size<1MW	The incentives granted for heat pumps are proportional to the total rated thermal power, thermal efficiency of the heat pump and the climate zone installation. Incentives are paid annually for a period varying between 2 and 5 years. Thanks to the Conto Termico, you do not need to have taxes to be payable to deduct the costs of the intervention, because the contributions are made annually by the GSE directly through wire transfer to bank accounts.
	Deductions for renovations	Yes	Works on residential units and residential buildings that they have as their objective the achievement of energy savings.	Deductions from IRPEF (income tax of physical persons) of a portion of the costs incurred to renovate the homes and common areas of residential buildings. The deduction must be divided into ten equal yearly amounts in the year in which the expenditure is incurred and in future ones.
	TEE	Yes	Heat generator have to be metered and the plant accredited by GSE	This kind of feed in tariffs can be received in the case of installation of new generators of heat / cold, either with or without temperature control systems as part of new buildings or existing buildings.

Table 3-21: Italy-Summary of identified incentive schemes

3.7.2.2 National case 2: France

As in Italy, in France there are National and local regional incentives. Local incentives are targeted and different in each "Department" and "Region" and approved by ADEME (Agence de l'Environnement et de la maîtrise de l'énergie – French Environment and Energy Agency). Here below the National fiscal aides are presented.

The French government has set the target of a 23% share of renewables in the energy mix by 2020.
With this aim the RES Directive is implemented in France by the Grenelle law. In addition to this target, France aims at a 38% reduction in energy demand and a 20% reduction in CO2 emissions. Specific targets for each technology are stated in statutory texts (PPI: "Programmations pluriannuelles des investissements"). The PPI chaleur 15/12/2009 regarding heat pumps mentions that "The National RES Industry Roadmap projects" are aiming at having two million individual households heated by heat pumps in 2020. This project will be implemented in one step in 2012, aiming at 2,245 million heat pump installations. In order to reach this interim target the French Government has included air to air heat pump to the technologies. Within the implementation process of the EPBD, France applies a specific regulation on thermal energy in buildings: RT2012. The RT2012 provides a maximum allowable demand of 50 kWh/m² y for new buildings. Specific targets have been fixed for RES used in single-family dwellings with a minimum consumption threshold of 5 kWh/m²y. However, these targets have not been extended to multi-family dwellings. As renewable energy becomes mandatory for individual housing, the heat pump market in new buildings will necessarily increase. The method used for calculating RES for heat pump is therefore different from the one described in the RES directive. It is indeed done in primary energy. The primary to final energy ratio for electricity is taken as 2.58 and for natural gas is taken as 1.0.

The application of RT2012 imposes to the planners/specifiers to use performance data certified by authorized bodies or by manufacturers (in this last case a 20% decrease is applied on manufacturer declared performance)

The French product labelling scheme NF PAC was initiated in 2006. This label sets a minimum COP/GUE level, with test conditions in accordance with EN 14511 (nominal and application conditions for EHPs) and with EN12309 (for GAHPs). The NFPAC certification is a third party certification eligible for use under RT2012 legislation.

Moreover, NF PAC specifies requirements regarding minimum quality levels. Random audits are carried out for monitoring and control by a random and independent body. Additionally, energy saving certificates and white certificates managed by energy suppliers are in operation to financially
support heat pumps installations.

In France the regulation on thermal energy in buildings (RT2012) with its maximal allowable heating demand for new buildings has a medium impact on heat pump development. Together with the RT2012, the target of increasing the number of households that have heat pumps installed will also have a medium to high impact for heat pumps in the French market. Other policies and financial incentives like the RES

Directive, the National RES Industry Roadmap only have low impacts on heat pump development.

- ***Crèdit d'Impot***
  Energy efficient heating systems are supported in France thanks to the "Crédit d'impot" (tax credits). This is a tax discount reserved to people living in France. It allows to deduct from their tax amount to be paid part of the money spent for some improvements in energy efficiency in buildings, in their primary residence. If the credit tax is higher than the amount of tax due, the excess is refunded to the household.
  You can access to these incentives if your heat pump have a COP higher than 3,4 or 2.3 if the Heat Pump is used for domestic heating water exploiting geothermal and aerothermal thermal input (2.5 for exhaust air pump). The amount of the tax credit is 26% and 34% of the whole amount of the expenses for the improvements.

  It is worthy to underline that the eligibility of the GAHP to this policy needs to be clarified as The COP requested is calculated in a different mode of the GAHP one as the regulation is dedicated to traditional Heat Pump

- ***VAT discount***
  You can benefit from a reduced VAT rate for the supply and the installation of a heat pump in your home (primary or secondary) completed within two years. The VAT discount is applied by the supplier or the installation company.

- ***Eco Loan – Zero Tax***
  In France, it's possible to have loans with a tax rate fixed at 0% for installations of efficient solution for heating systems and improvements for energy efficiency in the buildings built before 1990. This interest-free loan is open to owners, co-owners, occupants, of a principal residence, a house or an apartment. It is granted until December 31, 2015 by banks that have signed an agreement with the state. The amount of eco-interest loan of € 20,000 for a package of ctwo works and € 30,000 for a package of three works.. For the same improvement work, limitations to benefit from both ZERO TAX ECO LOAN and CREDIT D'IMPOT are present.

  It is important to underline that Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible if a different approach in calculating COP is going to be discussed

- **Prime Renovation Energetique**
  You can access to this new incentive if you made twoenergy efficient actons in order to reduce energy consumptions in a house. The GAHP is included in this inventive as it is a energy efficient system and if it's going to replace a unefficient conditioning system if the installation of the GAHP takes place with another action (for example the replacement of windows). The amount of this incentive is 1 350€ for two actions.

- **CEE – Certificat d'Economie d'Energie**

You can access to this new incentive if you made twoenergy efficient actons in order to reduce energy consumptions in a house. This program is similar to the Italian one of the "Certificati Bianchi"

The amount of the subsidy depends on :
- localization of the house
- COP
- size of the house
- CEE cost (whose value is referred to annual revision)

GAHP is eligible as it has a COP higher than 3,4 and it has one of this certification : NF PAC or EHPA or Eurovent or European Eco-Label

All these dispositions are presented on the ADEME website:
http://ecocitoyens.ademe.fr/financer-mon-projet/renovation/credit-dimpot-developpement-durable

REFERENCE DOCUMENTS
RT2012 – RT2020: Loi grenelle 4/8/2009 – 3rd article

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
France	Crédit d'Impôt Développe-ment Durable 2014 (CIDD)	No.	You can access to these this incentives if your heat pump have a COP higher than 3,4 or 2.3 if the Heat Pump is used for domestic heating water exploiting geothermal and aerothermal thermal input (2.5 for exhaust air pump). Housing is to be located in France, built over two years and assigned to the main house, valid for renters, homeowners (excluding donors). Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be	The cost of the heat pump unit serves as a basis for the deductible amount and the subsidies vary depending on the year of purchase and the type of heat pump. In 2012, the rates were 26% of the cost for a ground source heat pump and sanitary hot water heat pump, and from 15 % to 25 % (single or package of works) in the case of air/water heat pumps. These rates are applicable on the purchase of equipment and materials excluding installation costs (excluding insulating walls and roofs). Installation has to be performed by a qualified company.

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
			eligible	
	VAT discount 2014	No. Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Any specified requirement, installation has to be made by an accredited company. Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	VAT rate for the supply and the installation of a heat pump in your home (primary or secondary) completed within two years. A 10 % VAT rate (to 5,5 % VAT rate for works eligible to CIDD) is applied by the supplier or the installation company
	Eco Loan – Zero Tax (Air/water heat pump)	No.	For the same improvement work, limitations to benefit from both ZERO TAX ECO LOAN and CREDIT D'IMPOT are present. Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	it's possible to have loans with a tax rate fixed at 0% for installations of efficient solution for heating systems and improvements for energy efficiency in the buildings built before 1990. This interest-free loan is open to owners, co-owners, occupants, of a principal residence, a house or an apartment. It is granted until December 31, 2015 by banks that have signed an agreement with the state. The amount of eco-interest loan of € 20,000 for a package of two works and € 30,000 for a package of three works.
	Premium energy retrofit	No.	housing built over 2 years renovation (insulation or installation of efficient equipment by a professional). Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Until 2015, it is possible to receive a bonus of 1,350 € to fund a package of works of thermal of the main residence. This bonus can be combined with the CIDD and eco loan – zero tax.

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
	National Housing Agency (Anah) + local authorities aids	No.	Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Depends on income and type of energy renovation work. These aids can be combined with Eco Loan – Zero Tax
	White certificate (certificat d'économie d'énergie)	Yes	Request before beginning work. Bonus paid by check in exchange of your bill works.	air/water heat pump => 473€

Table 3-22: France-Summary of identified incentive schemes

3.7.2.3 National case 3: Germany

German energy policy is based on the principle of providing balance between security of supply, affordable energy prices, effective environment protection and climate change mitigation in an efficient manner. The Energy Savings Ordinance (EnEV) came into force in 2002 and combines regulations for the insulation of houses with efficient systems engineering to enhance reduction of primary energy use in the German housing stock. This combination makes it possible for building owners to rely on a combination of existing house insulation with efficient heating systems to reach the required standards set by the EnEV. Within this regulation an energy performance certificate EPC (Energieausweis) based on DIN V 18599 and DIN 4701-10 must be provided by owners containing information on the energy balance and energy efficiency of the building to buyers or tenants. The German Act on the Promotion of Renewable Energies in the Heat Sector (Erneuerbare EnergienWärmegesetz, EEWärmeG) entered into force on January 1st 2009. The EEWärmeG introduces an obligation to use renewable energies to cover the heating energy demand in new buildings and public buildings already erected. The law makes it mandatory that by 2020, 15% of the energy used for heating in newly built houses comes from renewable energy sources. The use of heat pumps is explicitly mentioned as a contribution to reaching such a goal.

Germany has special support incentives within 2012 Guidelines for the support of measures to utilise renewable energies in the heat market providing subsidies for installation and market penetration of heat pumps. The market incentive programme contains two segments, namely investment grants for renewable heating installations up to 100 kW thermal (competency Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA) and long-term low-interest loans (soft loans), including a redemption grant, for installations larger than 100 kW or infrastructure measures (competency The Federal Bank Kreditanstalt für Wiederaufbau - KfW). The basic support offers funding for the utilisation of renewable energies for heat generation. Support for ground source heat pumps is on average approx. €2800 per installation with an additional support for every kW over 10 kW depending on the heat output. Support for air source heat pumps varies between €1300-1600 whereas the support amount for gas-driven heat pumps is the same as ground source heat pumps. There are limits for seasonal performance of heat pumps in order to benefit from the support incentives. (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, MAP 2012).

In Germany the Renewable Energy Heat Law (EEWärmeG) and the Market Incentive Programme are promising measures that have a medium impact on heat pump sales. Other instruments like various labels and the Energy Saving Ordinance (EnEV) and its planned recasting only have a low impact on heat pumps.

Heating and Cooling Market Promotion Program

The German Federal Government has announced ambitious goals within the framework of a sustainable energy supply for Germany.

To this aim, a market incentive program has been applied to promote investment grants, low interest loans, and liquidation allowances for equipment utilizing renewable energies. The focus of the program is aimed towards heat generating equipment such as solar thermal collectors, facilities exploiting solid biomass, and efficient heat pumps for space heating installations and DHW in buildings.

The overarching goal is to increase the share of renewable energies to at least 30% of German gross power consumption by the year 2020. Therefore, the program addresses all

property holders of old and new buildings alike. The application, development, authorization, and disbursement of aid funds are administered by the Federal Office of Economics and Export Control (BAFA).
The German Federal Environmental Ministry has allocated considerable resources in 2009 to support energy restructuring projects.
There are several incentive programs promoting efficient and renewable heating and cooling technologies. Available funding for the Marktanreizprogrammor "Incentive Program" encourages the use of renewable energies for heating of new and existing residential and non-residential buildings has increased significantly. These incentives are offered at National and local levels.
The most important incentives at the National level for heat pumps are innovation promotions for air/water, water/water or brine/water heat, pumps subject to the coefficient of performance (COP) level. For example, within existing building stock it is possible to benefit from grants of up to EUR 30 per m² of floor space up to a maximum of €4,500 per apartment or 22.5% of net investment costs respectively for a water/water or brine/water heat pump with a COP of 4.5. Newly built apartments have a slightly higher COP value of 4.7.
GAHP are eligible under this framework. It's worthy underlining the different definition of the COP for GAHP technology, thus it would be better to have regulation that use a reference a COP calculated on the basis of the primary energy.

Renewable Energy Heating Act and Market Incentive Program (MAP)
Germany's Renewable Heat Act aims to increase the share of renewable heat to 14% by 2020 (current level of 7%). New building owners are obligated to get a certain share of their heat from renewable energy, and owners of old building get financial support for renovations. This funding was temporarily cut during the last economic crisis although it is estimated that every Euro spent here generates more than €7 in private investments. Now, the programme is back in place.

Because renewable heating systems can be planned from the outset when new buildings are constructed, the Renewable Energy Heating Act only applies to this sector.

In existing buildings, the German government supports renovations of heating systems with its Market Incentive Program (MAP), which was originally instituted in 2000. This program now supports only existing buildings; new buildings are no longer eligible.

Homeowners, small and midsize businesses, freelancers, and municipalities can apply for special funding for the following types of systems:

- Small and large solar heat collectors
- Biomass-fired furnaces with automatic feed systems (such as wood pellets)
- Highly efficient firewood gasifiers
- Efficient heat pumps (including GAHPs)

The MAP offers upfront bonuses to reduce the purchase price. For instance, €90 is granted per square meter of solar collector, €2,400 for small water/water heat pumps, and €2,000 for small wood boilers (which have very low particle emissions).

GAHP are eligible under this framework. It's worth underlining the different definition of the COP for GAHP technology so it would be better to have regulation that use a reference a COP calculated on the basis of the primary energy.

The purpose is to ensure that sensible ways of using renewable energy are promoted when the current building standard does not go far enough. In 2012, the MAP has a budget of 366 million euro. In the last years the total funding for promoting renewable technologies decreased, but the amount dedicated to renewable heat has been maintained quite stable.

Direct Grant

These kinds of incentives are dedicated both to new built houses and renovated ones and they are in force since 2008. Here below, the incentives dedicated to heat pump are described. (Table 3-23) to access these feed in tariffs, a minimum COP is required according to VDI 4650.

	New houses built in 2009 or later	New houses built before 2009	Renovation
Ground-coupled heat pumps • Water/water • Brine/water	• 7,50 €/m² of inhabited area max. 1.500 € for each apartment • Houses with more than two apartments: max. 7,5 % of the net-investment for the heat pump	• 10 €/m² of inhabited area max. 2.000 € for each apartment • Houses with more than two apartments: max. 10% of the net-investment for the heat pump	• 20 €/m² of inhabited area max. 3.000 € for each apartment • Houses with more than two apartments: max. 15% of the net-investment for the heat pump
Air source heat pumps	• 3,75 €/m² of inhabited area max. 637,50 € for each apartment • Houses with more than two apartments: max. 7,5 % of the net-investment for the heat pump	• 5 €/m² of inhabited area max. 850 € for each apartment • Houses with more than two apartments: max. 10% of the net-investment for the heat pump	• 10 €/m² of inhabited area max. 1.500 € for each apartment • Houses with more than two apartments: max. 10 % of the net-investment for the heat pump

Table 3-23- Summary of the German incentives for heat pumps

- In 2011 these incentives were decreased, the German government has modified its incentive scheme for heat pumps. The main changes were:
- Availability of subsidies for large industrial heat pumps formerly excluded from the scheme: brine/water and water/water heat pumps with a capacity above 100 kW are newly taken into account in the funding provided by the KfW Banking Group, the German government-owned development bank. Eligible heat pumps, encompassing an Annual Performance Factor above 3.8, will be awarded €80 per kW of design capacity, with a minimum of €10,000 and up to a maximum of €50,000.
- The required minimum Annual Performance Factors have been lowered: this will amount to 3.8 for brine/water heat pumps and water/water heat pumps for dwellings and to 4.0 for non-residential buildings. For air/water heat pumps, the

minimum annual performance factor will be 3.5 (down from 3.7 previously), while for gas-powered heat pumps (GAHP) it will be 1.3.
- The basis for calculating the level of support for heat pumps will be switched from heated floor space previously used to the rated heat output. This will facilitate and simplify the application process for receiving the support.
- The overall support levels remain approximately the same, ranging from €2,400 for heat pumps in single-family homes up to €11,400 for heat pumps with a heat output of 100 kW.
- The bonus for combining solar thermal energy and heat pumps has been raised from €500 to €600 for 2011.

Support levels for heat pumps up to 100kW will amount to:

Heat pump type and Annual Performance Factors (APF) requirements	**Rated output capacity (kW)**	**Support level for installation in existing buidlings**	**Bonus for combining solar thermal energy and heat pumps**
Water/water or brine/water heat pumps - Gas driven: APF ≥ 1.3 - Electrically driven: APF ≥ 3.8 - In non-residential buildings: APF ≥ 4.0	≤ 10 kW	€2,400 lump sum	€600
	> 10 kW ≤ 20 kW	€2,400 + €120 per each extra kW	
	> 20 kW ≤ 100 kW	€2,400 + €100 per each extra kW	
Electrically driven air/water heat pumps - APF ≥ 3.5	≤ 20 kW	€900 lump sum	
	> 20 kW	€1,200 lump sum	

Table 3-24- Summary of the requirements needed to access to the German incentives for heat pumps

Cash Incentives

There are two main programs directing the allocation of cash grants for production facility set-up support: the Joint Task for the Promotion of Industry and Trade (Joint Task); a special cash incentives program to promote investment activities in Eastern Germany called the investment allowance. The Joint Task program regulates the distribution of non-repayable grants for investment costs through-out Germany. Money available through this program is usually distributed in the form of cash payments.
In Eastern Germany, investment grants are complemented by the investment allowance program, which is usually provided in the form of a tax-free cash payment but can also be allotted in the form of a tax credit.

Public Loans and Guarantees

Special loan programs make up a second component of Germany's investment support. These programs are offered by publicly organized financial institutions submitting loans at attractive rates.
The provision of such loans usually makes it easier for investors to access funding from private lending banks.

In the table below a short summary of the German incentives program

REFERENCE DOCUMENTS

EnEG 2013: Gesetz zur Einsparung von Energie in Gebauden (Energie-einsparun geset-EnEG) – 4/7/2013

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
Germany	Direct Grant	No	To be clarified. The COP requested is calculated in a different mode of the GAHP one as the regulation is dedicated to traditional Heat Pump	A direct grant on the basis of €/m^2 is paid by the government taking into account the heated surface and the status of the house (renovation/new building/buildings finished after 2009)
	Renewable Energy Heating Act and Market Incentive Program (MAP)	No	A more suitable Definition of GAHP COP has to be considered to be taken into account by the MAP regulation	The MAP offers upfront bonuses to reduce the purchase price 2,400 euros for small water/water heat pumps

Table 3-25: Germany-Summary of identified incentive schemes

3.7.2.4 National case 4: Belgium

In Belgium, renewable energy regulation is a federal issue, thus there are different rules for Flanders, Wallonia and Brussels.
Regarding HPs you can get a premium (investment subsidy) from your distribution system operator and potentially from your municipality.
In Belgium also energy and related certification of RES installations is administered on regional level in Flemish, Walloon and Brussels Region. Certain policy instruments exist in all regions, with possible difference in the level of implementation. For example the Walloon regional government decided to adopt a more ambitious 20% renewable energy consumption target by 2020, compared to the 13% mandatory Belgian target.
Among the tax reductions offered by the Federal Government for energy saving measures, a 40% tax reduction is offered for heat pump installations. Heat pumps are also supported by direct or indirect subsidies. In new buildings, the subsidies are linked to the building energy performance index, in terms of primary energy consumption. In existing buildings, the subsidies are related to the energy performance of the system (minimum Ecolabel criteria). Heat pump boilers are only subsidized in the Walloon Region.
Similar to other European countries (e.g. Austria) a lot of activities are still governed on a regional level. Most regulatory law, financial incentives and information instruments currently in place have a low impact on heat pump sales. Apart from the Green Heat Action plan (in the Flemish region) which will most likely only have a low impact on heat pump sales, hardly any further measures or incentives are in a final planning stage. Among the discussed actions only the financial incentive of a 40% tax reduction for a heat pump installation may have a low to medium impact on the development of heat pump technology.

National Renewable Energy Action Plan

Under the EU Directive 2009/28/EC member countries of the European Union are obliged to draft and submit to the European Commission National Renewable Action Plans (NREAPs) outlining pathway which will allow them to meet their 2020 renewable energy, energy efficiency and GHG cuts targets.

Support for renewable offered in Belgium (federal level only) established in order to successfully develop RE sector and reach above enlisted targets:

- Green certificate scheme
- Contribution to the financing of connection costs for offshore wind parks
- Tax reduction on energy-saving investment for individuals
- Tax deductions for investments for the benefit of companies

Subsidies for renewable energy in tertiary sector buildings - Brussels region

As part of a package of subsidies aiming to increase sustainable use of energy in tertiary sector buildings, the Brussels government offers financial assistance for building owners seeking to install renewable energy systems. The subsidy covers 40% of the investment cost in the renewable energy system, including studies. Renewable sources covered include: hydropower; solar energy (hot water and electricity); geothermal; biogas; waste gases (including agriculture and forestry); renewable energy using boilers; central heating systems using cogeneration. Small wind power systems are excluded, as are heat pumps are covered only under specific conditions (there must be a net gain in primary energy

supply of the building; pumps using outside air are not covered). Photovoltaic panels used for water heating must be accompanied by an energy efficiency monitoring system for two years. The installed system must directly meet the buildings energy needs.

Call-system ecological investment subsidy – Flanders

Starting in October 2007, a new call-system grant and investment subsidy or ecology bonus to sustainable investments was established, depending on the size of the company. The system provides grant up to 40% of additional costs for SMEs, and 20% for large entreprises. Solar thermal power, solar photovoltaic energy, wind energy, biomass (electricity/heat/CHP) and heat pumps qualify as sustainable investments. (?)
Recently, the system has undergone changes in the percentage of support (depending on the size of the company and the type of investment) and technologies eligible for support. Latest changes became effective on 20 December 2012.

Energy Fund Grants for Small-Scale Heat Generation – Wallonia

As of 2006, the Walloon government awarded grants for the installation of micro-cogeneration systems and high-efficiency wood-burning furnaces and heating boilers Households, enterprises, self-employed workers and private entities were all eligible to receive grants. Every year, the programme is reviewed, taking into account the evolution of technology.

Subsidies for Renewable Energy Investment - Wallonia

Since 2005, the Walloon Region awards an investment subsidy and an exemption from real estate taxes to companies which carry out an investment program aiming at a sustainable use of energy (hydroelectric energy, wind energy, solar energy, geothermal energy, biogas, organic products and waste from agriculture and forestry arboriculture, biodegradable organic part of waste), a quality cogeneration and energy savings during the manufacturing process Certain sectors are excluded form the scheme (e.g. the energy sector). The overall amount of the subsidy and the exemption from real estate taxes covers a percentage of eligible investments. The rates of the supports depend on the size of the enterprise and the objective of the investment program. It can be 20%, 25% and 30% for large companies (depending on geographical area), and 50% for SMEs. The amount of the subsidy and the exemption from real estate taxes cannot exceed: - EUR 1,000,000 per company over a 4-year period, in the case of a SME; - EUR 2,000,000 per company over a 4-year period, in the case of a large enterprise. This grant covers investments in all types of renewable energy hydroelectric energy, wind energy, solar energy, geothermal energy, biogas, organic products and waste from agriculture and forestry arboriculture, biodegradable organic part of waste. The exemption from real estate taxes will be applied to investments in non-movables, including investments in equipment considered as non-movable, by nature or by purpose. The exemption can be awarded: - to the small-sized enterprise for a 5-year period; - to the medium-sized enterprise for a 4-year period; - to the large enterprise for a 3-year period. Nevertheless, this exemption can be awarded for a maximum period of 7 years as regards the equipment and the implements in the case of a business setting-up. At present the order of the Walloon government (AGW) of 2 December 2004 is under modification.

REFERENCE DOCUMENTS

Legislation Flemish Government 29 November 2013

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
Belgium	Subsidies for Renewable Energy Investment - Wallonia	Yes	Dedicated to enterprise heating systems renovation Whose targets are increasing energy efficient of previous system?	The system provides 40% of additional costs for SMEs, and 20% for large enterprises.
	Call-system ecological investment subsidy – Flanders	Yes	Dedicated to enterprise heating systems renovation Whose targets are increasing energy efficient of previous system	It can be 20%, 25% and 30% for large companies (depending on geographical area), and 50% for SMEs. The amount of the subsidy and the exemption from real estate taxes cannot exceed: - EUR 1,000,000 per company over a 4-year period, in the case of a SME; - EUR 2,000,000 per company over a 4-year period, in the case of a large enterprise.
	Income tax reduction	No	Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	40% of the installation cost of RES-Heating units. Max €2830

Table 3-26: Belgium-Summary of identified incentive schemes

3.7.2.5 National case 5:The Netherlands

As in other European federal countries, in the Netherlands Renewable Heating system can be supported both by local authorities and central government.
The Netherlands have introduced a premium tariff (bonuses on the top of the wholesale price) to promote the generation of heat from RES.
Here below a summary of the most important measures about RES heating systems subsidies policy:

- **Premium tariff.** The Netherlands have introduced a premium tariff (bonuses on top of the wholesale price) to promote the generation of heat from renewable sources.
- **Tax regulation mechanisms.** Enterprises are eligible for a tax credit (EIA) for investments in specific types of renewable heating systems
- **Loans. Investors in RES H**&C projects (excluding Biomass/Biogas) are eligible for a reduction of the interest rate on the basis of a Green project declaration

References:

- **SDE +** (Besluit stimulering duurzame energieproductie – Renewable Energy Production Incentive Scheme 2007)
- **RISEP (**Algemene uitvoeringsregeling stimulering duurzame energieproductie - Regulation implementing sustainable energy production)
- **RAC 2013** (Regeling aanwijzing categorieën duurzame energieproductie 2013– Regulation designating sustainable energy production categories)
- **Energy List 2013** (Energielijst 2012)
- **RGP 2010** (Regeling Groenprojecten 2010) - Regulation Green Projects 2010
- **Wet IB 2001** (Wet van 11 mei 2000 tot vaststelling van de Wet inkomstenbelasting 2001 – Income Tax Act) WBM (Wet Belastingen op Milieugrondslag – Act Introducing the Environmental Tax)
- In the Netherlands, the main support instrument for renewable energy is the SDE+ premium feed-in scheme. This support scheme promotes renewable energy sources used for electricity, renewable gas and heating purposes. It encompasses a system of phased admission with escalating base tariffs, which favors low cost RES options. Besides the premium scheme, investments in renewable energy technologies are supported via loans and various tax benefits. Moreover, net-metering applies to small installations. Access of electricity from renewable energy sources to the grid shall be granted according to the principle of non-discrimination. Grid operators are generally obliged to develop the grid to provide sufficient capacity for the access and transmission of electricity. Heat from renewable sources is promoted through a premium tariff (bonuses on top of the wholesale price) as well as tax benefits.

The Netherlands has adopted an obligation scheme which should result in a 10% RES share of energy consumption in the transport sector. Tax credits exist for biofuel and hydrogen related RES-T investments.

Regarding policies, the Dutch Energy Agency facilitates market parties and specific organisations to establish training and certification facilities for RES installers and installations. Innovation in energy is supported through innovation contracts between

private companies, universities, R&D institutes. In the framework of the Energieinvesteringsaftrek, tax credits are available for RES-H infrastructure.

- **SDE+**
  The SDE+ (Stimulering Duurzame Energieproductie/Encouraging Sustainable Energy Production) is an operating grant. Producers receive financial compensation for the renewable energy they generate. Production of renewable energy is not always profitable because the cost price of renewable energy is higher than that of energy derived from fossil fuel. The difference in cost price is called the unprofitable component. SDE+ compensates producers for this unprofitable component for a fixed number of years, depending on the technology used. The SDE+ is available for the production of: renewable electricity, renewable gas, renewable heat or a combination of renewable heat and electricity (CHP). The cost price for the production of renewable energy is set in the base sum for the technology. The yield of fossil energy is established in the correction sum. The SDE+ contribution = base – correction sum. This makes the level of the SDE contribution dependant on energy-price developments. When the energy price is high, you receive less SDE+ and more from your energy consumer. When the energy price is lower, you get more SDE+ and less from the energy consumer. The correction amount is the average energy price per category during the year of production. The base energy price is the lower limit for the correction amount. The maximum grant is reached when the correction amount is equal to the base energy price. The final payments are calculated per year on the amount of energy produced and the actual energy price.
- ***Loans***
  The Dutch government gives a tax benefit to consumers who invest or put their savings in a green fund. This enables the banks to offer loans at lower interest rates to 'green' projects. For a project to qualify for such a loan it should apply for a declaration on the basis of the Regulation Greenprojects 2010. In general projects, which positively affect the environment can apply for a declaration. The declaration is valid for 10 or 15 years depending on the application.

- ***Tax Regulation Mechanism (Energy Investment Allowance, Eia Scheme)***
  This tax benefit enables entrepreneurs based in the Netherlands to write off investments in renewable energy plants against tax (Article 3.42 Wet IB 2001). The eligibility criteria are extensively described in the Energy List.

The level of funding depends, among other things, on the source of energy and the type of plant used. Investments of less than € 450 are ineligible (Article 3.45 Wet IB 2001). Furthermore, a total of at least € 2,300 (and at most € 118 million) must be invested in eligible projects within one year (Article 3.42 Wet IB 2001

Unfortunately any of these feed-in schemes can support GAHP diffusion as the GAHP technology is not recognized as one of the eligible generators

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
The Netherlands	Tax Regulation Mechanism (Energy Investment Allowance, Eia Scheme)	Yes for the SDE+ (compensation for the production of renewable heat in spit of fossil fuel heat.	Incentive proportional to the primary energy savings brought by the investments	The level of funding depends, among other things, on the source of energy and the type of plant used. Investments of less than 450 Euros are ineligible
	Income tax reduction	No	Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Percentage of the installation cost of RES-Heating units. Max €2830

Table 3-27: The Netherlands-Summary of identified incentive schemes

3.7.2.6 National case 6: UK

According to the Government's Heat Strategy, GAHPs, as the most efficient gas utilising heating solution, have the potential to play a significant long-term strategic role as the UK endeavours to decarbonise its heating supply. GAHPs are unique as they utilise gas to generate renewable heat. The recently published EU guidelines on calculating renewable energy for heat pumps, confirm that GAHPs can be considered a renewable technology and establish a methodology to calculate the renewable energy that they generate towards legally binding renewable targets.

The UK government set out its Renewable Energy Strategy in 2009 for achieving the 15% target in 2020. The UK government thus retains responsibility for energy regulation, energy services, appliance labelling, mandatory obligations and energy services. The liberalised energy markets are regulated by an independent body, Office of the Gas and Electricity Markets (OFGEM). Policies related to environment are the responsibility of the Department for Environment, Food and Rural Affairs (DEFRA). DEFRA has lead involvement in all labelling activities of heat pumps, the various preparatory studies (e.g. Lots) and also implementation of F-gas regulations.
A number of schemes supported by the relatively new Department of Energy and Climate Change
(DECC, established in 2010) provides support tools for heat pumps:

- **Enhanced Capital Allowance (ECA)** scheme provides tax relief on energy-saving equipment for businesses considering a list of products. Products eligible for the list must meet certain criteria e.g. COPs measured to EN 14511. The scheme is regarded as a certification of quality runs on manufacturer's self-declaration which is subject to control. The scheme is recently being operated by the Carbon Trust (CT).
- **Green Deal and the Energy Company Obligation (ECO)** are the government support mechanisms for the uptake of energy efficiency measures, operated by GEMSERVE. The Green Deal finance mechanisms are based on the principle that eliminates the need to pay upfront for energy efficiency measures by enabling use of estimated annual savings on an individual property to obtain a loan to buy efficiency enhancements with a loan tied to electricity bill to the property. The proposed solution includes a new financial payment mechanism, accreditation of the associated Green Deal participants, increased consumer protection and the provision of information to assist consumers in making an informed decision about investing in energy efficiency measures. However, concerns are raised as the Green Deal starts to emerge, as generating electricity and heat will probably be of secondary importance after all insulation measures have been installed.

- **Renewable Heat Initiative (RHI), operated by OFGEM**, currently only addresses non-dwellings. The initiative pays a tariff for every kWh of useful heat across a range of technologies. Air to air source heat pumps are considered to be a mature market and too difficult to meter and hence are not seen in the need of incentives. Air to water may be included as long as they are not reversible. So far the majority of the applications were for biomass boilers. There are significant concerns regarding the quality of information provided and quality of heat meter installations which is a fairly novel idea in the UK. RHI scheme is split into Domestic

& Non Domestic Schemes, and for heat pumps it currently only supports electric compressor technology.

- The current COP for Heat Pump support in the RHPP and the following RHI, is based on electric driven heat pumps, and a conversion formula has been now agreed with the Microgeneration Certification Scheme based on Primary energy to create a minimum threshold, and is formal process of being adopted by the MCS Technical Approval Board
-

- **Micro-generation Certification Scheme (MCS)** certifies micro-generation technologies used to produce electricity and heat from renewable sources. It has started life as Clear Skies programme which is the principle source of grants for heat pumps provided that the product and installer are accredited. It is accepted as eligibility requirement for the Government's financial incentives, which include the Feed-in Tariff and the Renewable Heat Incentive RHI. The scheme has its own set of criteria, uses EN14511 as Standard for heat pumps which covers all renewable products up to 45 kW capacity.

The Renewable Heat Premium Payment (RHPP) is a one-off grant aiming to meet the cost of renewable heat technologies until formal launch of domestic Renewable Heat Incentive (RHI) tariffs for domestic customers. Eligibility criteria are launched by the government and require micro-generation Certification Scheme (MCS). Air to water and ground source heat pumps are available within the scheme but not air source heat pumps.

Nowadays Gas Heat Pumps are not included in the list of eligible generators, and the text of the policy is under review by the UK Department of Energy & Climate Change.

Compared to the other examined markets many activities are taking place in the UK, especially the planning of regulatory laws and financial incentives. However, most of the measures will only have a low impact on heat pump sales. Other policy and information instruments only have low impacts on heat pump technology:

- ***Renewable Heat Incentive***
  The details of the domestic Renewable Heat Incentive (RHI) were announced by the UK Government on 12 July 2013. The main details of the scheme which were announced, and which are subject to final clarification and parliamentary approval, are listed below:

The main details of the scheme are listed below.

- The domestic RHI is a UK Government financial support scheme for renewable heat, targeted at, but not limited to, off gas grid households.
- **DECC** (Department of Energy and Climate Change) intend that the scheme opened to applications in Spring 2014 and administered by Ofgem (British Electricity and Gas Market Regulator).
- **Ofgem** guidance will be available before the launch of the scheme on how to apply and the information that will need to be provided the scheme will cover single domestic dwellings and will be open to owner-occupiers, private landlords, Registered Providers of Social Housing, third party owners of heating systems and

self-builders. It will not be open to new build properties other than self-build it will be open to anyone in these groups who installed an eligible technology since 15th July 2009, provided they meet the scheme criteria for those who have installed a renewable heating system before the launch of the scheme in Spring 2014 and since 15 July 2009 (legacy applications), the date they can submit their application may not be from when the scheme first opens and will be phased over time. Further details on the phasing will be provided by Ofgem prior to launch the financial support will be paid at a set rate per unit of renewable heat produced (kilowatt hour or kWh – Table 3-28), for seven years, to the owner of the heating system the scheme will support air source heat pumps (ASHP), biomass systems, ground source heat pumps (GSHP) and solar thermal technologies.

Air source heat pump	Ground source heat pump	Biomass	Solar thermal
7.3 p/kwh	12.2p/kwh	18.8p/kwh	19.2p/kwh

Table 3-28- Summary of British incentives inside the Renewable Heat Incentive

The support rates will vary depending on the technology installed for biomass the renewable heat generated will be based on an estimated figure of heat demand from an Energy Performance Certificate (EPC) for heat pumps the renewable heat generated will be based on an estimate of the heat demand from an EPC combined with an estimate of the heat pump's efficiency for solar thermal systems the renewable heat generated will be based on the estimate of system performance completed as part of an Microgeneration Certification Scheme (MCS) installation to help improve performance of renewable heating systems, there will be an extra incentive for applicants who install metering and monitoring service packages, of £230 per year for heat pumps and £200 per year for biomass boilers to be eligible the system must be certified under the Microgeneration Certification Scheme (MCS) scheme and meet relevant standards for each technology all applicants are required to complete a Green Deal Assessment (GDA) before applying and to ensure they meet minimum energy efficiency requirements of loft and cavity insulation where required by the GDA any public grants previously received, including RHPP, will be deducted to avoid a double subsidy tariffs will change annually in line with the Retail Price Index (RPI) DECC intend to introduce a system of digression to control the costs of the scheme. This is where tariffs are reduced over time for new applications to the scheme. Those who have already secured their tariff will not have their tariff reduced due to cost control. The Renewable Heat Incentive (RHI) is a UK Government scheme set up to encourage uptake of renewable heat technologies among householders, communities and businesses through the provision of financial incentives. The Renewable Heat Incentive is the first of its kind in the world.

Technology is in the process of being included in the Microgeneration Certification Scheme for Heat Pumps as a Product and Installers, which will enable the technology to receive government support for incentive schemes if detailed by government as a technology in those schemes. However this does not stop the technology being sold and installed in the UK providing it meets EN Standards on manufacturer and safety, but does stop it receiving fiscal support from government.

To be included in SAP & Rd SAP, the manufacturer must submit the technology through a procedure detailed in SAP Appendix Q, providing evidence and test data on products performance and carbon benefits, via the BRE.

No support in place for Gas or Thermal driven Heat pumps, but envisaged it would adopt the same method for electric compressor heat pumps if introduced, by paying at a set rate per unit of renewable heat produced (kilowatt hour or kWh), for seven years, to the owner of the heating system the scheme will support air source heat pumps (ASHP), biomass systems, ground source heat pumps (GSHP) and solar thermal technologies. As we can see GAHP is nowadays not eligible to any feed-in policy of the British Government as it's a not recognized technology even if GAHP has most of the required performances data

REFERENCE DOCUMENTS

Building a greener future – Policy Statement – July 2007

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
UK	Renewable Heat Incentive. Gas Heat Pumps are not included, and is under review by the UK Department of Energy & Climate Change	No	RHI scheme is split into Domestic & Non Domestic Schemes, and for heat pumps it currently only supports electric compressor technology The current COP for Heat Pump support in the RHI, is based on electric driven heat pumps, and a conversion formula has been now agreed with the Microgeneration Certification Scheme based on Primary energy to create a minimum threshold, and is formal process of being adopted by the MCS Technical Approval Board	No support in place for Gas or Thermal driven Heat pumps, but envisaged it would adopt the same method for electric compressor heat pumps if introduced, by paying at a set rate per unit of renewable heat produced (kilowatt hour or kWh), for seven years, to the owner of the heating system the scheme will support air source heat pumps (ASHP), biomass systems, ground source heat pumps (GSHP) and solar thermal technologies.

Table 3-29: UK-Summary of identified incentive schemes

3.7.2.7 National case 7: Poland

On 22 December 2011, the Polish Ministry of Economy presented the draft of a new Renewable Energy Sources Law. It includes a renewable building obligation for the private and public sector, as well as a one-time tax deduction for private solar thermal customers (in addition to the grants offered by the Polish National Fund for Environmental Protection and Water Management, NFOŚiGW). Are GAHPs eligible? Under which criteria? The Renewable Energy Sources (RES) Law indicates a significant shift in Poland's green energy policy. The NFOŚiGW and the EU funds for larger solar thermal systems were only thought to stimulate market development temporarily. In implementing the RES Law, the Polish government now intends to provide private and commercial investors with a fixed legal framework and long-lasting support schemes. The law includes tax deductions of up to Polish Zloty (PLN) 10,000 (EUR 2,200) in the first year after purchasing a solar thermal system for residential use. Owners of systems which have been purchased and installed since 1 January 2011 can profit from this tax reduction once the law has been implemented. The RES Law also provides the NFOŚiGW with an additional budget and specifies new rules regulating how the money should be spent. The NFOŚiGW should receive funds from electricity utilities who must purchase or produce a certain amount of green energy. If they are not able to fulfill the required output, they must pay a penalty to NFOŚiGW. According to the draft law, funds must be spent as follows:

- 30% to support renewable heat systems with capacities of up to 40 kW or 70 kW,
- 30% to support renewable energy systems of up to 500 kW,
- 40% for new electricity grids.

The RES law also contains a renewable building obligation, which stipulates that

- In the public sector, every major building renovation or construction must include renewable energy systems that cover at least 10% of the building's total energy consumption of heat and electricity. This requirement should come into effect at the moment the law will be implemented.
- In the private sector, every major building renovation or construction must include renewable energy systems that cover at least 13% of the building's total energy consumption. This regulation will come into effect as early as January 2015.

The aforementioned conditions represent the first legal steps planned by the Polish authorities to boost energy efficiency in the public and residential sector. After the law will have been implemented, the regulations should further align the Polish law with the European Union's targets stated in building directive 2002/91/EC for energy-efficient construction. As the popularity of solar thermal systems in Poland is increasing year after year, solar collectors are thought to substantially help investors in meeting the new RES standards. The new RES Law also stipulates that installers specialised in solar thermal systems, heat pumps, biomass boilers, small-scale biogas plants or photovoltaic systems must pass a National exam for small-scale renewable energy installations to obtain a so-called micro-RES installer's license. Qualified installers from other EU countries will also be admitted for RES installations with the new Polish standards. These regulations will be specified further in a separate executive law prepared by the Ministry of Economy. The implementation of the new support mechanisms and mandatory regulations is needed to achieve the goals set by the Polish government in its National Renewable Energy Action

Plan (NREAP). There are two subsidy schemes for heat from renewable energy sources. One was launched by a state-owned bank, the other one by the National Fund for Environmental Protection and Water Management. The former supports refurbishment works which, among others, may include the installation of RES technologies for heat generation. The subsidy from the National Fund supports the purchase and installation of solar collectors. The thermo-modernisation grant scheme supports building renovations which increase energy efficiency or the use of renewable energy sources for heating purposes. Lenders may receive grants to pay off part of the loan taken out to implement such measures. Eligible measures shall reduce a building's annual energy demand, annual energy losses or annual costs of heat production or replace existing heat generation plants with renewable or high-efficiency CHP plants (art. 3 par. 4 Act on Thermo-Modernisation). The amount of grant is equal to 20% of the loan received for the implementation of thermo-modernisation undertakings. However, the subsidy may not exceed 16% of the total costs of the modernisation work and may not exceed twice the amount of the anticipated annual savings in energy costs, which were identified through an energy audit (art 5 Act on Thermo-Modernisation).

Nowadays Gas Heat Pumps are not included in the list of eligible generators, and the text of the policy is under review by the UK Department of Energy & Climate Change. RHI scheme is split into Domestic & Non Domestic Schemes, and for heat pumps it currently only supports electric compressor technology.

The current COP for Heat Pump support in the RHI, is based on electric driven heat pumps, and a conversion formula has been now agreed with the Microgeneration Certification Scheme based on Primary energy to create a minimum threshold, and is formal process of being adopted by the MCS Technical Approval Board

No support in place for Gas or Thermal driven Heat pumps, but envisaged it would adopt the same method for electric compressor heat pumps if introduced, by paying at a set rate per unit of renewable heat produced (kilowatt hour or kWh), for seven years, to the owner of the heating system the scheme will support air source heat pumps (ASHP), biomass systems, ground source heat pumps (GSHP) and solar thermal technologies.

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
Poland	Art. 3 par. 4 Act on Thermo-Modernisation	No	Nowadays GAHP is NOT present in the possible modernization unit	The amount of grant is equal to 20% of the loan received for the implementation of thermo-modernisation undertakings. However, the subsidy may not exceed 16% of the total costs of the modernisation work and may not exceed twice the amount of the anticipated annual savings in energy costs, which were identified through an energy audit

Table 3-30: Poland-Summary of identified incentive schemes

Conclusions

Analyzing the National renewable feed-in tariffs framework, a variegated framework is present within the European borders, as the EU Commission indications to facilitate the spreading of renewable energy and energy efficiency don't give any particular and precise information about building up local policy, but they give only targets to be reached within a delivery year (i.e. 2020).
Thus, regarding to their National economic scenario and regarding to their own Renewable Energy Action Plan (mandatory strategy document that each country has to redact as obliged by EU Commission), each country decides how to incentive RES technologies.
According to this overview, GAHP systems can be well supported by a feed-in policy as much similar to the British Renewable Heat Incentive, paying a tariff for every kWh of useful heat produced. Thus, it will be important to underline the high efficiency of the GAHP technology and its differences with classical heat pump in order to receive, by National governments, dedicated incentives.
It's also important to discuss and define a new common European approach in defining in National normative and incentives policy the value of the COP; it would be better to have regulation that use a reference to the PER (Primary Energy Ratio) calculated on the basis of the primary energy (fossil fuel energy), as the ErP regulations already state.

Here below in Table 3-31 a summary of the proposed National incentive schemes that can be taken into account for a GAHP installation.

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
Italy	Eco bonus	Yes	GAHP has to substitute a less efficient heating system	An amount equal to 65% of the costs incurred and must be divided into ten equal annual installments
	Conto termico	Yes, incentive proportional to efficiency, thermal power production	Efficiency evaluated according to EN 12309 – T1 requirements GUE > 1,5 Substitution of less efficient heating system with a Size<1MW	The incentives granted for heat pumps are proportional to the total rated thermal power, thermal efficiency of the heat pump and the climate zone installation. Incentives are paid annually for a period varying between 2 and 5 years. Thanks to the Conto Termico, you do not need to have taxes to be payable to deduct the costs of the intervention, because the contributions are made annually by the GSE directly through wire transfer to bank accounts.
	Deductions for renovations	Yes	Works on residential units and residential buildings that they have as their objective	Deductions from IRPEF (income tax of physical persons) of a portion of the costs incurred to renovate the homes and common areas of residential buildings. The

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
			the achievement of energy savings.	deduction must be divided into ten equal yearly amounts in the year in which the expenditure is incurred and in future ones.
	TEE	Yes	Heat generator have to be metered and the plant accredited by GSE	These kind of feed in tariffs can be received in the case of installation of new generators of heat / cold, either with or without temperature control systems as part of new buildings or existing buildings.
France	Crédit d'Impôt Développe-ment Durable 2014 (CIDD)	No.	You can access to these this incentives if your heat pump have a COP higher than 3,4 or 2.3 if the Heat Pump is used for domestic heating water exploiting geothermal and aerothermal thermal input (2.5 for exhaust air pump). Housing is to be located in France, built over two years and assigned to the main house, valid for renters, homeowners (excluding donors). Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	The cost of the heat pump unit serves as a basis for the deductible amount and the subsidies vary depending on the year of purchase and the type of heat pump. In 2012, the rates were 26% of the cost for a ground source heat pump and sanitary hot water heat pump, and from 15 % to 25 % (single or package of works) in the case of air/water heat pumps. These rates are applicable on the purchase of equipment and materials excluding installation costs (excluding insulating walls and roofs). Installation has to be performed by a qualified company.
	VAT discount 2014	No. Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Any specified requirement, installation has to be made by an accredited company. Nowadays, this incentive is applicable for	VAT rate for the supply and the installation of a heat pump in your home (primary or secondary) completed within two years. A 10 % VAT rate (to 5,5 % VAT rate for works eligible to CIDD) is applied by the supplier or the installation company

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
			electric heat pumps only, but GAHP could be eligible	
	Eco Loan – Zero Tax (Air/water heat pump)	No.	For the same improvement work, limitations to benefit from both ZERO TAX ECO LOAN and CREDIT D'IMPOT are present. Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	it's possible to have loans with a tax rate fixed at 0% for installations of efficient solution for heating systems and improvements for energy efficiency in the buildings built before 1990. This interest-free loan is open to owners, co-owners, occupants, of a principal residence, a house or an apartment. It is granted until December 31, 2015 by banks that have signed an agreement with the state. The amount of eco-interest loan of € 20,000 for a package of two works and € 30,000 for a package of three works.
	Premium energy retrofit	No.	housing built over 2 years renovation (insulation or installation of efficient equipment by a professional). Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Until 2015, it is possible to receive a bonus of 1,350 € to fund a package of works of thermal of the main residence. This bonus can be combined with the CIDD and eco loan –zero tax.
	National Housing Agency (Anah) + local authorities aids	No.	Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Depends on income and type of energy renovation work. These aids can be combined with Eco Loan – Zero Tax

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
	White certificate (certificat d'économie d'énergie)	Yes	Request before beginning work. Bonus paid by check in exchange of your bill works.	air/water heat pump => 473 €**(**depends on income, works done)
Germany	Direct Grant	No	To be clarified. The COP requested is calculated in a different mode of the GAHP one as the regulation is dedicated to traditional Heat Pump	A direct grant on the basis of €/m^2 is paid by the government taking into account the heated surface and the status of the house (renovation/new building/buildings finished after 2009)
	Renewable Energy Heating Act and Market Incentive Program (MAP)	No	A more suitable Definition of GAHP COP has to be considered to be taken into account by the MAP regulation	The MAP offers upfront bonuses to reduce the purchase price 2,400 € for small water/water heat pumps
Belgium	Subsidies for Renewable Energy Investment - Wallonia	Yes	Dedicated to enterprise heating systems renovation Whose targets are increasing energy efficient of previous system?	The system provides 40% of additional costs for SMEs, and 20% for large entreprises.
	Call-system ecological investment subsidy – Flanders	Yes	Dedicated to enterprise heating systems renovation Whose targets are increasing energy efficient of previous system	It can be 20%, 25% and 30% for large companies (depending on geographical area), and 50% for SMEs. The amount of the subsidy and the exemption from real estate taxes cannot exceed: - EUR 1,000,000 per company over a 4-year period, in the case of a SME; - EUR 2,000,000 per company over a 4-year period, in the case of a large enterprise.
	Income tax reduction	No	Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	40% of the installation cost of RES-Heating units. Max €2830

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
The Netherlands	Tax Regulation Mechanism (Energy Investment Allowance, Eia Scheme)	Yes for the SDE+ (compensation for the production of renewable heat in spit of fossil fuel heat.	**Incentive proportional to the primary energy savings brought by the investments**	The level of funding depends, among other things, on the source of energy and the type of plant used. Investments of less than 450 Euros are ineligible
	Income tax reduction	No	Nowadays, this incentive is applicable for electric heat pumps only, but GAHP could be eligible	Percentage of the installation cost of RES-Heating units. Max €2830
UK	Renewable Heat Incentive. Gas Heat Pumps are not included, and is under review by the UK Department of Energy & Climate Change	No	RHI scheme is split into Domestic & Non Domestic Schemes, and for heat pumps it currently only supports electric compressor technology The current COP for Heat Pump support in the RHI, is based on electric driven heat pumps, and a conversion formula has been now agreed with the Microgeneration Certification Scheme based on Primary energy to create a minimum threshold, and is formal process of being adopted by the MCS Technical Approval Board	No support in place for Gas or Thermal driven Heat pumps, but envisaged it would adopt the same method for electric compressor heat pumps if introduced, by paying at a set rate per unit of renewable heat produced (kilowatt hour or kWh), for seven years, to the owner of the heating system the scheme will support air source heat pumps (ASHP), biomass systems, ground source heat pumps (GSHP) and solar thermal technologies.
Poland	Art. 3 par. 4 Act on Thermo-Modernisation	No	Nowadays GAHP is NOT present in the possible modernization unit	The amount of grant is equal to 20% of the loan received for the implementation of thermo-modernisation undertakings. However, the subsidy may not exceed 16% of the total costs of the modernisation work and may not exceed twice the amount

EU country	Incentives scheme	GAHP included?	GAHP applicability requirements	Incentives amount
				of the anticipated annual savings in energy costs, which were identified through an energy audit

Table 3-31- Summary of the presence of incentives applicable/not applicable to GAHP in the analyzed European countries

3.7.3 Recommendation for KQ7

As GAHP turns out to be not yet eligible in several schemes, it is recommended to **promote a wider dissemination of the advantages provided by GAHP among the Governmental institutions** in charge of setting eligibility criteria for subsidies.

4 Overall conclusions and recommendations

HEAT4U project has been conceived to overcome not only technological barriers which currently prevent GAHP application in single family houses, but also non-technological obstacles that could have an impact on GAHP penetration into the different European markets. The main focus of this deliverable has been to show how both European and National[4] legislative frameworks are currently affected by lack of consideration for the peculiarities of GAHP that can result in a barrier and could prevent these appliances from realising their potential as one of the most **suitable heating technologies for retrofitting residential buildings**.

To this purpose, possible critical issues have been identified and deeply analyzed. In particular, the analysis has focused on the following directives and standards:

- Pressure Equipment Directive 97/23/EC;
- Installation standard EN378;
- Gas Appliance Directive 2009/142/EC;
- Energy Performance of the Buildings Directive 2002/91/EC;

Moreover, national incentives schemes have been investigated in order to understand if GAHP appliances are listed as eligible.

Finally, recommendations and proposals for legislative improvements/extensions related to each specific topic have been provided to address critical issues pointed out.

The deliverable has been structured in seven different sections, one for each of the identified topics and has been presented in terms of “Key Questions”. Each Key Question has been deeply analyzed and commented. The conclusions of each of the aforementioned and analyzed Key Questions are presented in the following Tables.

[4] Italy, France, Germany, Belgium, the Netherlands, United Kingdom and Poland.

4.1 *Summary for Key Question 1: Design and manufacturing*

ID No.	Key Question short description	Reference Standard(s)	Reference in the text
KQ1	**Design and manufacturing** Analyse the implementation at national level of the European *Pressure Equipment Directive* (PED) and assess national differences possibly affecting GAHP.	*Pressure Equipment Directive 97/23/CE and related National implementations*	§3.1 and APPENDIX A APPENDIX B

Summary and conclusions

All State Members of interest have implemented PED directive by means of proper national standard(s), which do not present specific deviations from the core text of the directive as far as design and manufacturing requirements.

The long list of derogations reported in the PED is not including any item directly applicable to GAHP, but several derogated pressure devices do present similarities to GAHP appliances.

RECOMMENDATION

Extend the list of derogations of PED to include absorption appliances, incorporating the relevant requirements with possible adaptations into a dedicated section of the product norm EN12309 (to be developed), thus unifying and simplifying the regulatory framework for GAHP all over EU.

4.2 *Summary for Key Question 2: In-service inspections*

ID No.	Key Question short description	Reference Standard(s)	Reference in the text
KQ2	**In-service inspections** Analyse the requirements of each Member State in terms of in-service periodical inspections and requalification programs as far as pressure-related safety aspects during the operational life of the GAHP appliance.	*Pressure Equipment Directive 97/23/CE and related National implementations*	*§* 3.2 and APPENDIX A

Summary and conclusions

In PED Directive (97/23/EC), the domain of first commissioning and periodical integrity and functional checks throughout the operational life of the equipment is not thoroughly covered**.** This results in a situation where each **Member State independently issues un-harmonized National laws and regulations** with different and sometimes contradictory provisions.

Only the French legislation has a clear set of provisions specifically conceived for absorption appliances (CTP2).

RECOMMENDATION

Integrate in the norm EN12309 a dedicated part with provisions for in-service inspections on the basis of the French standard CTP2, to be regarded as a common European reference for all EU countries.

4.3 *Summary for Key Question 3: Installation norms*

ID No.	Key Question short description	Standard(s) of reference	Reference in the text
KQ3	**Installation norms** Analyse the applicability of installation norms to GAHP and the relevant implications in the residential sector.	*EN378 "Refrigerating systems and heat pumps*	*§* 3.3 and APPENDIX A

Summary and conclusions

The existing installation norms conceived either for gas appliances or for electrical heat pumps are not taking into account the peculiarities of GAHP appliances, which do have some features in common with both these categories, but in fact represent a different category on its own.

This situation is resulting in unclear provisions for the installation of GAHP, especially for the indoor applications, representing a significant barrier against the deployment, in particular in the residential sector.

RECOMMENDATION

Set up a *formal liason* between Technical Committees in charge of EN378 and EN12309 and transfer specific installation rules for GAHP directly to a dedicated section of the product norm EN12309.

4.4 *Summary for Key Question 4: Measurement of emissions*

ID No.	Key Question short description	Reference Standard(s)	Reference in the text
KQ4	***Measurement of emissions*** Compare different approaches for the calculation of emissions in the frame of the *Gas Appliance Directive (GAD).*	*Gas Appliance Directive 2009/142/EC*	*§* 3.4 and APPENDIX A

Summary and conclusions

The calculation of specific emissions on the basis of the thermal output, instead of thermal input (as already possible through methods presented in EN12309), is a more appropriate approach for a fair comparison of environmental performances of gas appliances, in particular when GAHP is considered.

RECOMMENDATION

Include in GAD a clause to impose the calculation of emissions with reference to thermal output, instead of thermal input, through a cross-reference to methods already described in EN12309.

4.5 *Summary for Key Question 5: Flueless installation*

ID No.	Key Question short description	Reference Standard(s)	Reference in the text
KQ5	***Flueless installation*** Search and evaluate the existing regulations and requirements among the Member States for this new category of installation (as defined by *prEN12309:2014*) made possible by the GAHP technology.	*Gas Appliance Directive 2009/142/EC and prEN12309:2014*	*§* 3.5 and APPENDIX A

Summary and conclusions

Provisions for GAHP flueless appliances are set by *EN12309-2:2014*. The resulting mixed flow would feature concentration levels totally negligible and could be substantially treated as standard air. Installation rules for flueless appliances should be shaped accordingly.

RECOMMENDATION

Extend EN12309 to include not only the definition and design requirements, but also installation requirements for flueless appliances.

4.6 *Summary for Key Question 6: Calculation software*

ID No.	Key Question short description	Reference Standard(s)	Reference in the text
KQ6	***Calculation software*** Ascertain if the GAHP is included in the regional-specific software-programs issued by local Technical Bodies for assessing and certifying the *Energy Performance of the Buildings* according to the national implementations of the relevant European *Energy Performance Building Directive EPBD (2002/91/EC)*.	*Energy Performance Building Directive 2002/91/EC*	*§* 3.6 and APPENDIX A APPENDIX C

Summary and conclusions

Several software programs in different European Countries do not include the option of GAHP appliances, not allowing obtaining the Energy Performance Certification of the building. The inclusion of new technologies / appliances in this software turns out to be a country-specific complex, expensive and time consuming process, hindering the introduction of technological progress to the market.

RECOMMENDATION

In order to reduce the intangible barriers due to the fragmentation of the EPBD implementation in the national legislation, it is recommended:

- To create a liaison between CEN TC299 responsible for norm prEN12309 and CEN TC371 responsible for norm prEN 15603 (expected to become the European Normative that could be used in all the countries) in order to include GAHP technology in the calculation standards and methods;
- To propose always trough the TC371 a harmonized evaluation process so that the results of any certified laboratory can be recognized by other European laboratories;
- To interface with CTI in Italy to ensure proper inclusion of GAHP technology in UNI-11300 and associated implementing measured norms;
- To work toward the adoption in Germany of EN12309 in ENEV, BAFA, MAP legislation tool in replacement of the temporary guidelines currently used (VDI4650-2) for GAHP performance;
- To ensure that in UK *Standard Assessment Procedure (SAP)* includes GAHP technology for existing buildings (Reduced SAP–RdSAP) and for non-residential buildings (*Simplified Building Energy Model* - SBEM).
- To enforce a common accreditation program for laboratories and mutual recognition among Technical Bodies in order to reduce fragmentation and costs.

4.7 *Summary for Key Question 7: Incentive schemes*

ID No.	Key Question short description	Reference Standard(s)	Reference in the text
KQ7	**Incentive schemes** Analyse the incentive programs in force in the Member States and verify if the GAHP technology is listed as being eligible to subsidies.	*Different national incentives schemes*	*§* 3.7 and APPENDIX A

Summary and conclusions

Although most of European incentive programs are claiming energy savings and use of renewable energies as main goals, GAHP is not yet eligible in several schemes.

RECOMMENDATION

Promote a wider dissemination of the advantages provided by GAHP among the Governmental institutions in charge of setting eligibility criteria for subsidies.

4.8 *General recommendation*

To address the lack of recognition for GAHP encountered throughout the analyses of this Deliverable, it is recommended to include all type of specific requirements for GAHP (design, manufacturing, installation, in-service inspections, measurement of emissions) in the product norm EN12309, in such a way to make it the single reference text for all aspects of GAHP lifecycle. The availability of a fully comprehensive norm for GAHP, harmonized with the general-purpose Directives and specific norms defining the criteria and requirements for the design, the performance measurement, the installation, the in-service inspections, and all other aspects of the life-cycle of other product categories presenting some sort of similarity with the GAHP, will be instrumental for the following activity of harmonization of legislative framework of all EU Member States.

In the figure below a schematic roadmap showing the current starting point of GAHP legislative framework, the identified legislative barriers to be overcome (blue arrows) and the expected goal, is presented.

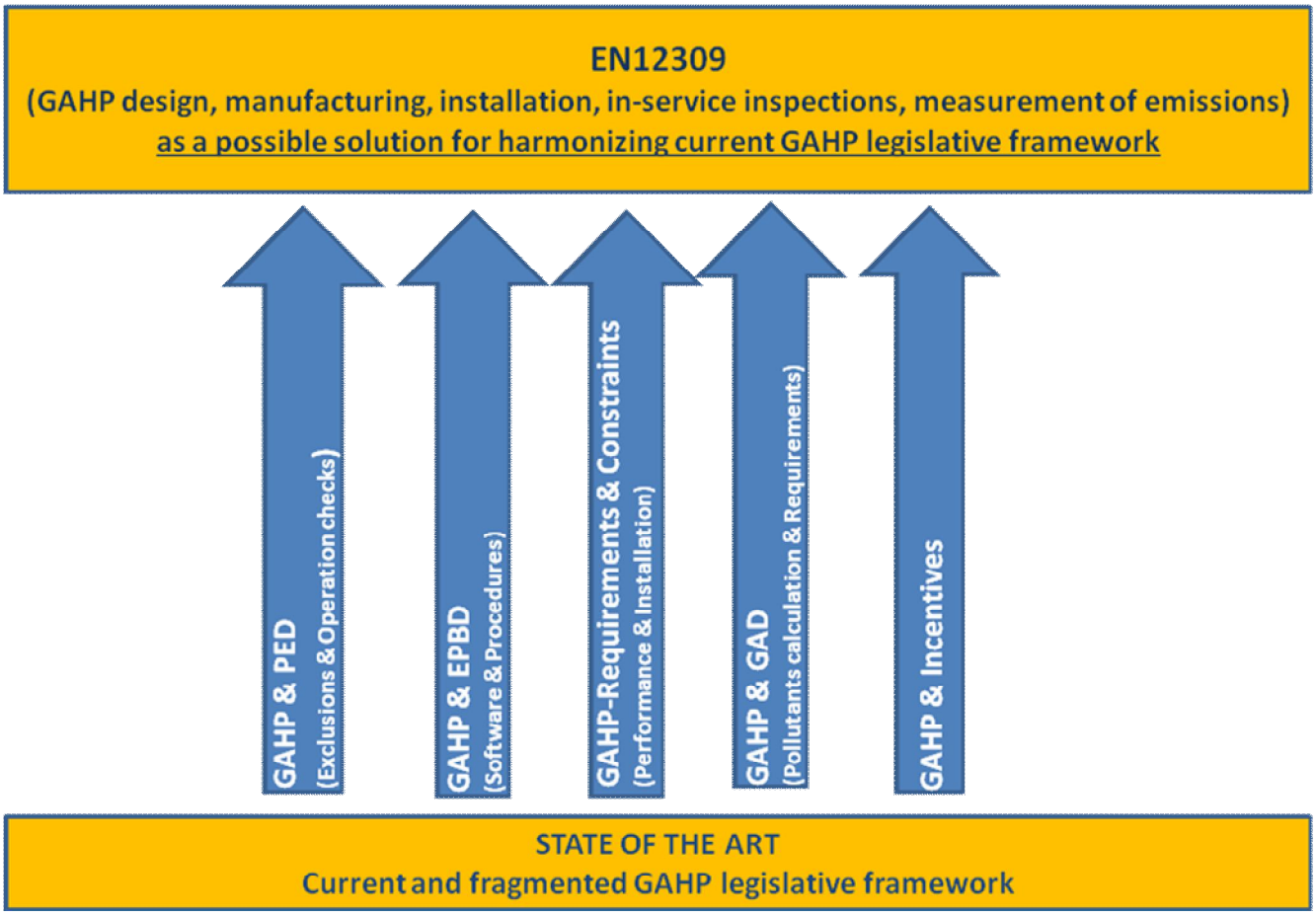

Figure 4-1:Schematic roadmap

Bibliography

In addition standards used as reference and listed in APPENDIX A to present deliverable, technical standards, in order to prepare this analysis, the following documents and websites have been useful.

Concerted Action on Energy Perfomance of Buildings - http://www.epbd-ca.eu/ (last access 10/4/2014)

IEA/IRENA Joint Policies and Measures Database - http://www.iea.org/policiesandmeasures/renewableenergy (last access 10/4/2014)

RES-LEGAL EU FP7 Intelligent Energy Project Website - (www.res-h-policy.eu).

CSTB – Centre Scientifique and Technique du Batiment – www.cstb.fr

CTI – Centro Termotecnico Italiano – www.cti2000.it

Fachverband Gebäude-Klima - www.fgk.de

Building Research Establishment – www.bre.co.uk

Kwaliteit voor Installies in Nederland - http://kvinl.nl

National House Building Council – www.nhbc.co.uk

ADEME (France) website which presents to citizens all the funding possibilities for their interventions

http://ecocitoyens.ademe.fr/financer-mon-projet/renovation/credit-dimpot-developpement-durable

Renewable Heat Incentive official website – www.rhincentive.co.uk

ROBUR Thermal Incentives dedicated website - www.incentiviriscaldamento.it/

EUCI (2007) Position Paper: In-service Inspection of Pressure Equipment

MS Approaches to introduce RES in NZEB – 15/5/2014 – Concerted Action Energy Performance of Buildings

APPENDIX A

Legislative framework

The scope of the this Appendix is to describe the present legislative framework related to the use in existing residential buildings (for heating and DHW systems) of the Gas Absorption Heat Pump (GAHP) developed within HEAT4U project.
The first step in order to reach the highlighted scope is the identification of the research topics. The preliminary list has been identified in collaboration with the Project Coordinator, and it includes the following items:

- Design and Performance
- Installation
- Maintenance

The methodology that should be adopted is presented in figure 2.1 below. As shown, the analysis carried out for each research topic of interest is articulated in different steps:

- Identification and analysis of the related European legislative framework in terms of directives and regulations
- Identification and analysis of the National laws derived from implementation of identified EU directives of interest and comparative analysis among the EU Countries, in order to find out possible National peculiarities that may have occurred in the EU directives' implementation process;
- Identification and analysis of additional National laws to be taken into account concerning the analyzed research topic.

The European countries of interest presented in figure 2.1 below are the countries where the commercial exploitation is foreseen in the early stage on the basis of the results of studies performed in HEAT4U - Work Package 1 (Deliverables 1.1).

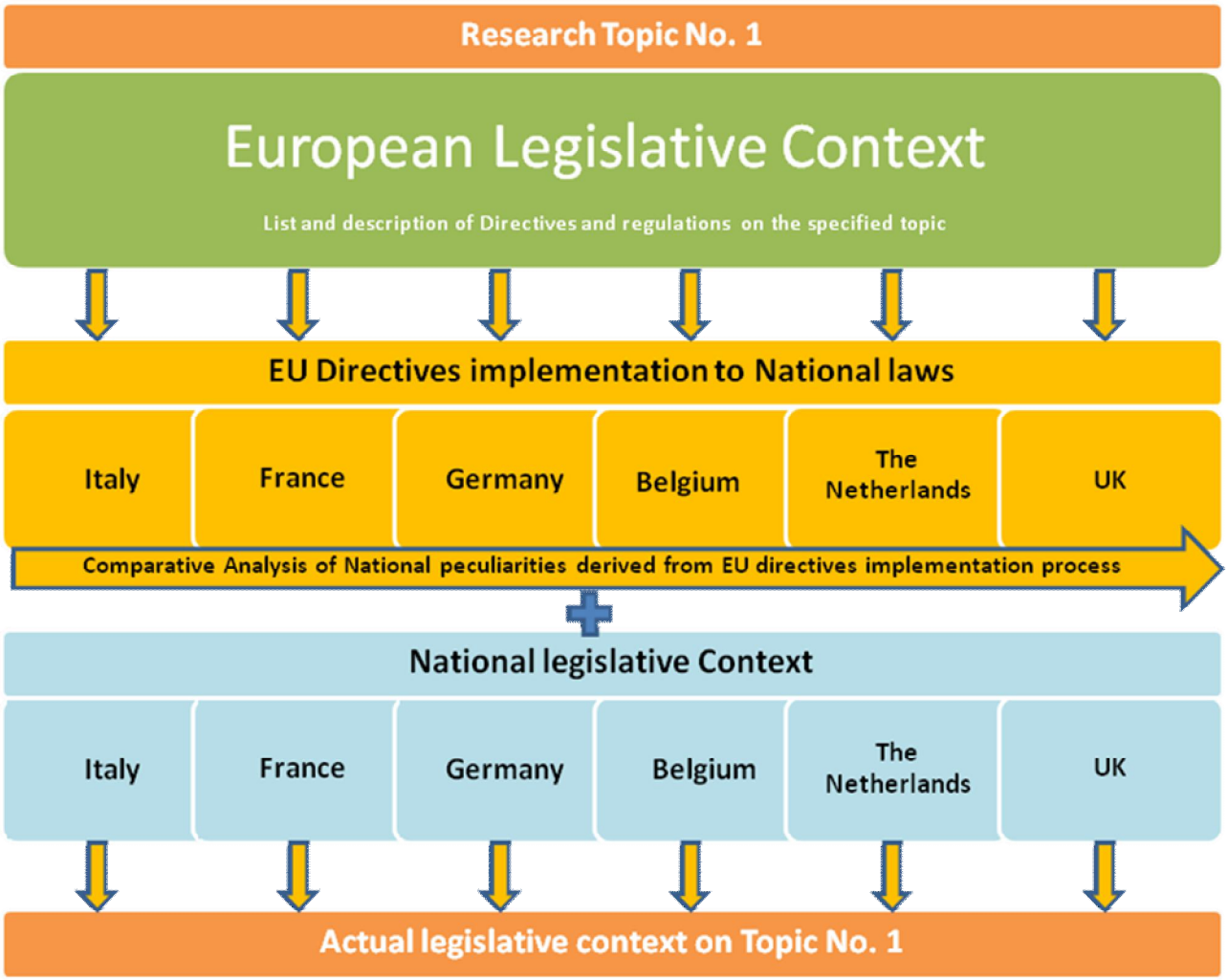

Figure 0-1: Methodological approach for investigating actual legislative framework

A1. EU legislation context

Design and Performance

ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
P1	97/23/CE	Pressure Equipment Directive (PED)		Currently being harmonized
P2	2009/28/UE (RES)	Renewable Energy Directive	-	It defines Renewable Energy Sources and how Heat Pump production can be considered in this context
P3	EN 12309	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW Rational use of energy		The latest version of the norm was submitted for Formal Vote by Member States (JUL2014)
P4	EPBD – 2	Energy Performance of Buildings Directive		
P5	EN 625	Gas-fired central heating boilers - Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW		
P6	UE – 811 – 812-813-814/2013	Ecodesign / Energy Labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar	September 2013 – substituting 92/42/CEE. Adoption of energy label begins Sep2015.	Define the Ecodesign requirements and Energy Labelling for heating systems
P7	2009/125/CE	ErP - Ecodesign		Directive that has resulted in publication of regulations mentioned at P5
P8	EN 378 – Part 1 EN 378-	Refrigerating systems and heat pumps. Safety and		Currently under revision (2014)

	Part 2	environmental requirements Part1: Basic requirements, definitions, classification and selection criteria Part 2: Design, construction, testing, marking and documentation		
P9-1	EN 677	Gas-fired central heating boilers. Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW		
P9-2	EN 9614	Acoustics. Determination of sound power levels of noise sources using sound intensity		
P10	EN 12102	Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling. Measurement of airborne noise. Determination of the sound power level		
P11	EN14511	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling Test conditions		Define the methodology to test electrically driven air conditioning and heat pump systems particularly evaluating the COP of these machines
P12	Pr EN-ISO 1379	Thermal performance of buildings – Calculation of	Provisory	Define the calculation method to evaluate the energy use for space heating.

		energy use for space heating.		
P13	Pr EN 15603	Energy performance of buildings - Overarching standard EPBD	Provisory	This normative try to harmonise National European countries legislation about EPBD
P14	ISO/TC 163	Thermal performance and energy use in the built environment		It proposes test and calculation and measurement methods about Thermal performance and energy use in the built environment
P15	ISO/TR 16344 – 16343 - 16346	Energy performance of buildings - Common terms, definitions and symbols for the overall energy performance rating and certification	2012	ISO/TR 16344:2012 provides a coherent set of terms, definitions and symbols for concepts and physical quantities related to the overall energy performance of buildings and its components, including definitions of system boundaries, to be used in all standards elaborated within ISO on energy performance of buildings.
P16	EN 676	Automatic forced draught burners for gaseous fuels	2008	Describes the calculation methods for NOx and CO emissions
P17	EN 15502 - 1	Gas-fired heating boilers General requirements and tests	2012	Describes the calculation methods for NOx and CO emissions and the test to evaluate performance.
P18	UE – 813-814/2013	Ecodesign requirements for space heaters and combination heaters	September 2013 – substituting 92/42/CEE	Define the technical specifications for an ecofriendly project of heating systems

Table 0-1: Summary of EU directives/regulations with regards to GAHP design and performance

Installation

ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
I1	EN 12309	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW Safety		The latest version of the norm was submitted for Formal Vote by Member States (JUL2014)
I2	2009/142/CEE	Approximation of the laws of the Member States relating to appliances burning gaseous fuels	2009	Technical precautions and requirements for gas equipment for domestic purposes.
I3	EN 378 – Part 3	Refrigerating systems and heat pumps. Safety and environmental requirements – Part 3:Installation site and personal protection		Currently under revision
I4	EN 806	Specification for installations inside buildings conveying water for human consumption		Describe the technical requirement for plants using water in buildings (i.e.Heating and DHW system)

Table 0-2: Summary of EU directives/regulations with regards to GAHP installation

Maintenance

Maintenance				
ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
M1	97/23/CE	Pressure Equipment Directive (PED)		Currently being harmonized
M2	EN 378 - 4	Refrigerating systems and heat pumps. Safety and environmental requirements Operation, maintenance, repair and recovery		Currently under revision
M3	EN 12309 – 3,4	Gas-fired absorption and adsorption air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW Test Methods		The latest version of the norm was submitted for Formal Vote by Member States (JUL2014)

Table 0-3: Summary of EU directives/regulations with regards to GAHP Maintenance

A2. EU Directives' implementation at National levels

Design and Performance

Country of interest	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
Italy	D.Lgs. 28/2011 – UNI 11300 -2	-	2012	Transposing 2009/28/UE (RES)
	P2 – ITA: DPR 59/2009 – 2/4/2009	Regolamento di attuazione dell'articolo 4, comma 1, lettere a) e b), del decreto legislativo 19agosto 2005, n. 192, concernente attuazione della direttiva 2002/91/CE sul rendimento energetico in edilizia	2009	-
France	RT 2012	Reglementation Thermique 2012	2010	-
Germany	EnEV		2014	Transposing EPBD2
Belgium				
The Netherlands				
UK				

Table 0-4: summary table for EU directives implementation at National level

Installation

Country of interest	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
Italy	I3 – ITA: DPR 15/11/1996	-	1996	Transposing 90/396/CEE
	I5 – ITA: UNI 9182	-	2014	Integration to EN 806
France				-
Germany				-
Belgium				-
The Netherlands				-
UK				-

Table 0-5: summary table for EU directives implementation at National level

Maintenance

Country of interest	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
Italy	D.Lgs. 25/02/2000, n. 93	Attuazione della direttiva 97/23/CE in materia di attrezzature a	2000	Implementation of EU Directive 97/23/CE

		pressione.		
	UNI 8065	Trattamento dell'acqua degli impianti termici ad uso civile	1989	Chemical requirements and water treatment for water used in DHW and heating systems
France	Décret No. 99-1046 of 13/12/1999	Décret on pressure equipment (JO 290 of 15/12/1999)	2000	Implementation of EU Directive 97/23/CE
	Arrêté of 21/12/1999	Classification and conformity assessment of pressure equipment (JO 300 of 28/12/1999)	2000	Implementation of EU Directive 97/23/CE
Germany	ArbSchG - BGBl I 1996, 1246, 7.8.1996	- Arbeitsschutzgesetz (Law on Occupation Protection) - Druckgeräteverordnung - 14.	1996	Implementation of EU Directive 97/23/CE
	BGBl I 2002, 3777, 27.9.2002	Betriebssicherheitsverordnung – BetrSichV BGBl (Occupational Safety Order)	2002	Implementation of EU Directive 97/23/CE
	GPSG - BGBl I 2004, 2 (219), 6.1.2004	Geräte- und Produktsicherheitsgesetz - (Law on the Safety of Devices and Products)	2004	Implementation of EU Directive 97/23/CE
	GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002	Pressure Devices Order)	2003	Implementation of EU Directive 97/23/CE
Belgium	Arrêté royal of 13/06/1999	Arrêté royal concerning the placing on the market of pressure equipments (MB of 08/10/1999) title amended by Arrêté royal of 06/12/2005 (MB of 07/02/2006)	2000 - 2006	Implementation of EU Directive 97/23/CE
The Netherlands	(Stb. 1999, 311	Warenwetbesluit Drukapparatuur.	2000	Implementation of EU Directive 97/23/CE
UK	SI 2001 of 1999	Pressure Equipment Regulations	2000	Implementation of EU Directive 97/23/CE

Table 0-6: summary table for EU directives implementation at National level

A3. National legislative context

Italy

ID	Normative No.	Normative Title	Entry into force date	Additional notes
NP 1	Decreto 28/12/2012	Conto Termico	2012	It describes the procedures to consider heat pump thermal production as "renewable" gaining a special feed in tariff. In this decree there is the description of the calculations to be used to evaluate "renewable" production of GAHP
NP 2	Piano di azione nazionale per le energie rinnovabili dell'Italia – 30.6.2012	Misure Specifiche Finalizzate Al Rispetto Dei Requisiti Degli Articoli 13, 14, 16 E Degli Articoli Da 17 A 21 Della Direttiva 2009/28/Ce	2013	Policies to incentive RES exploitation in Italy according to EC 2009/28/CE
NP 3	DECRETO LEGISLATIVO 3 marzo 2011 , n. 28	Attuazione della direttiva 2009/28/CE sulla promozione dell'uso dell'energia da fonti rinnovabili, recante modifica e successiva abrogazione delle direttive 2001/77/CE e 2003/30/CE.	2012	Policies and feed-in tariffs regulation to incentive RES exploitation in Italy according to EC 2009/28/CE

Table 0-7: Summary of Italian directives/regulations with regards to GAHP performance

France

ID	Normative No.	Normative Title	Entry into force date	Additional notes
NP 1 -	RT2012	Reglementation Thermique 2012	2010	The RT2012 sets rigorous performance expectations, requiring that residential and non-residential buildings use a maximum of 40-65kWh/m2/pa depending on locality and altitude of the building
NP-2	PPI Chaleur 2009	Programmation pluriannuelle des investissements	2010	Policies and feed-in tariffs regulation to

		de production de chaleur Période 2009 - 2020		incentive RES exploitation in France in thermal and heating systems

Table 0.10: Summary of French directives/regulations with regards to GAHP performance

Germany

ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
NP 1	EnEV	Energieeinsparverordnung, EnEv	2014	The German Energy Saving Ordinance (Energieeinsparverordnung, EnEv) was revised by the National Government in November 2013. Compared to current standards, the new code requires a 25% reduction in primary energy demand and a 20% improvement in the energy performance of the building envelope, the requirements of the code are based on an energy frame calculation.
NP-2	EEWärmeG	Erneuerbare-Energien-Wärmegesetz – EEWärmeG	2009	Act on the Promotion of Renewable Energies in the Heat Sector

Table 0.13: Summary of German directives/regulations with regards to GAHP performance

Belgium

Performance				
ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
NP 1	ATG-E	Energieeinsparverordnung (EnEv2014)	2014	Receiving the EPBD specific requirements it defines the standard to define a heat generator as

				efficient thanks to the approvals of the Belgian Organisation for Technical Approvals

Table 0.16: Summary of Belgian directives/regulations with regards to GAHP performance

The Netherlands

ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
NP 1	SDE+	Besluit stimulering duurzame energieproductie	2008	Policies and feed-in tariffs regulation to incentive RES exploitation in the Netherlands
NP2	RAC 2013	Regeling aanwijzing categorieën duurzame	2013	Regulation designating sustainable energy production categories and describing the technologies which can get incentives
NP3	RISEP	Algemene uitvoeringsregeling stimulering duurzame energieproductie	2013	Regulation implementing sustainable energy production
NP4	BRL 9501	Beoordelingsrichtlijn	2014	Energy efficiency label (Energielabel) as based on the European Energy Performance of Buildings Directive

Table 0.19: Summary of Dutch directives/regulations with regards to GAHP performance

UK

ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
NP 1	Renewable Heat Incentive	Government Decree of 12th July 2013 - UK8 - Renewable Energy Financial Incentives – Renewable Heat Incentive	2014	The Renewable Heat Incentive (RHI) is a UK Government scheme set up to

				encourage uptake of renewable heat technologies among householders, communities and businesses through the provision of financial incentives. The UK Government expects the RHI to make a significant contribution towards their 2020 ambition of having 12 per cent of heating coming from renewable sources.

Table 0.22: Summary of Dutch directives/regulations with regards to GAHP performance

Poland

ID	*Normative No.*	*Normative Title*	*Entry into force date*	*Additional notes*
NP 1	NREAP - Poland	National Renewable Energy Action Plan	2014	The Poland National Renewable Energy Action Plan is the National Renewable Energy Action Plan (NREAP) for Poland. The plan was commissioned by the Directive 2009/28/EC which required Member States of the European Union to notify the European Commission with a road map. The report describes how Poland planned to achieve its legally binding target of a 15% share of energy from renewable sources in gross final consumption of energy by 2020.
NP2	PN-ISO- EN 13790	Metodyka obliczeń sezonowego zapotrzebo wania ciepła	2013	Polish Transposition of EN 13790

Table 0.25: Summary of Polish directives/regulations with regards to GAHP performance

APPENDIX B

Comparative analysis among specific sections of different national standards

Exclusion mentioned in PED 97/23/CE

Reference:

Directive 97/23/EC of the European Parliament and of the council of 29 may 1997 on the approximation of the laws of the member states concerning pressure equipment

Original text from Directive

Article 1
Scope and definitions

3. The following are excluded from the scope of this Directive:

3.1. pipelines comprising piping or a system of piping designed for the conveyance of any fluid or substance to or from an installation (onshore or offshore) starting from and including the last isolation device located within the confines of the installation, including all the annexed equipment designed specifically for pipelines. This exclusion does not apply to standard pressure equipment such as may be found in pressure reduction stations or compression stations;
3.2. networks for the supply, distribution and discharge of water and associated equipment and headraces such as penstocks, pressure tunnels, pressure shafts for hydroelectric installations and their related specific accessories;
3.3. equipment covered by Directive 87/404/EEC on simple pressure vessels;
3.4. equipment covered by Council Directive 5/324/EEC of 20 May 1975 on the approximation of the laws of the Member States relating to aerosol dispensers (1);
3.5. equipment intended for the functioning of vehicles defined by the following Directives and their Annexes:

— Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers (2),— Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the Member States relating to the type-approval of wheeled agricultural or forestry trac-tors (3),
— Council Directive 92/61/EEC of 30 June 1992 relating to the type-approval of two or three-wheel motor vehicles (4);
3.6. equipment classified as no higher than category I under Article 9 of this Directive and covered by one of the following Directives:
— Council Directive 89/392/EEC of 14 June 1989 on the approximation of the laws of the Member States relating to machinery (5),
— European Parliament and Council Directive 95/16/EC of 29 June 1995 on the approximation of the laws of the Member States relating to lifts (6)

Where:

(1) OJ No L 147, 9. 6. 1975, p. 40. Directive as last amended by Commission Directive 94/1/EC (OJ No L 23, 28. 1. 1994, p. 28).
(2) OJ No L 42, 23. 2. 1970, p. 1. Directive as last amended by Commission Directive 95/54/EC (OJ No L 266, 8. 11. 1995, p. 1).
(3) OJ No L 84, 28. 3. 1974, p. 10. Directive as last amended by the 1994 Act of Accession.
(4) OJ No L 225, 10. 8. 1992, p. 72. Directive as last amended by the 1994 Act of Accession.
(5) OJ No L 183, 29. 6. 1989, p. 9. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
(6) OJ No L 213, 7. 9. 1995, p. 1.

— Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits (1),
— Council Directive 93/42/EEC of 14 June 1993 concerning medical devices (2),

— Council Directive 90/396/EEC of 29 June 1990 on the approximation of the laws of the Member States relating to appliances burning gaseous fuels (3),
— Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (4);

3.7. equipment covered by Article 223 (1) (b) of the Treaty;
3.8. items specifically designed for nuclear use, failure of which may cause an emission of radioactivity;
3.9. well-control equipment used in the petroleum, gas or geothermal exploration and extraction industry and in underground storage which is intended to contain and/or control well pressure. This comprises the wellhead (Christmas tree), the blow out preventers (BOP), the piping manifolds and all their equipment upstream;
3.10. equipment comprising casings or machinery where the dimensioning, choice of material and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics and for which pressure is not a significant design factor. Such equipment may include:
— engines including turbines and internal combustion engines,
— steam engines, gas/steam turbines, turbo-generators,
compressors, pumps and actuating devices;
3.11. blast furnaces including the furnace cooling system, hot-blast recuperators, dust extractors and blast-furnace exhaust-gas scrubbers and direct reducing cupolas, including the furnace cooling, gas converters and pans for melting, re-melting, de-gassing and casting of steel and non-ferrous metals;

(1) OJ No L 77, 26. 3. 1973, p. 29. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
(2) OJ No L 169, 12. 7. 1993, p. 1.
(3) OJ No L 196, 26. 7. 1990, p. 15. Directive as last amended by Directive 93/68/EEC (OJ No L 220, 30. 8. 1993, p. 1).
(4) OJ No L 100, 19. 4. 1994, p. 1.

3.12. enclosures for high-voltage electrical equipment such as switchgear, control gear, transformers, and rotating machines;
3.13. pressurized pipes for the containment of transmission systems, e.g. for electrical power and telephone cables;
3.14. ships, rockets, aircraft and mobile off-shore units, as well as equipment specifically intended for installation on board or the propulsion thereof;
3.15. pressure equipment consisting of a flexible casing, e.g. tyres, air cushions, balls used for play, inflatable craft, and other similar pressure equipment;
3.16. exhaust and inlet silencers;
3.17. bottles or cans for carbonated drinks for final consumption;
3.18. vessels designed for the transport and distribution of drinks having a PS·V of not more than 500 bar·L and a maximum allowable pressure not exceeding 7 bar;
3.19. equipment covered by the ADR (1), the RID (2), the IMDG (3) and the ICAO Convention (4);
3.20. radiators and pipes in warm water heating systems;
3.21. vessels designed to contain liquids with a gas pressure above the liquid of not more than 0,5 bar.

Article 2
Market surveillance

1. Member States shall take all appropriate measures to ensure that the pressure equipment and the assemblies referred to in Article 1 may be placed on the market and put into serive only if, when properly installed and maintained and used for their intended purpose, they do not endanger the health and safety of persons and, where appropriate, domestic animals or property.

2. The provisions of this Directive shall not affect Member States' entitlement to lay down, with due regard to the provisions of the Treaty, such requirements as they may deem necessary to ensure that persons and, in particular, workers are protected during use of the pressure equipment or assemblies in question provided that this does not mean
modifications to such equipment or assemblies in a way not specified in this Directive.

(1) ADR = European Agreement concerning the International Carriage of Dangerous Goods by Road.
(2) RID = Regulations concerning the International Carriage of Dangerous Goods by Rail.
(3) IMDG = International Maritime Dangerous Goods Code.
(4) ICAO = International Civil Aviation Organization.

3. At trade fairs, exhibitions, demonstrations, etc., Member States shall not prevent the showing of pressure equipment or assemblies as defined in Article 1 not in conformity with the provisions of this Directive, provided that a visible sign clearly indicates their non- conformity and their non-availability for sale until brought into conformity by the manufacturer or by his authorized representative established within the Community. During demonstrations, appropriate safety measures shall be taken in accordance with any requirements laid down by the competent authority of the Member State concerned in order to ensure the safety of persons.

Article 3
Technical requirements

1. The pressure equipment referred to in 1.1, 1.2, 1.3 and 1.4 must satisfy the essential requirements set out in Annex I:

1.1. Vessels, except those referred to in 1.2 for:
(a) gases, liquefied gases, gases dissolved under pressure, vapours and also those liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure, (1 013 mbar) within the following limits:

— for fluids in Group 1 with a volume greater than 1 L and a product of PS and V greater than 25 bar·L, or with a pressure PS greater than 200 bar (Annex II, table 1),
— for fluids in Group 2, with a volume greater than 1 L and a product of PS and V is greater than 50 bar·L, or with a pressure PS greater than 1 000 bar, and all portable extinguishers and bottles for breathing apparatus (Annex II, table 2);

(b) liquids having a vapour pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1 013 mbar) within the following limits:

— for fluids in Group 1 with a volume greater than 1 L and a product of PS and V greater than 200 bar·L, or with a pressure PS greater than 500 bar (Annex II, table 3),
— for fluids in Group 2 with a pressure PS greater than 10 bar and a product of PS and V greater than 10 000 bar·L, or with a pressure PS greater than 1 000 bar (Annex II, table 4).

1.2. Fired or otherwise heated pressure equipment with the risk of overheating intended for generation of steam or super-heated water at temperatures higher than ►C1110 °C ◄having a volume greater than 2L, and all pressure cookers (Annex II, table 5).

1.3. Piping intended for:

(a) gases, liquified gases, gases dissolved under pressure, vapours and those liquids whose vapour pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1 013 mbar) within the following limits:

— for fluids in Group 1 with a DN greater than 25 (Annex II, table 6),
— for fluids in Group 2 with a DN greater than 32 and a product of PS and DN greater than 1 000 bar (Annex II, table 7);
(b) liquids having a vapour pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1 013 mbar), within the following limits:
— for fluids in Group 1 with a DN greater than 25 and a product of PS and DN greater than 2 000 bar (Annex II, table 8),
— for fluids in Group 2 with a PS greater than 10 bar, a DN greater than 200 and a product of PS and DN greater than 5 000 bar (Annex II, table 9).

1.4. Safety and pressure accessories intended for equipment covered by 1.1, 1.2 and 1.3 including where such equipment is incorporated into an assembly.2.
The assemblies defined in Article 1, section 2.1.5, which include at least one item of pressure equipment covered by section 1 of this Article and which are listed in 2.1, 2.2 and 2.3 of this Article must satisfy the essential requirements set out in Annex I.

2.1. Assemblies intended for generating steam or superheated water at a temperature higher than ►C1110 °C ◄comprising at least one item of fired or otherwise heated pressure equipment presenting a risk of overheating

2.2. Assemblies other than those referred to in 2.1, if the manufacturer intends them to be placed on the market and put into service as assemblies.

2.3. By way of derogation from the introductory paragraph to this section, assemblies intended for generating warm water at temperatures not greater than 110 °C which are manually fed with solid fuels and have a PS·V greater than 50 bar·L must comply with the essential requirements referred to in 2.10, 2.11, 3.4, 5 (a) and 5 (d) of Annex I.

3. Pressure equipment and/or assemblies below or equal to the limits in sections 1.1, 1.2 and 1.3 and section 2 respectively must be designed and manufactured in accordance with the sound e engineering practice of a Member State in order to ensure safe use. Pressure equipment and/or assemblies must be accompanied by adequate instructions for use and must bear markings to permit identification of the manufacturer or of his authorized representative established within the Community. Such equipment and/or assemblies must not bear the CE marking referred to in Article 15.

National implementations of PED 97/23/CE

EU country	Original text	English translation
Italy		
Art. 1.3 **D.Lgs. 25 Febbraio 2000, n. 93** ***Attuazione della direttiva 97/23/CEin materia di attrezzature a pressione.***	Sono esclusi dal campo di applicazione del presente decreto: a) le condotte comprendenti una tubazione o un sistema di tubazioni per il trasporto di qualsiasi fluido o sostanza da o verso un impianto, in mare aperto o sulla terra ferma, a partire dall'ultimo organo di isolamento situato nel perimetro dell'impianto, comprese tutte le attrezzature progettate e collegate specificatamente per la condotta, fatta eccezione per le attrezzature a pressione standard, quali quelle delle cabine di salto di pressione e delle centrali di spinta; b) le reti per la raccolta, la distribuzione e il deflusso di acqua e relative apparecchiature, nonché canalizzazioni per acqua motrice come condotte forzate, gallerie e pozzi in pressione per impianti idroelettrici ed i relativi accessori specifici; c) le attrezzature di cui al decreto legislativo 27 settembre 1991, n. 311, in materia di recipienti semplici a pressione; d) le attrezzature di cui al decreto del Presidente della Repubblica 21 luglio 1982, pubblicato nella Gazzetta ufficiale della Repubblica italiana, serie generale, n. 284 del 14 ottobre 1992, in materia di aerosol; e) le attrezzature destinate al funzionamento dei veicoli disciplinati dalle seguenti disposizioni: 1) legge 27 dicembre 1973, n. 942, relativa all'omologazione dei veicoli a motore e dei loro rimorchi; 2) legge 8 agosto 1977, n. 572 e decreto del Presidente della Repubblica 11 gennaio 1980, n. 76 relativi all'omologazione dei trattori agricoli o forestali a ruote; 3) decreto del Ministro dei trasporti e della navigazione 5 aprile 1994, pubblicato nel Supplemento ordinario n. 67 alla Gazzetta ufficiale della Repubblica italiana, serie generale, n. 99 del 30 aprile 1994, relativo all'omologazione dei veicoli a motore a due o tre ruote; f) le attrezzature appartenenti alla categoria I a norma	Are excluded from the scope of this decree: a) pipelines comprising piping or a system of pipes for the conveyance of any fluid or substance to or from a facility, offshore or on land since the last isolation device located within the perimeter of the plant, including all equipment specifically designed and linked to the conduct, except for pressure equipment standards, such as those of the cabins of pressure drop and compressor stations; b) networks for the collection, distribution and discharge of water and associated equipment and ducts for water drive as penstocks, pressure tunnels, pressure shafts for hydroelectric installations and their related specific accessories; c) the equipment referred to in Legislative Decree 27 September 1991 n. 311, relating to simple pressure vessels; d) the equipment referred to in the Decree of the President of the Republic of 21 July 1982, published in the Official Journal of the Italian Republic, General Series, no. 284 of 14 October 1992 on the subject of aerosols; e) equipment intended for the functioning of the vehicles covered by the following provisions: 1) Law of 27 December 1973 no. 942 on type-approval of motor vehicles and their trailers; 2) Law of 8 August 1977, no. 572 Decree of the President of the Republic January 11, 1980, n. 76 on type-approval of wheeled agricultural or forestry tractors; 3) Decree of the Minister of Transport and Navigation April 5, 1994, published in Ordinary Supplement no. 67 to the Official Journal of the Italian Republic, General Series, no. 99 of 30 April 1994 concerning the homologation of motor vehicles with two or three wheels; f) equipment belonging to category I under Article 9 and Annex II and covered by one of the following provisions:

	dell'articolo 9 e dell'allegato II e contemplate da una delle seguenti disposizioni: 1) decreto del Presidente della Repubblica 24 luglio 1996, n.459, relativo alle macchine; 2) decreto del Presidente della Repubblica 30 aprile 1999, n.162, relativo agli ascensori; 3) legge 18 ottobre 1977, n. 791 e successivi decreti attuativi in materia di materiale elettrico destinato ad essere adoperato entro taluni limiti di tensione; 4) decreto legislativo 24 febbraio 1997, n. 46, e successive modificazioni, in materia di dispositivi medici; 5) legge 6 dicembre 1971, n. 1083, e decreto del Presidente della Repubblica 15 novembre 1996, n. 661, in materia di apparecchi a gas; 6) decreto del Presidente della Repubblica 23 marzo 1998, n. 126, in materia di apparecchi e sistemi di protezione destinati a essere utilizzati in atmosfera potenzialmente esplosiva; g) le armi, le munizioni e il materiale bellico, le attrezzature e gli insiemi appositamente progettati e costruiti a fini militari o di mantenimento dell'ordine pubblico, nonché tutti gli altri prodotti destinati a fini specificatamente militari; h) le attrezzature progettate specificatamente per usi nucleari le quali, in caso di guasto, possono provocare emissioni di radioattività; i) le attrezzature per il controllo dei pozzi nell'industria dell'esplorazione ed estrazione del petrolio, del gas o geotermica nonché nello stoccaggio sotterraneo, e previste per contenere o controllare la pressione del pozzo. Sono compresi la testa pozzo, gli otturatori di sicurezza (BOP), le tubazioni e i collettori nonché le loro attrezzature a onte; 1) le attrezzature di cui fanno parte alloggiamenti o meccanismi in cui il dimensionamento, la scelta dei materiali, le norme di costruzione sono motivati essenzialmente da criteri di resistenza, rigidità e stabilità nei confronti degli effetti operativi statici e dinamici o da altri criteri legati al loro funzionamento e per le quali la pressione non costituisce un fattore significativo a livello di progettazione, quali: 1) i motori, comprese le turbine e i motori a combustione	1) Decree of the President of the Republic July 24, 1996, 459, relating to machinery; 2) Decree of the President of the Republic April 30, 1999, 162, relative to the elevators; 3) Law of 18 October 1977 n. 791 and following decrees and implementation relating to electrical equipment designed for use within certain voltage limits; 4) Legislative Decree 24 February 1997, n. 46, as amended, relating to medical devices; 5) Law of 6 December 1971 n. 1083, and the decree of the President of the Republic November 15, 1996, n. 661, relating to appliances burning gaseous fuels; 6) Decree of the President of the Republic of 23 March 1998, no. 126, concerning equipment and protective systems intended for use in potentially explosive atmospheres; g) weapons, munitions and war material, equipment and sets specially designed and constructed for military or law enforcement, as well as all other products intended for specifically military purposes; h) equipment specifically designed for nuclear use, in case of failure may cause an emission of radioactivity; i) equipment for well control industry and extraction of oil, gas or geothermal well in underground storage which is intended to contain or control well pressure. This includes the well head, the blow out preventers (BOP), the piping manifolds and all their equipment shames; 1) the equipment comprising casings or machinery where the dimensioning, choice of materials, the manufacturing rules are based primarily on requirements for strength, stiffness and stability to meet the static and dynamic operational effects or other criteria related to the their operation and for which the pressure is not a significant factor in the design, such as: 1) engines, including turbines and internal combustion engines; 2) steam engines, gas turbines or steam, turbine generators, compressors, pumps and actuators; m) blast furnaces, including furnace cooling systems, the devices of the recovery of the hot air, dust extraction and devices for cleaning of exhaust gases from blast furnace and direct reducing cupolas, including the furnace cooling system ,

	interna; 2) le macchine a vapore, le turbine a gas o a vapore, i turbogeneratori, i compressori, le pompe e gli attuatori; m) gli altiforni, compresi i sistemi di raffreddamento dei forni, i dispositivi di recupero dell'aria calda, di estrazione delle polveri e dispositivi di lavaggio dei gas di scarico degli altiforni e cubilotti per la riduzione diretta, compreso il sistema di raffreddamento del forno, i convertitori a gas e i recipienti per la fusione, la rifusione, la degassificazione e la colata di acciaio e di metalli non ferrosi; n) gli alloggiamenti per apparecchiature ad alta tensione come interruttori, dispositivi di comando, trasformatori e macchine rotanti; o) gli alloggiamenti pressurizzati che avvolgono gli elementi dei sistemi di trasmissione quali cavi elettrici e telefonici; p) le navi, i razzi, gli aeromobili o le unità mobili "off-shore" nonché le attrezzature espressamente destinate ad essere installate a bordo di questi veicoli o alla loro propulsione; q) le attrezzature a pressione composte di un involucro leggero, ad esempio i pneumatici, i cuscini d'aria, le palle e i palloni da gioco, le imbarcazioni gonfiabili e altre attrezzature a pressione analoghe; r) i silenziatori di scarico e di immissione; s) le bottiglie o lattine per bevande gassate, destinate al consumo finale; t) i recipienti destinati al trasporto ed alla distribuzione di bevande con un PS-V non superiore a 500 bar L e una pressione massima ammissibile non superiore a 7 bar; u) le attrezzature contemplate nell'Accordo europeo relativo al trasporto internazionale di merci pericolose su strada (ADR), ratificato dalla legge 12 agosto 1962, n. 1839, nel Regolamento internazionale concernente il trasporto di merci pericolose per ferrovia (RID), ratificato dalla legge 2 marzo 1963, n. 806, nel Codice marittimo internazionale per il trasporto delle merci pericolose (IMDG) cui é stata data esecuzione con decreto del Ministro dei trasporti e della navigazione 2 ottobre 1995, pubblicato nella Gazzetta ufficiale della Repubblica italiana n. 235 del 7 ottobre 1995, e nella Convenzione dell'aviazione civile internazionale (ICAO) approvata con decreto legislativo 6 marzo	gas converters and pans for melting, re-melting, de-gassing and casting of steel and non-ferrous metals; n) slots for high-voltage equipment such as switchgear, control gear, transformers, and rotating machines; o) pressurized pipes for the elements of transmission systems such as electric and telephone cables; p) ships, rockets, aircraft or mobile units "off-shore" as well as equipment specifically intended for installation on board these vehicles and their propulsion; q) the pressure equipment consisting of a flexible casing, eg tires, air cushions, balls used for play, inflatable craft, and other similar pressure equipment; r) the exhaust and inlet; s) bottles or cans for carbonated drinks for final consumption; t) receptacles intended for the transport and distribution of drinks having a PS-V does not exceed 500 bar L and a maximum allowable pressure not exceeding 7 bar; u) the equipment covered by the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), ratified by the Law of 12 August 1962 no. , 1839, in the Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), ratified by the Law of 2 March 1963 n. 806, in the Code of the International Maritime Dangerous Goods (IMDG) which has been implemented by the Minister of Transport and Navigation of October 2, 1995, published in the Official Journal of the Italian Republic. 235 7 October 1995, and the Convention the International Civil Aviation Organisation (ICAO) approved by legislative decree March 6, 1948, n. 616; v) the radiators and pipes in warm water heating systems; z) vessels intended to contain liquids with a gas pressure above the liquid does not exceed 0,5 bar

	1948, n. 616; v) i termosifoni e i tubi negli impianti di riscaldamento ad acqua calda; z) i recipienti destinati a contenere liquidi con una pressione gassosa al di sopra del liquido non superiore a 0,5 bar	
Art. 2 **D.Lgs. 25 Febbraio 2000, n. 93** Condizioni per l'immissione sul mercato e la messa in servizio	1. Possono essere immessi sul mercato e messi in servizio le attrezzature a pressione e gli insiemi di cui all'articolo 1, comma 1, conformi alle disposizioni del presente decreto e ai requisiti essenziali di cui all'allegato I, purché, debitamente installati, mantenuti in efficienza e utilizzati conformemente alla loro destinazione, non pregiudichino la salute e la sicurezza delle persone o degli animali domestici o la sicurezza dei beni. 2. In occasione di fiere, di esposizioni, di dimostrazioni o di analoghe manifestazioni pubbliche é consentita la presentazione di attrezzature a pressione o di insiemi di cui all'articolo 1, comma 1, che non sono conformi alle disposizioni del presente decreto, purché un apposito cartello visibile indichi chiaramente la non conformità, nonché l'impossibilità di acquistare tali attrezzature o insiemi prima che siano resi conformi dal fabbricante o dal suo mandatario stabilito nel territorio comunitario. Il responsabile della presentazione deve presentare all'autorità pubblica preposta a rilasciare l'autorizzazione alle suddette manifestazioni una relazione tecnica in cui sono dettagliatamente descritte le adeguate misure adottate per garantire la sicurezza delle persone.	1. They can be placed on the market and put into service of pressure equipment and assemblies referred to in Article 1, paragraph 1, in accordance with the provisions of this Decree and the essential requirements of Annex I, provided that, properly installed and maintained with and used for their intended purpose, do not endanger the health and safety of persons or domestic animals or the safety of property. 2. At trade fairs, exhibitions, demonstrations, or similar public events is permitted the presentation of the pressure equipment or assemblies referred to in Article 1, paragraph 1, which do not comply with the provisions of this Decree, provided that a special visible sign clearly indicates non-compliance, as well as the inability to purchase such equipment or assemblies before they are brought into conformity by the manufacturer or his authorized representative established within the Community. The presentation must submit to the authority responsible for the public authority to grant authorization to a technical report these events which are described in detail in the appropriate measures taken to ensure the safety of persons.
Art. 3 **D.Lgs. 25 Febbraio 2000, n. 93** Requisiti tecnici particolari	1. Le attrezzature a pressione indicate alle lettere a), b), c), e d), classificate in conformità a quanto previsto dall'articolo 9 e dall'allegato II, devono soddisfare i requisiti essenziali stabiliti nell'allegato I secondo le seguenti modalità: a) recipienti, ad eccezione di quelli di cui alla lettera b), destinati a contenere: 1) gas, gas liquefatti, gas disciolti sotto pressione, vapori e liquidi la cui tensione di vapore alla temperatura massima ammissibile è superiore di almeno 0,5 bar alla pressione atmosferica normale (1013 mbar) entro i seguenti limiti: - per i fluidi del gruppo 1, quando il volume è superiore a 1 litro e il prodotto PS-V è superiore a 25 bar-L, nonché quando la pressione PS è superiore a 200 bar (allegato II, tabella 1); - per i fluidi del gruppo 2, quando il volume è superiore a 1 litro	1. Pressure equipment referred to in points a), b), c) and d), classified in accordance with the provisions of Article 9 and Annex II, must meet the essential requirements set out in Annex I according to the following mode: a) vessels, except those referred to in point b), intended to contain: 1) gases, liquefied gases, gases dissolved under pressure, vapors and those liquids whose vapor pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: - For fluids in Group 1 with a volume greater than 1 L and a product of PS and V exceeds 25 bar-L, or with a pressure PS greater than 200 bar (Annex II, table 1); - For fluids in Group 2 with a volume greater than 1 L and a

	e il prodotto PS-V è superiore a 50 bar-L, nonché quando la pressione PS è superiore a 1000 bar, nonché per tutti gli estintori portatili e le bombole per apparecchi respiratori (allegato II, tabella 2); 2) liquidi con una tensione di vapore alla temperatura massima ammissibile inferiore o pari a 0,5 bar oltre la pressione atmosferica normale (1013 mbar), entro i seguenti limiti: - per i fluidi del gruppo I, quando il volume è superiore a un litro e il prodotto PS-V è superiore a 200 bar-L, nonché quando la pressione PS è superiore a 500 bar (allegato II, tabella 3); - per i fluidi del gruppo 2, quando la pressione PS è superiore a 10 bar e il prodotto PS-V è superiore a 10000 bar-L, nonché quando la pressione PS è superiore a 1000 bar (allegato II, tabella 4); b) attrezzature a pressione a focolare o altro tipo di riscaldamento, con rischio di surriscaldamento, destinate alla generazione di vapore o acqua surriscaldata a temperature superiori a 110°C, quando il volume è superiore a 2 litri, nonché tutte le pentole a pressione (allegato II, tabella 5); c) tubazioni destinate a contenere: 1) gas, gas liquefatti, gas disciolti sotto pressione, vapori e liquidi la cui tensione di vapore alla temperatura massima ammissibile è superiore di 0,5 bar alla pressione atmosferica normale (1013 mbar), entro i seguenti limiti: - per i fluidi del gruppo 1, quando la DN è superiore a 25 (allegato II, tabella 6); - per i fluidi del gruppo 2, quando la DNè superiore a 32 e il prodotto PS-DN è superiore a 1000 bar (allegato II, tabella 7); 2) liquidi con una tensione di vapore alla temperatura massima ammissibile inferiore o pari a 0,5 bar oltre la pressione atmosferica normale (1013 mbar), entro i seguenti limiti: - per i fluidi del gruppo 1, quando la DNè superiore a 25 e il prodotto PS-DN è superiore a 2000 bar (allegato II, tabella 8); - per i fluidi del gruppo 2; quando il PS è superiore a 10 bar, la DN è superiore a 200 e il prodotto PS-DN è superiore a 5000 bar (allegato II, tabella 9); d) accessori di sicurezza e accessori a pressione destinati ad attrezzature di cui alle lettere a), b) e c), anche quando tali	product of PS and V exceeds 50 bar-L, or with a pressure PS greater than 1000 bar, as well as all portable extinguishers and bottles for breathing apparatus (Annex II, table 2); 2) liquids having a vapor pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: - For fluids in Group I, when the volume is greater than L and a product of PS and V exceeds 200 bar-L, or with a pressure PS greater than 500 bar (Annex II, table 3); - For fluids in Group 2 with a pressure PS greater than 10 bar and a product of PS and V exceeds 10,000 bar-L, or with a pressure PS greater than 1000 bar (Annex II, table 4); b) pressure equipment Fired or otherwise heated, with the risk of overheating intended for generation of steam or superheated water at temperatures above 110 ° C, when the volume is greater than 2L, and all pressure cookers (Annex II, table 5); c) piping intended for: 1) gases, liquefied gases, gases dissolved under pressure, vapors and those liquids whose vapor pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: - For fluids in Group 1 with a DN greater than 25 (Annex II, table 6); - For fluids in Group 2 with the DNE greater than 32 and a product of PS and DN greater than 1000 bar (Annex II, table 7); 2) liquids having a vapor pressure at the maximum allowable temperature of not more than 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: - For fluids in Group 1 with the DNE greater than 25 and a product of PS and DN greater than 2000 bar (Annex II, table 8); - For fluids in Group 2; with a PS greater than 10 bar, a DN greater than 200 and a product of PS and DN greater than 5000 bar (Annex II, table 9); d) safety accessories and pressure accessories intended for equipment referred to in points a), b) and c), even when such equipment is incorporated into an assembly. 2. Sets referred to in Article 1, paragraph 2, letter f), include at least one pressure referred to in paragraph 1 and described

	attrezzature sono inserite in un insieme. 2. Gli insiemi di cui all'articolo 1, comma 2, lettera f), comprendenti almeno un'attrezzatura a pressione di cui al comma 1 e di seguito indicati alle lettere a), b) e c), devono soddisfare i requisiti essenziali enunciati nell'allegato I, qualora abbiano le seguenti caratteristiche: a) gli insiemi previsti per la produzione di vapore o di acqua surriscaldata ad una temperatura superiore a 110°C, contenenti almeno un'attrezzatura a pressione a focolare o altro tipo di riscaldamento, con rischio di surriscaldamento; b) gli insiemi diversi da quelli indicati alla lettera a), allorché il fabbricante li destina a essere commercializzati e messi in servizio come insiemi; c) in deroga a quanto disposto dall'alinea del presente comma, gli insiemi previsti per la produzione di acqua calda ad una temperatura inferiore a 110°C, alimentati manualmente con combustibile solido, con un PS-V superiore a 50 bar-L debbono soddisfare i requisiti essenziali di cui ai punti 2.10, 2.11, 3.4, 5a) e 5d) dell'allegato I. 3. In deroga a quanto previsto dall'articolo 4, comma 1, sono consentite l'immissione sul mercato e la messa in sevizio delle attrezzature e degli insiemi aventi caratteristiche inferiori o pari ai limiti fissati rispettivamente dal comma 1, lettere a), b) e c), e dal comma 2, purché progettati e fabbricati secondo la corretta prassi costruttiva in uso nello Stato di fabbricazione appartenente all'Unione europea o aderente all'Accordo istitutivo dello Spazio economico europeo, che garantisca la sicurezza di utilizzazione. Tali attrezzature e insiemi non recano la marcatura CE, sono corredati da sufficienti istruzioni per l'uso e hanno marcature che consentono l'individuazione del fabbricante o del suo mandatario stabilito nel territorio comunitario.	below in paragraphs a), b) and c) shall satisfy the essential requirements Annex I, should have the following characteristics: a) assemblies intended for the production of steam or superheated water at a temperature higher than 110 ° C, containing at least pressure equipment hearth or other type of heating, with the risk of overheating; b) sets other than those referred to in subparagraph a), if the manufacturer intends them to be marketed and put into service as assemblies; c) Notwithstanding the provisions of this paragraph, assemblies intended for the production of hot water at a temperature below 110 ° C, manually fed with solid fuel, with a PS and V exceeds 50 bar-L must meet the essential requirements set out in paragraphs 2.10, 2.11, 3.4, 5a) and 5d) of Annex I. 3. Notwithstanding the provisions of Article 4, paragraph 1, allowed the placing on the market and putting into operation equipment and assemblies with characteristics less than or equal to the limits laid down respectively in paragraph 1, letters a), b) and c), and paragraph 2, provided that designed and manufactured according to sound engineering practice in use in the country of manufacture outside the European Union or party to the Agreement establishing the European Economic Area, to ensure safety of use. Such equipment and sets must not bear the CE marking shall be accompanied by adequate instructions for use and have markings that allow the identification of the manufacturer or his authorized representative established within the Community..
Art. 2 **DM n 329 01-12-2004** Esclusioni	1. I recipienti a pressione, ivi compresi gli apparecchi semplici di cui al decreto legislativo 27 settembre 1991, n. 311, aventi capacita' minore o uguale a 25 litri e, se con pressione minore o uguale a 12 bar, aventi capacita' minore o uguale a 50 litri; 2. I desurriscaldatori, gli scaricatori, e i separatori di condense, disoliatori inseriti lungo le tubazioni di vapori o di gas, i filtri,	1. Pressure vessel and simple devices with maximum capacity 25 l or 50 l with maximum pressure 2. Condense separator and related components, desoil inserted along steam and gas piping, filters, receiver vessels with maximum DN 500 mm, PS max 6 bar (maximum product between DN and PS = 3000) 3. Piping with max DN 80 mm

	i barilotti ricevitori e distributori di vapori o di gas, purche' si verifichino almeno due delle seguenti condizioni:1) il loro diametro interno in mm o dimensione nominale non superi 500; 2) la pressione massima ammissibile PS non superi i 6 bar; 3) il prodotto del loro diametro interno in mm o dimensione nominale DN per la pressione massima ammissibile non superi 3000; 3. Le tubazioni con DN minore o uguale a 80; 4. Le tubazioni che collegano attrezzature a pressione che risultano singolarmente escluse dal campo di applicazione del presente regolamento.	4. Piping networking between excluded and derogated components
France		
Article 2 **Décret n°99-1046 du 13 décembre 1999 relatif aux équipements sous pression** (Titre Ier : Définitions et champ d'application.- Title I: Definitions and field of application)	I Sont soumis aux dispositions du présent décret les équipements sous pression et les ensembles dont la pression maximale admissible PS est superieure à 0.5 bar. II. Les équipements sous pression définis ci-dessous ne sont pas soumis aux dispositions des titres II et III du présent décret : a) Les canalisations comprenant une tuyauterie ou un ensemble de tuyauteries destinées au transport de tout fluide ou matière vers une ou à partir d'une installation (sur terre ou en mer), à partir du, et y compris le, dernier organe d'isolement situé dans le périmètre de l'installation, y compris tous les équipements annexes qui sont spécifiquement conçus pour la canalisation. Cette exclusion ne couvre pas les équipements sous pression standard tels que ceux qui peuvent se trouver dans les postes de détente et dans les stations de compression ; b) Les réseaux d'adduction, de distribution et d'évacuation d'eau et leurs équipements ainsi que les conduites d'eau motrice telles que conduites forcées, galeries sous pression, cheminées d'équilibrage des installations hydroélectriques et leurs accessoires spécifiques ; c) Les générateurs d'aérosol définis par l'article 1er de l'arrêté du 6 janvier 1978 modifié portant application de la réglementation des appareils à pression aux générateurs d'aérosol ;	I .Are submitted to the clauses of the present Decree pressure equipment and plants having a maximum allowed pressure PS greater than 0.5 bar. II. Pressure equipment defined below are not submitted to the clauses of titles II and III of the present Decree**.** a) Pipelines comprising piping or a system of piping designed for the conveyance of any fluid or substance to or from an installation (onshore or offshore), from and including the last isolation device located in the perimeter of the facility, including any additional equipment specifically designed for pipelines. This exclusion does not apply to standard pressure equipment such as those that may be found in positions of relaxation and compressor stations; b) Adduction, distribution and discharge networks of water and associated equipment together with motive water pipes such as forced pipes, pressure tunnels, surge chambers of hydroelectric installations and their specific accessories. c) The aerosol generators defined in modified Article 1 of the Decree of 6th January 1978 implementing regulation of pressure devices to aerosol generators.; d) The equipment intended to the operation of vehicles mentioned in Articles R. 106, R. 109-2, R. 163, R. 184 and R. 200 of the Highway Code;

	d) Les équipements destinés au fonctionnement des véhicules mentionnés aux articles R. 106, R. 109-2, R. 163, R. 184 ou R. 200 du code de la route ; e) Les équipements qui relèveraient au plus de la catégorie I en application de la classification prévue à l'article 8 ci-après et qui sont incorporés dans un des produits suivants : - machines mentionnées à l'article R. 233-83 du code du travail ; - ascenseurs mentionnés au VIII de l'article R. 233-83-1 du code du travail ; - matériels électriques mentionnés à l'article 1er du décret du 3 octobre 1995 susvisé ; - dispositifs médicaux mentionnés à l'article L. 665-3 du code de la santé publique ; - appareils à gaz mentionnés à l'arrêté du 12 août 1991 portant application de la directive 90/396/CEE relative aux appareils à gaz ; - appareils destinés à être utilisés en atmosphères explosibles mentionnés au décret du 19 novembre 1996 susvisé ; f) Les armes, munitions et matériel de guerre ; g) Les équipements de contrôle de puits utilisés dans l'industrie de prospection et d'exploitation pétrolière, gazière ou géothermique ainsi que dans le stockage souterrain et prévus pour contenir ou contrôler la pression du puits. Ceci comprend la tête de puits (arbre de noël) et les obturateurs de sécurité, les tuyauteries et collecteurs ainsi que leurs équipements situés en amont ; h) Les équipements comportant des carters ou des mécanismes dont le dimensionnement, le choix des matériaux, les règles de	e) Equipment classified as no higher than category I under the application of the classification laid down in Article 8 below and that are incorporated in one the following products: - Machine mentioned in Article R. 233-83 of the Labour Code; - Lifts mentioned in VIII of Article R. 233-83-1 of the Labour Code; - Electrical equipment mentioned in Article 1 of the Decree of 3 October 1995 aforementioned; - Medical devices mentioned in Article L. 665-3 of the Public Health Code; - Gas appliances mentioned in the Decree of 12 August 1991 implementing Directive 90/396/EEC related to gas appliances; - Equipment intended for use in explosive atmospheres mentioned in the Decree of November 19, 1996 aforementioned; f) Weapons, ammunition and war material; g) Well (pit) control equipments used in exploration and exploitation industry of oil, gas and geothermal as well as underground storage and designed to contain or control well pressure. This includes the wellhead (Christmas tree) and security valves, pipes and collectors and all their equipments upstream; h) Equipment comprising casings or machinery whose dimensioning, material choice, manufacturing rules are based primarily on requirements for strength, rigidity and stability with regard to the static and dynamic stresses in service (on-stream?) or with regard to other characteristics related to their operating and for which pressure is not a significant factor in their design. Such equipment may include:

	construction reposent essentiellement sur des critères de résistance, de rigidité et de stabilité à l'égard des sollicitations statiques et dynamiques en service ou à l'égard d'autres caractéristiques liées à leur fonctionnement et pour lesquels la pression ne constitue pas un facteur significatif au niveau de la conception. Ces équipements peuvent comprendre : - les moteurs, y compris les turbines et les moteurs à combustion interne ; - les machines à vapeur, les turbines à gaz ou à vapeur, les turbogénérateurs, les compresseurs ; - les pompes et les servocommandes ; i) Les hauts fourneaux, y compris leurs systèmes de refroidissement, leurs récupérateurs de vent chaud, leurs extracteurs de poussières et leurs épurateurs de gaz de hauts fourneaux, ainsi que les fours à réduction directe, y compris leurs systèmes de refroidissement, leurs convertisseurs à gaz et leurs cuves destinées à la fusion, à la refusion, au dégazage et à la coulée de l'acier et des métaux non ferreux ; j) Les enveloppes sous pression entourant les éléments de réseaux de transmission, tels que les câbles électriques et les câbles téléphoniques ; k) Les bateaux, fusées, aéronefs ou unités mobiles off-shore, ainsi que les équipements destinés expressément à être installés à bord de ces engins ou à les propulser ; l) Les équipements sous pression composés d'une enveloppe souple, par exemple les pneumatiques, les coussins pneumatiques, balles et ballons de jeu, les embarcations gonflables et autres équipements sous pression similaires ; m) Les silencieux d'échappement et d'admission ; n) Les bouteilles ou les canettes de boissons gazeuses destinées	- Engines comprising turbines and internal combustion engines; - Steam engines, gas or steam turbine, turbo-generators and compressors; - Pumps and servo controls; i) Blast furnaces, including their cooling systems, their warm wind recuperators, their dust extractors and their gas scrubbers as well as direct reduction furnaces, including their cooling systems, their gas converters and cisterns for melting, re-melting, de-gassing and casting of steel and non-ferrous metals; j) Pressurized casing surrounding transmission networks systems such as electrical and telephone cables; k) Ships, rockets, aircraft and offshore mobile units as well as equipment specifically intended to be installed on these devices or to propel them; l) Pressurized equipment consisting of a flexible casing, eg tires, air cushions, balls and play balloons, inflatable boats and other equipment under similar pressure; m) The exhaust and intake silencers; n) Bottles or cans for gaseous drinks for final customers; o) Containers for the transport and distribution of beverages whose product of maximum allowable pressure PS by volume V does not exceed 500 bar.l and whose maximum allowable pressure does not exceed 7 bar; p) Equipment covered by ADR (European Agreement related to the International Carriage of Dangerous Goods by Road), RID (Regulations concerning the International Carriage of Dangerous Goods by train), IMDG (International Maritime Code for the Transport of Dangerous Goods) and ICAO (Organization

	aux consommateurs finals ; o) Les récipients destinés au transport et à la distribution de boissons dont le produit de la pression maximale admissible PS par le volume V n'excède pas 500 bar.l et dont la pression maximale admissible n'excède pas 7 bar ; p) Les équipements relevant des conventions ADR (accord européen relatif au transport international des marchandises dangereuses par route), RID (règlement concernant le transport international ferroviaire des marchandises dangereuses), IMDG (code maritime international pour le transport des marchandises dangereuses) et OACI (organisation de l'aviation civile internationale) ; q) Les radiateurs et les tuyaux dans les systèmes de chauffage à eau chaude ; r) Les récipients devant contenir des liquides avec une pression de gaz au-dessus du liquide ne dépassant pas 0,5 bar. III. - Les récipients à pression simples, définis par l'article 1er de l'arrêté du 14 décembre 1989 portant application de la directive 87/404/CEE relative aux récipients à pression simples, ne sont pas soumis aux dispositions du titre II du présent décret. IV. - Un arrêté des ministres chargés de la sûreté nucléaire, pris après avis, de la commission centrale des appareils à pression mentionnée à l'article 26 ci-après et de l'Autorité de sûreté nucléaire, définit les équipements spécialement conçus pour des applications nucléaires, dont la défaillance peut donner lieu à des émissions radioactives, qui ne sont pas soumis aux dispositions du titre II, et précise les dispositions particulières qui sont applicables à leur construction et à son contrôle. V. - Par exception à l'exclusion mentionnée au a du II, un arrêté du ministre chargé de l'industrie, pris après avis de la commission centrale des appareils à pression mentionnée à	of International Civil Aviation) agreements; q) Radiators and pipes in hot water heating systems; r) Vessels designed for containing liquids with a gas pressure above the liquid that does not exceed 0.5 bar III. - Simple pressure vessels, as defined in Article 1 of the Decree of 14 December 1989 implementing the Directive 87/404/EEC related to simple pressure vessels are not subject to the measures of Title II of the present Decree . IV. - An order of the Ministers responsible for nuclear safety, issued after consultation of the Central Committee for Pressure Devices mentioned in Article 26 aforementioned and consultation of the Nuclear Safety Authority, defines equipment specially designed for nuclear applications whose failure can lead to radioactive emissions, which are not subject to the measures of Title II, and lays down special rules applicable to their construction and to the control of their construction. V. An exception to the exclusion mentioned in II (a), an order of the Minister of Industry, issued after consultation of the Central Committee for Pressure Devices mentioned in Article 26 below, defines the specific measures applicable to the manufacture and conformity assessment of superheated water pipelines whose temperatures can exceed 120 ° C or water vapor pipelines, that are not subject to the dispositions of Title II. VI. - An order of the Minister of Industry, issued after consultation of the Central Committee for Pressure Devices mentioned in Article 26 below, defines the specific measures applicable to the manufacture and conformity assessment of high voltage electrical equipment casings such as switchgear and control gear, transformers, and rotating machines, which are not subject to the measures of Title II. VII. - The orders mentioned in V and VI above shall not apply to pressure equipment originated from a member of the European

	l'article 26 ci-après, définit les dispositions particulières applicables à la fabrication et à l'évaluation de conformité des canalisations de transport d'eau surchauffée dont la température peut excéder 120 °C ou de vapeur d'eau, qui ne sont pas soumises aux dispositions du titre II. VI. - Un arrêté du ministre chargé de l'industrie, pris après avis de la commission centrale des appareils à pression mentionnée à l'article 26 ci-après, définit les dispositions particulières applicables à la fabrication et à l'évaluation de conformité des enveloppes des équipements électriques à haute tension tels que les appareillages de connexion et de commande, les transformateurs et les machines tournantes, qui ne sont pas soumises aux dispositions du titre II. VII. - Les arrêtés mentionnés aux V et VI ci-dessus ne sont pas applicables aux équipements sous pression en provenance d'un Etat membre de l'Union européenne ou d'un autre Etat partie à l'accord instituant l'Espace économique européen qui sont conformes à une norme ou à une réglementation technique en vigueur dans cet Etat, assurant un niveau de sécurité reconnu équivalent par le ministre chargé de l'industrie. **Titre II : Mise sur le marché et évaluation de la conformité.** **Article 3** Créé par Décret n°99-1046 du 13 décembre 1999 - art. 32 (V) JORF 15 décembre 1999 en vigueur le 29 novembre 1999 Les équipements sous pression énumérés ci-dessous doivent satisfaire, tant en ce qui concerne leur conception que leur fabrication, aux exigences essentielles de sécurité énoncées à l'annexe 1 : 1. Les récipients, à l'exception de ceux relevant du 2 ci-après, prévus pour : a) Des gaz, des gaz liquéfiés, des gaz dissous sous pression, des	Union or any other State member of the Agreement on the European Economic Area that are conform to a standard or technical regulation in force in that State, providing a level of equivalent safety recognized by the Minister of Industry. **Title II: Placing on the market and conformity assessment.** Established by Decree No. 99-1046 of December 13, 1999 - art. 32 (V) Official Journal 15 December 1999 applicable on 29 November 1999 Pressure equipment listed below must satisfy, regarding both their design and manufacture, the essential safety requirements set out in Annex 1: 1 Containers, excepted those falling within 2 below, provided for: a) Gases, liquefied gases, gases dissolved under pressure, vapors and liquids whose vapor pressure at the maximum allowable temperature is 0.5 bar greater at standard atmospheric pressure (1013 mbar) within the following limits: - For fluids of Group 1 when volume is greater than 1l and product PS.V is greater than 25 bar.l, as well as for pressure PS greater than 200 bar; - For fluids of Group 2 when volume is greater than 1l and PS.V product greater than 50 bar.l, as well as for pressure PS greater than 1000 bar as well as portable fire extinguishers and bottles for respiratory systems; b) Liquids whose vapor pressure at the maximum allowable temperature is less than or equal to 0.5 bar above normal atmospheric pressure (1013 mbar) within the following limits: - For fluids of Group 1 when volume is greater than 1 l and PS.V product is greater than 200 bar.l, as well as for pressure

	vapeurs ainsi que les liquides dont la pression de vapeur, à la température maximale admissible, est supérieure de 0,5 bar à la pression atmosphérique normale (1 013 mbar), dans les limites suivantes : - pour les fluides du groupe 1, lorsque le volume est supérieur à 1 l et le produit PS.V est supérieur à 25 bar.l, ainsi que lorsque la pression PS est supérieure à 200 bar ; - pour les fluides du groupe 2, lorsque le volume est supérieur à 1 l et le produit PS.V est supérieur à 50 bar.l, ainsi que lorsque la pression PS est supérieure à 1 000 bar ainsi que tous les extincteurs portables et les bouteilles pour appareils respiratoires ; b) Des liquides dont la pression de vapeur, à la température maximale admissible, est inférieure ou égale à 0,5 bar au-dessus de la pression atmosphérique normale (1 013 mbar), dans les limites suivantes : - pour les fluides du groupe 1, lorsque le volume est supérieur à 1 l et le produit PS.V est supérieur à 200 bar.l, ainsi que lorsque la pression PS est supérieure à 500 bar ; - pour les fluides du groupe 2, lorsque la pression PS est supérieure à 10 bar et le produit PS.V est supérieur à 10 000 bar.l, ainsi que lorsque la pression PS est supérieure à 1 000 bar ; 2. Les équipements sous pression soumis à l'action de la flamme ou à un apport calorifique présentant un danger de surchauffe prévus pour la production de vapeur ou d'eau surchauffée à une température supérieure à 110 °C lorsque le volume est supérieur à 2 l, ainsi que tous les autocuiseurs ; 3. Les tuyauteries prévues pour : a) Des gaz, des gaz liquéfiés, des gaz dissous sous pression, des vapeurs ainsi que les liquides dont la pression de vapeur, à la	PS greater than 500 bar; - For fluids of Group 2 when pressure PS is greater than 10 bar and DN is greater than 200 and PS.V product is greater than 10.000 bar.l, as well as for pressure PS greater than 1000 bar; 2. Pressure equipment subject to the action of flame or heat supply presenting a risk of overheating and intended for generation of steam or superheated water at a temperature greater than 110 ° C when the volume is greater than 2 l, as well as all pressure cookers; 3 Pipes provided for.: a) Gases, liquefied gases, gases dissolved under pressure, vapors and liquids whose vapor pressure at the maximum allowable temperature is 0.5 bar greater at standard atmospheric pressure (1013 mbar) within the following limits: -For fluids of Group 1 when DN is greater than 25; - For fluids of Group 2 when DN is greater than 32 and PS.DN product is greater than 1000 bar; b) Liquids whose vapor pressure at the maximum allowable temperature is less than or equal to 0.5 bar above normal atmospheric pressure (1013 mbar) within the following limits: - For fluids of Group 1 when DN is greater than 25 and the PS.DN product is greater than 2000 bar; - For fluids of Group 2 when pressure PS is greater than 10 bar and DN is greater than 200 and the PS.DN product is greater than 5000 bar. 4. The safety accessories and pressure accessories intended for equipment covered by points 1, 2 and 3 above, also when this equipment is incorporated in an assembly.

	température maximale admissible, est supérieure de 0,5 bar à la pression atmosphérique normale (1 013 mbar), dans les limites suivantes : - pour les fluides du groupe 1, lorsque la DN est supérieure à 25 ; - pour les fluides du groupe 2, lorsque la DN est supérieure à 32 et le produit PS.DN est supérieur à 1 000 bar ; b) Des liquides dont la pression de vapeur, à la température maximale admissible, est inférieure ou égale à 0,5 bar au-dessus de la pression atmosphérique normale (1 013 mbar), dans les limites suivantes : - pour les fluides du groupe 1, lorsque la DN est supérieure à 25 et le produit PS.DN est supérieur à 2 000 bar ; - pour les fluides du groupe 2, lorsque la pression PS est supérieure à 10 bar et la DN est supérieure à 200 et le produit PS.DN est supérieur à 5 000 bar ; 4. Les accessoires de sécurité et les accessoires sous pression destinés à des équipements relevant des points 1, 2 et 3 ci-dessus, y compris lorsque de tels équipements sont incorporés dans un ensemble.	
Belgium		
Art. 3 **Arrêté royal of 13/06/1999, title amended by Arrêté royal of 06/12/2005 (MB of 07/02/2006)** Concerning the placing on the market of pressure	Sont exclus du champ d'application du présent arrêté : 1° les canalisations comprenant une tuyauterie ou un ensemble de tuyauteries destinées au transport de tout fluide ou matière vers une ou à partir d'une installation (sur terre ou en mer), àpartir du, et y compris le dernier organe d'isolement situé dans le périmètre de l'installation, ycompris tous les équipements annexes qui sont spécifiquement conçus pour la canalisation. Cette exclusion ne couvre pas les équipements sous pression	The following items are excluded from the present decree: 1st piping or assembly of pipes intended for conveyance of any fluid or substance to or from an installation (onshore or offshore), starting from (and included) the last isolation device located within the perimeter of the facility, including all the annexed equipment designed specifically for pipelines. this exclusion does not apply to standard pressure equipment such as those who can find in positions of relaxation and compressor

equipments	standard tels que ceux qui peuvent se trouver dans les postes de détente et dans les stations de compression; 2° les réseaux d'adduction, de distribution et d'évacuation d'eau et leurs équipements ainsi que les conduites d'eau motrice telles que conduites forcées, galeries sous pression, cheminées d'équilibrage des installations hydroélectriques et leurs accessoires spécifiques; 3° les équipements visés par l'arrêté royal du 11 juin 1990 portant exécution de la Directive du Conseil des Communautés européennes concernant le rapprochement des législations des Etatsmembresrelatives aux récipients à pression simples; 4° les équipements visés par l'arrêté royal du 14 avril 1978 relatif aux générateurs aérosols; 5° les équipements destinés au fonctionnement des véhicules définis par les directives suivantes et leurs annexes : - Directive 70/156/CEE du Conseil, du 6 février 1970, concernant le rapprochement des législations des Etats-membres relatives à la réception des véhicules à moteur et de leurs remorques; - Directive 74/150/CEE du Conseil, du 4 mars 1974, concernant le rapprochement des législations des Etats-membres relatives à la réception des tracteurs agricoles ou forestiers à roues; - Directive 92/61/CEE du Conseil, du 30 juin 1992, relative à la réception des véhicules à moteur à deux ou trois roues, transposées en droit belge par l'arrêté royal du 26 février 1981 portant exécution des directives des Communautés européennes relatives à la réception des véhicules à moteur et de leurs remorques, des tracteurs agricoles ou forestiers à roues, leurs éléments ainsi que leurs accessoires de sécurité; 6° les équipements qui relèveraient au plus de la catégorie I en application de l'article 5 du présent arrêté et qui sont visés par l'une des directives suivantes : - Directive 89/392/CEE du Conseil, du 14 juin 1989, concernant le rapprochement des législations des Etats-membres relatives aux machines transposée en droit belge par arrêté royal du 5	stations; 2nd the supply networks, distribution and discharge of water and associated equipment as well as motive water pipes such as penstocks, pressure tunnels, pressure chimneys balancing hydroelectric installations and their specific accessories; 3rd equipment covered by the Royal Decree of 11 June 1990 implementing the Directive Council of the European Communities on the approximation of the laws of member states, relating to simple pressure vessels; 4th equipment covered by the Royal Decree of 14 April 1978 relating to aerosol dispensers; 5th equipment intended for the functioning of vehicles defined by the following directives and annexes: - Council Directive 70/156/EEC of 6 February 1970 on the approximation of laws of Member States relating to the type-approval of motor vehicles and their trailer; - Council Directive 74/150/EEC of 4 March 1974 on the approximation of legislation relating to the receipt of the Member States of agricultural or forestry tractors wheels; - Council Directive 92/61/EEC of 30 June 1992 relating to the type-approval of motor with two or three wheels, transposed into Belgian law by the Royal Decree of 26 February 1981 to implement the directives of the European Communities relating to the receipt of motor vehicles and their trailers, agricultural tractors and forestry tractors, their elements and their safety accessories; 6th equipment classified as no higher than category I under Article 5 of this decree and which are covered by one of the following directives: - Council Directive 89/392/EEC of 14 June 1989 on the approximation of laws of Member States relating to machinery

	mai 1995; - Directive 95/16/CE du Parlement européen et du Conseil, du 29 juin 1995, concernant le rapprochement des législations des Etats-membres relatives aux ascenseurs, transposée en droit belge par arrêté royal du 10 août 1998; - Directive 73/23/CEE du Conseil, du 19 février 1973, concernant le rapprochement des législations des Etats-membres relatives au matériel électrique destiné à être employé dans certaines limites de tension, transposée en droit belge par arrêté royal du 23 mars 1977; - Directive 93/42/CEE du Conseil, du 14 juin 1993, relative aux dispositifs médicaux; - Directive 90/396/CEE du Conseil, du 29 juin 1990, relative au rapprochement des législations des Etats-membres concernant les appareils à gaz transposée en droit belge par arrêté royal du 3 juillet 1992; - Directive 94/9/CE du Parlement européen et du Conseil, du 23 mars 1994, concernant le rapprochement des législations des Etats-membres pour les appareils et les systèmes de protection destinés à être utilisés en atmosphères explosibles; 7° les armes, munitions et matériel de guerre; 8° les équipements spécialement conçus pour des applications nucléaires, dont la défaillance peut donner lieu à des émissions radio-actives; 9° les équipements de contrôle de puits utilisés dans l'industrie de prospection et d'exploitation pétrolière, gazière ou géothermique ainsi que dans le stockage souterrain et prévus pour contenir et/ou contrôler la pression du puits. Ceci comprend la tête de puits (arbre de Noël) et les obturateurs de sécurité (BOP), les tuyauteries et collecteurs, ainsi que leurs équipements situés en amont; 10° les équipements comportant des carters ou des mécanismes dont le dimensionnement, le choix des matériaux, les règles de construction reposent essentiellement sur des critères de résistance, de rigidité et de stabilité à l'égard des sollicitations	transposed into Belgian law by decree Royal Decree of 5 May 1995; - Directive 95/16/EC of the European Parliament and of the Council of 29 June 1995 on the laws of Member States relating to lifts, transposed into Belgian law by the Royal Decree of 10 August 1998; - Council Directive 73/23/EEC of 19 February 1973 on the approximation of laws of Member States relating to electrical equipment designed for use within certain voltage limits, transposed into Belgian law by the Royal Decree of 23 March 1977; - Council Directive 93/42/EEC of 14 June 1993 concerning medical devices; - 90/396/EEC Council Directive of 29 June 1990 on the approximation of laws of Member States relating to appliances burning gas transposed into Belgian law by Royal Decree of 3 July 1992; - Directive 94/9/EC of the European Parliament and of the Council of 23 March 1994 on the laws of the Member States concerning equipment and systems protection for use in potentially explosive atmospheres; 7th Weapons, ammunitions and other weaponry; 8th equipment specially designed for nuclear use, failure of which may lead to radioactive emissions; 9th drilling equipment control used in oil, gas or geothermal well industry for exploration, as well as in underground storage and planned to hold and / or controlling the pressure of the well. This comprises the wellhead and safety shutters, the piping manifolds and their equipment located upstream; 10th equipment comprising casings or machinery where the dimensioning, choice of materials, the manufacturing rules are based primarily on requirements for strength, rigidity and stability to meet the static and dynamic stresses in service or in respect other characteristics related to their operation and to

	statiques et dynamiques en service ou à l'égard d'autres caractéristiques liées à leur fonctionnement et pour lesquels la pression ne constitue pas un facteur significatif au niveau de la conception. Ces équipements peuvent comprendre : - les moteurs, y compris les turbines et les moteurs à combustion interne; - les machines à vapeur, les turbines à gaz ou à vapeur, les turbo-générateurs, les compresseurs, les pompes et les servocommandes; 11° les hauts-fourneaux, y compris leurs systèmes de refroidissement, leurs récupérateurs de vent chaud, leurs extracteurs de poussières et leurs épurateurs de gaz de hauts-fourneaux, ainsi que les fours à réduction directe, y compris leurs systèmes de refroidissement, leurs convertisseurs à gaz, et leurs cuves destinées à la fusion, à la refusions, au dégazage et à la coulée de l'acier et des métaux non ferreux; 12° les enveloppes des équipements électriques à haute tension tels que les appareillages de connexion et de commande, les transformateurs et les machines tournantes; 13° les enveloppes sous pression entourant les éléments de réseaux de transmission, tels que les câbles électriques et les câbles téléphoniques; 14° les bateaux, fusées, aéronefs et unités mobiles off shore, ainsi que les équipements destinés expressément à être installés à bord de ces engins ou à les propulser; 15° les équipements sous pression composés d'une enveloppe souple, par exemple les pneumatiques, les coussins pneumatiques, balles et ballons de jeu, les embarcations gonflables, et autres équipements sous pression similaires; 16° les silencieux d'échappement et d'admission; 17° les bouteilles ou les canettes de boissons gazeuses destinées aux consommateurs finaux;	which pressure is not a significant factor in the design. Such equipment may include: - Engines including turbines and internal combustion engines; - Steam engines, gas turbines or steam turbo-generators, compressors, pumps and actuating devices; 11th blast furnaces, including their cooling systems, their heat harvesters, dust extractors and scrubbers gas furnaces, as well as direct reduction furnaces including the furnace cooling, gas converters and pans for melting, to refuse, degassing and casting of steel and non-ferrous metals; 12th enclosures of electrical equipment such as high-voltage switchgear and control gear, transformers and rotating machines; 13th pressurized enclosures of transmission systems, such as electrical cables and telephone cables; 14th ships, rockets, aircraft and mobile offshore units and equipment specifically intended to be installed on these devices or to propel; 15th pressure equipment consisting of a flexible casing, eg tires, tires, balls for play, inflatable craft, and other similar pressure equipment cushions; 16th exhaust silencer and intake; 17th bottles or cans for carbonated drinks for final consumers; 18th containers intended for the transportation and distribution of drinks with PS.V not exceeding 500 barL and a maximum allowable pressure not exceeding 7 bar; 19th equipment within the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), the Regulations concerning the International Carriage of Dangerous

	18° les récipients destinés au transport et à la distribution de boissons avec un PS.V n'excédant pas 500 bar.L et une pression maximale admissible n'excédant pas 7 bar; 19° les équipements relevant de l'Accord européen relatif au transport international de marchandises dangereuses par route (ADR), du Règlement concernant le transport international ferroviaire des marchandises dangereuses (RID), du Code maritime international pour le transport des marchandises dangereuses (IMDG) et la Convention de l'organisation de l'aviation civile internationale (OACI); 20° les radiateurs et les tuyaux dans les systèmes de chauffage à eau chaude; 21° les récipients devant contenir des liquides avec une pression de gaz au-dessus du liquide ne dépassant pas 0,5 bar.	Goods by Rail (RID), the International Maritime Code for the Transport of Dangerous Goods (IMDG) and the Convention of the Organization of the International Civil Aviation Organization (ICAO); 20th radiators and pipes in heating hot water; 21st before the containers contain liquids with a gas pressure above the liquid lower than 0.5 bar.
Art. 11,12,13,14 Arrêté royal of 13/06/1999, title amended by Arrêté royal of 06/12/2005 (MB of 07/02/2006) (Mise sur marché-placing on the market)	**Art. 11.** Pour pouvoir être mis sur le marché ou être mis en service, les équipements sous pression, à l'exception de ceux visés à l'article 4, § 3 et à l'article 9, doivent répondre aux exigences essentielles visées à l'article 4, porter le marquage " CE " prévu à l'article 19, indiquant qu'ils ont été soumis à une évaluation de la conformité conformément aux articles 6 ou 7, et être munis de la déclaration de conformité " CE " prévue à l'annexe V. En outre, dans la mesure où cela est nécessaire pour un usage correct et sûr des équipements sous pression et des ensembles par l'utilisateur final belge, les instructions d'utilisation visées à l'article 4, § 3 et les informations visées, points 3.3 et 3.4, de l'annexe I doivent être fournies dans les langues officielles du pays. **Art. 12. § 1er.** Les équipements sous pression et les ensembles qui portent le marquage " CE " visé à l'article 19 et sont munis de la déclaration de conformité " CE " prévue à l'annexe V, sont présumés conformes aux dispositions du présent arrêté, y compris à l'évaluation de la conformité. **§ 2.** Les équipements sous pression et ensembles dont la conformité aux exigences essentielles de sécurité a été évaluée par un Service d'Inspection des utilisateurs visé à l'article 9 sont	**Art. 11.** For being placed on the market or put into service, pressure equipment, with the exception of those referred to in Article 4 § 3 and Article 9 must meet the essential requirements as of Article 4 and carry the "CE" marking provided as of Article 19, stating that they have been subjected to conformity assessment in accordance with Articles 6 and 7, and be equipped with the Declaration of Conformity "CE" under Annex V. In addition, to the extent necessary for the proper and safe use of pressure equipment and assemblies by the Belgian end-user operating instructions referred to in Article 4 § 3 and the information referred to in points 3.3 and 3.4 of Annex I shall be provided in the official languages of the country. **Art. 12. § 1**. Pressure equipment and assemblies bearing the "CE" marking referred to in Article 19 and are provided with the Declaration of Conformity "CE" in Schedule V, are presumed to comply with the provisions of this Order, including assessing compliance. **§ 2.** Pressure equipment and assemblies the conformity with the essential safety requirements has been assessed by an Inspection Service users referred to in Article 9 shall be presumed to comply with the provisions of this Order, if they

	présumés conformes aux dispositions du présent arrêté, s'ils sont munis de la déclaration de conformité " CE " prévue à l'annexe V. **Art. 13.** Les équipements sous pression et les ensembles conformes aux normes nationales transposant les normes harmonisées dont la référence a fait l'objet d'une publication au Journal officiel des Communautés européennes sont présumés conformes aux exigences essentielles visées à l'article 4. Les références des normes belges transposant les normes harmonisées en question sont publiées au Moniteur belge. **Art. 14.** Notamment, lors des foires, des expositions et des démonstrations, des équipements sous pression ou des ensembles qui ne sont pas conformes aux dispositions du présent arrêté peuvent être exposés, pour autant qu'un panneau visible indique clairement leur non-conformité aux exigences ainsi que l'impossibilité d'acquérir ces équipements avant leur mise en conformité par le fabricant ou son mandataire établi dans la Communauté. Lors de démonstrations, l'exposant est tenu de prendre les mesures adéquates afin d'assurer la sécurité du public et du personnel chargé des démonstrations. Les équipements sous pression doivent porter des marques permettant d'identifier le fabricant. L'exposant doit être en mesure de présenter, sur les lieux de la démonstration, des documents dans lesquels le fabricant ou, à défaut, une tierce partie compétente déclare que l'équipement sous pression concerné a été conçu, fabriqué et, le cas échéant, réceptionné conformément aux règles en usage dans le pays d'origine ou conformément à un code de bonne pratique ou aux règles de l'art. L'organisateur des foires et expositions est tenu d'informer les exposants de ces obligations	are provided with the declaration of Conformity "CE" in Schedule V. **Art. 13.** The pressure equipment and assemblies which conform to national standards transposing the harmonized standards whose reference has been published in the Official Journal of the European Communities are presumed to comply with the essential requirements referred to in Article 4. References Belgian standards transposing the harmonized standards are published in the Belgian Official Gazette. **Art. 14**. Particular at trade fairs, exhibitions and demonstrations, pressure equipment or assemblies which are not in accordance with the provisions of this Order may be exposed, provided that a visible sign clearly indicates their non-compliance with and the inability to acquire such equipment before compliance by the manufacturer or his authorized representative established in the Community. During demonstrations, exhibitors are required to take adequate measures to ensure the safety of the public and staff demonstrations. Pressure equipment shall be marked to identify the manufacturer. The exhibitor must be able to present at the scene of the demonstration, documents in which the manufacturer or, failing that, a competent third party declares that the pressure equipment concerned has been designed, manufactured and, if necessary, approved in accordance with the rules in force in the country of origin or in accordance with a code of practice or the rules of the art. The organizer of fairs and exhibitions shall inform exhibitors of these obligations.
Germany		
§1 Druckgeräteverordnung - 14. GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002	(1) Diese Verordnung gilt für die Bereitstellung auf dem Markt von neuen Druckgeräten und Baugruppen mit einem maximal zulässigen Druck von über 0,5 bar. (2) Diese Verordnung gilt nicht für 1.	(1) This Regulation applies to the provision on the market of new pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar. (2) This Regulation does not apply to 1.

(Pressure Devices Order)	Fernleitungen aus einem Rohr oder einem Rohrsystem für die Durchleitung von Fluiden oder Stoffen zu oder von einer (Offshore- oder Onshore-)Anlage ab einschließlich der letzten Absperrvorrichtung im Bereich der Anlage, einschließlich aller Nebenausrüstungen, die speziell für diese Leitungen ausgelegt sind. Dieser Ausschluss erstreckt sich nicht auf Standarddruckgeräte, wie zum Beispiel Druckgeräte, die sich in Druckregelstationen und in Kompressorstationen finden können, 2. Netze für die Versorgung, die Verteilung und den Abfluss von Wasser und ihre Geräte sowie Triebwasserwege in Wasserkraftanlagen wie Druckrohre, -stollen und -schächte sowie die betreffenden Ausrüstungsteile, 3. Geräte gemäß der Richtlinie 87/404/EWG des Rates vom 25. Juni 1987 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für einfache Druckbehälter (ABl. EG Nr. L 220 S. 48), 4. Geräte gemäß der Richtlinie 75/324/EWG des Rates vom 20. Mai 1975 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Aerosolpackungen (ABl. EG Nr. L 147 S. 40), 5. Geräte, die zum Betrieb von Fahrzeugen vorgesehen sind, welche durch die folgenden Richtlinien und ihre Anhänge bestimmt sind: - Richtlinie 70/156/EWG des Rates vom 6. Februar 1970 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die Betriebserlaubnis für Kraftfahrzeuge und Kraftfahrzeuganhänger (ABl. EG Nr. L 42 S. 1), - Richtlinie 74/150/EWG des Rates vom 4. März 1974 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die Betriebserlaubnis für land- oder forstwirtschaftliche Zugmaschinen auf Rädern (ABl. EG Nr. L 84 S. 10), - Richtlinie 92/61/EWG des Rates vom 30. Juni 1992 über die Betriebserlaubnis für zweirädrige oder dreirädrige Kraftfahrzeuge	Pipelines comprising piping or a system for the conveyance of any fluid or substance to or from a (onshore or offshore) starting from and including the last isolation device located within the facility, including all the annexed equipment designed specifically for pipelines. This exclusion does not apply to standard pressure equipment, such as pressure equipment, which can be found in pressure reduction stations or compression stations, 2. Networks for the supply, distribution and discharge of water and their equipment as well as headraces hydropower plants such as pressure pipes, tunnels and shafts as well as the equipment in question, 3. Device, pursuant to Council Directive 87/404/EEC of 25 June 1987 on the approximation of the laws of Member States relating to simple pressure vessels (OJ EC No. L 220 p 48) 4. Device, pursuant to Council Directive 75/324/EEC of 20 May 1975 on the approximation of the laws of the Member States relating to aerosol dispensers (OJ L 147, p 40) 5. Devices that are intended for operation of vehicles, which are determined by the following Directives and their Annexes: - Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type approval of motor vehicles and their trailers (OJ L 42, p.1), - Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the Member States relating to the type-approval of agricultural or forestry tractors (OJ No L 84, p 10) - Council Directive 92/61/EEC of 30 June 1992 on the approval of two or three-wheel motor vehicles (OJ No L 225, p 72) 6. Devices that would fall under Article 9 of this Directive no higher than category I, which are covered by one of the following guidelines: - Directive 98/37/EC of the European Parliament and of the Council of 22 June 1998 on the approximation of laws,

	(ABl. EG Nr. L 225 S. 72), 6. Geräte, die nach Artikel 9 dieser Richtlinie höchstens unter die Kategorie I fallen würden und die von einer der folgenden Richtlinien erfasst werden: - Richtlinie 98/37/EG des Europäischen Parlaments und des Rates vom 22. Juni 1998 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten für Maschinen (ABl. EG Nr. L 207 S. 1), - Richtlinie 95/16/EG des Europäischen Parlaments und des Rates vom 29. Juni 1995 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Aufzüge (ABl. EG Nr. L 213 S. 1), - Richtlinie 73/23/EWG des Rates vom 19. Februar 1973 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (ABl. EG Nr. L 77 S. 29), - Richtlinie 93/42/EWG des Rates vom 14. Juni 1993 über Medizinprodukte (ABl. EG Nr. L 169 S. 1), - Richtlinie 90/396/EWG des Rates vom 29. Juni 1990 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Gasverbrauchseinrichtungen (ABl. EG Nr. L 196 S. 15), - Richtlinie 94/9/EG des Europäischen Parlaments und des Rates vom 23. März 1994 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen (ABl. EG Nr. L 100 S. 1), 7. ausschließlich für militärische Zwecke oder zur Aufrechterhaltung der öffentlichen Sicherheit oder der öffentlichen Ordnung geplante, konstruierte und gebaute Geräte im Sinne von Absatz 1, 8. Geräte, die speziell zur Verwendung in kerntechnischen Anlagen	regulations and administrative provisions of the Member States relating to machinery (OJ L 207, p.1), - Directive 95/16/EC of the European Parliament and of the Council of 29 June 1995 on the approximation of the laws of Member States relating to lifts (OJ L 213, p.1), - Council Directive 73/23/EEC of 19 February 1973 on the approximation of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits (OJ L 77, p 29) - Council Directive 93/42/EEC of 14 June 1993 concerning medical devices (OJ L 169, p.1), - Council Directive 90/396/EEC of 29 June 1990 on the approximation of the laws of Member States relating to appliances burning gaseous fuels (OJ L 196, p 15) - Directive 94/9/EC of the European Parliament and of the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (OJ L 100, p.1) 7. exclusively for military purposes or to maintain public safety or public order planned, designed and built equipment for the purposes of paragraph 1, 8. Devices that have been specially developed for use in nuclear facilities and their failure can result in a release of radioactivity, 9. Well-control equipment, which are used for industrial exploration and production of oil, natural gas or geothermal energy and in underground storage which is intended to keep the well pressure or regulate. These include the wellhead (Christmas tree), the blowout preventer (BOP), the piping and manifolds and all their equipment upstream, 10. Equipment comprising casings or machinery where the dimensioning, choice of materials and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics and for which pressure no

	entwickelt wurden und deren Ausfall zu einer Freisetzung von Radioaktivität führen kann, 9. Bohrlochkontrollgeräte, die für die industrielle Exploration und Gewinnung von Erdöl, Erdgas oder Erdwärme sowie für Untertagespeicher verwendet werden und dazu bestimmt sind, den Bohrlochdruck zu halten oder zu regeln. Hierzu zählen der Bohrlochkopf (Eruptionskreuz), die Blowout-Preventer (BOP), die Leitungen und Verteilersysteme sowie die jeweils davor befindlichen Geräte, 10. Geräte mit Gehäusen und Teilen von Maschinen, bei denen die Abmessungen, die Wahl der Werkstoffe und die Bauvorschriften in erster Linie auf Anforderungen an ausreichende Festigkeit, Formsteifigkeit und Stabilität gegenüber statischen und dynamischen Betriebsbeanspruchungen oder auf anderen funktionsbezogenen Kriterien beruhen und bei denen der Druck keinen wesentlichen Faktor für die Konstruktion darstellt. Zu diesen Geräten können zählen: - Motoren einschließlich Turbinen und Motoren mit innerer Verbrennung sowie - Dampfmaschinen, Gas- oder Dampfturbinen, Turbogeneratoren, Verdichter, Pumpen und Stelleinrichtungen, 11. Hochöfen mit Ofenkühlung, Rekuperativ-Winderhitzern, Staubabscheidern und Gichtgasreinigungsanlagen, Direktreduktionsschachtöfen mit Ofenkühlung, Gasumsetzern und Pfannen zum Schmelzen, Umschmelzen, Entgasen und Vergießen von Stahl und Nichteisenmetallen, 12. Gehäuse für elektrische Hochspannungsbetriebsmittel wie Schaltgeräte, Steuer- und Regelgeräte, Transformatoren und umlaufende Maschinen, 13. unter Druck stehende Gehäuse für die Ummantelung von Komponenten von Übertragungssystemen wie zum Beispiel Elektro- und Telefonkabel,	significant is a factor for the design. Such equipment may include: - Engines including turbines and internal combustion engines as well as - Steam engines, gas turbines, turbo-generators, compressors, pumps and actuating devices, 11. Blast furnaces with furnace cooling, recuperative hot blast stoves, dust collectors and blast furnace gas cleaning systems, direct reducing furnace cooling, gas converters and pans for melting, re-melting, degassing and casting of steel and non-ferrous metals, 12. Enclosures for high-voltage electrical equipment such as switchgear, control and regulation devices, transformers, and rotating machines, 13. pressurized pipes for the containment of transmission systems, such as electric and telephone cables, 14. Ships, rockets, aircraft and mobile offshore units together with equipment specifically intended for installation on board or the propulsion thereof, 15. Pressure equipment consisting of a flexible casing, eg tires, air cushions, game balls, inflatable boats and other similar pressure equipment, 16. Exhaust and inlet silencers, 17. Bottles or cans for carbonated drinks, which are intended for final consumption, 18. Containers for the transport and distribution of drinks, bar for the product of the maximum allowable pressure and the relevant volume is no more than 500 bar.Liter with a maximum allowable pressure not exceeding seven, 19. covered by the ADR, RID, IMDG and ICAO agreements devices,

	14. Schiffe, Raketen, Luftfahrzeuge oder bewegliche Offshore-Anlagen sowie Geräte, die speziell für den Einbau in diese oder zu deren Antrieb bestimmt sind, 15. Druckgeräte, die aus einer flexiblen Umhüllung bestehen, zum Beispiel Luftreifen, Luftkissen, Spielbälle, aufblasbare Boote und andere ähnliche Druckgeräte, 16. Auspuff- und Ansaugschalldämpfer, 17. Flaschen und Dosen für kohlensäurehaltige Getränke, die für den Endverbrauch bestimmt sind, 18. Behälter für den Transport und den Vertrieb von Getränken, für die bei einem maximal zulässigen Druck von höchstens sieben bar das Produkt aus dem maximal zulässigen Druck und dem maßgeblichen Volumen nicht mehr als 500 bar.Liter beträgt, 19. von den ADR-, RID-, IMDG- und ICAO-Übereinkünften erfasste Geräte, 20. Heizkörper und Rohrleitungen in Warmwasserheizsystemen und 21. Behälter für Flüssigkeiten mit einem Gasdruck über der Flüssigkeit von höchstens 0,5 bar.	20. Radiators and pipes in warm water heating systems and 21. Container for liquids with a gas pressure above the liquid of at most 0.5 bar.
§ 3 Druckgeräteverordnung - 14. GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002 (Safety requirements)	**§ 3 Sicherheitsanforderungen** (1) Druckgeräte nach Artikel 3 Abs. 1 der Richtlinie 97/23/EG des Europäischen Parlaments und des Rates vom 29. Mai 1997 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Druckgeräte (ABl. EG Nr. L 181 S. 1) und Baugruppen nach Artikel 3 Abs. 2 der Richtlinie dürfen nur auf dem Markt bereitgestellt werden, wenn sie den grundlegenden Sicherheitsanforderungen des Anhangs I der Richtlinie entsprechen. (2) Druckgeräte und Baugruppen nach Artikel 3 Abs. 3 der Richtlinie 97/23/EG dürfen nur auf dem Markt bereitgestellt werden, wenn sie in Übereinstimmung mit der in einem Mitgliedstaat der Europäischen Gemeinschaften oder in einem	**§ 3 safety requirements** (1) Pressure equipment referred to in Article 3, paragraph 1 of Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment (OJ L 181, p.1) and assemblies shall be made available on the market in accordance with Article 3, paragraph 2 of the Directive, if they meet the essential safety requirements of Annex I of the Directive. (2) Pressure equipment and assemblies referred to in Article 3 paragraph 3 of Directive 97/23/EC shall be made available on the market, if they apply in accordance with the in a Member State of the European Communities or in a party to the

	Vertragsstaat des Abkommens über den Europäischen Wirtschaftsraum geltenden guten Ingenieurpraxis ausgelegt und hergestellt werden. (3) Druckgeräte und Baugruppen dürfen nur auf dem Markt bereitgestellt werden, wenn sie bei angemessener Installierung und Wartung und bei bestimmungsgemäßer Verwendung die Sicherheit und die Gesundheit von Personen und gegebenenfalls von Haustieren oder Gütern nicht gefährden.	Agreement on the European Economic Area are designed and manufactured with good engineering practice. (3) Pressure equipment and assemblies shall be made available on the market, if they do not compromise when properly installed and maintained and used for its intended purpose, the health and safety of persons and, where appropriate, domestic animals or property.
§4 Druckgeräteverordnung - 14. GPSGV - BGBl I 2002, 3777, 3806, 27.9.2002 (Prerequisites for deploying to the market)	**§ 4 Voraussetzungen für die Bereitstellung auf dem Markt** (1) Druckgeräte und Baugruppen dürfen nur auf dem Markt bereitgestellt werden, wenn 1. sie die technischen Anforderungen nach Artikel 3 Abs. 1 oder 2 der Richtlinie 97/23/EG erfüllen, mit der Kennzeichnung gemäß Anhang I Nr. 3.3 der Richtlinie 97/23/EG und mit der CE-Kennzeichnung nach § 5 Abs. 1 und 3 sowie einer Konformitätserklärung gemäß Anhang VII der Richtlinie 97/23/EG versehen sind, durch die der Hersteller oder sein in der Gemeinschaft oder in einem anderen Vertragsstaat des Abkommens über den Europäischen Wirtschaftsraum niedergelassener Bevollmächtigter bestätigt, dass a) die Druckgeräte und Baugruppen den grundlegenden Sicherheitsanforderungen des § 3 Abs. 1 entsprechen, b) die in Artikel 10 Abs. 1 und 2 und Anhang II der Richtlinie 97/23/EG vorgeschriebenen Konformitätsbewertungsverfahren nach dem Anhang III der Richtlinie 97/23/EG eingehalten sind, c) er seine Verpflichtungen gegenüber der von ihm beauftragten notifizierten Stelle erfüllt hat und d) er sich verpflichtet, entsprechend dem angewandten Konformitätsbewertungsverfahren nach Anhang III der Richtlinie 97/23/EG die dort genannten Unterlagen über einen Zeitraum von zehn Jahren nach Herstellung des letzten Druckgeräts bereitzuhalten, und	**§ 4 Prerequisites for deploying to the market** (1) Pressure equipment and assemblies shall be made available on the market, if 1 they meet the technical requirements of article 3, paragraph 1 or 2 of Directive 97/23/EC, which is labeled in accordance with paragraph 3.3 of Annex I to Directive 97/23/EC and with the CE marking in accordance with § 5 paragraph 1 and 3 as well as a declaration of conformity in accordance with Annex VII to Directive 97/23/EC are provided by the manufacturer or his confirmed in the Community or in another State party to the Agreement on the European economic Area authorized representative established that a) the pressure equipment and assemblies with the basic safety requirements of § 3 para 1, shall meet b) prescribed in Article 10, paragraphs 1 and 2 and Annex II to Directive 97/23/EC Conformity assessment procedure according to Annex III of Directive 97/23/EC are complied with, c) he has fulfilled his obligations to the notified body appointed by him and d) he undertakes to keep available in accordance with the conformity assessment procedures applied in accordance with Annex III to Directive 97/23/EC, the documents referred to therein for a period of ten years after the last of the pressure equipment, and 2

	2. den Druckgeräten und Baugruppen eine Dokumentation nach Anhang I Nr. 3.3 sowie eine Betriebsanleitung nach Nr. 3.4 der Richtlinie 97/23/EG in deutscher Sprache beigefügt sind. (2) Abweichend von Absatz 1 dürfen die in Artikel 3 Abs. 3 der Richtlinie 97/23/EG genannten Druckgeräte und Baugruppen auf dem Markt bereitgestellt werden, wenn 1. sie die Anforderungen nach Artikel 3 Abs. 3 der Richtlinie erfüllen, 2. ihnen ausreichende Benutzungsanweisungen in deutscher Sprache beigefügt sind und 3. sie eine Kennzeichnung tragen, anhand derer der Hersteller oder sein in der Gemeinschaft ansässiger Bevollmächtigter ermittelt werden kann. (3) Druckgeräte und Baugruppen, deren Konformität von einer Betreiberprüfstelle nach § 7 festgestellt wurde, dürfen abweichend von Absatz 1 Nr. 1 nur auf dem Markt bereitgestellt werden, wenn sie nicht mit einer CE-Konformitätskennzeichnung nach § 5 Abs. 1 und 3 versehen sind und der Hersteller seine Verpflichtungen gegenüber der Betreiberprüfstelle erfüllt hat. (4) Abweichend von den Absätzen 1 und 3 können die zuständigen Behörden für Versuchszwecke die Bereitstellung einzelner Druckgeräte und Baugruppen auf dem Markt gestatten, auf die die in Absatz 1 Nr. 1 Buchstabe b genannten Verfahren nicht angewandt worden sind. (5) Die Aufzeichnungen und der Schriftwechsel betreffend die in Absatz 1 Nr. 1 Buchstabe b genannten Konformitätsbewertungsverfahren sind in einer Amtssprache des Mitgliedstaates der Europäischen Gemeinschaften, in dem die genannten Verfahren durchgeführt werden, oder in einer von der notifizierten Stelle akzeptierten Sprache abzufassen. (6) Unterliegen Druckgeräte oder Baugruppen auch anderen Rechtsvorschriften, welche die CE-Kennzeichnung vorschreiben, wird durch die CE-Kennzeichnung auch bestätigt, dass diese Druckgeräte oder Baugruppen ebenfalls den Bestimmungen dieser anderen einschlägigen Rechtsvorschriften entsprechen.	the pressure equipment and assemblies are attached documentation in German language according to Annex I, point 3.3 and an operating manual according to point 3.4 of Directive 97/23/EC. (2) By way of derogation from paragraph 1, referred to in Article 3 paragraph 3 of Directive 97/23/EC Pressure equipment and assemblies are available on the market, if 1 they meet the requirements of Article 3, paragraph 3 of the Directive, 2 they are accompanied by adequate instructions in German language and 3 they bear markings to permit identification of the manufacturer or his authorized representative established within the Community shall be determined. (3) Pressure equipment and assemblies the conformity has been established by a user inspectorate according to § 7 may, by derogation provided in paragraph 1 No. 1 on the market only if they are not provided with a CE marking in accordance with § 5 para 1 and 3 are and the manufacturer has fulfilled its obligations to the inspectorate. (4) By way of derogation from paragraphs 1 and 3, the competent authorities may allow for experimental purposes the provision of individual pressure equipment and assemblies on the market, on the one point method called b have not been applied to in paragraph 1 no. (5) The records and correspondence relating to in paragraph 1 No. 1 Letter b conformity assessment procedure referred to in an official language of the Member State of the European Communities, in which those procedures are carried out, or in a language accepted by the notified body language drafted. (6) are subject pressure equipment or assemblies also other laws which require the CE marking is also confirmed by the CE marking indicates that this pressure equipment or assemblies also comply with the provisions of those other relevant legislation. However, where according to one or more of the legislations to the manufacturer of pressure equipment or

	Steht jedoch gemäß einer oder mehrerer dieser Rechtsvorschriften dem Hersteller von Druckgeräten oder Baugruppen während einer Übergangszeit die Wahl der anzuwendenden Regelung frei, so bestätigt in diesem Fall die CE-Kennzeichnung lediglich, dass die Druckgeräte oder Baugruppen den vom Hersteller angewandten Rechtsvorschriften nach Satz 1 entsprechen. In diesen Fällen müssen in den Druckgeräten oder Baugruppen beizufügenden Unterlagen, Hinweisen oder Anleitungen alle Nummern der den von ihm angewandten Rechtsvorschriften zugrunde liegenden Gemeinschaftsrichtlinien entsprechend ihrer Veröffentlichung im Amtsblatt der Europäischen Gemeinschaften aufgeführt sein.	assemblies during a transitional period, to choose which arrangements to apply, as confirmed in this case, the CE marking only that the pressure equipment or assemblies equivalent to those applied by the manufacturer legislation pursuant to sentence 1. In these cases, to be annexed to the pressure equipment or assembly documents, notices or instructions must be listed all the numbers of the legislation which it applies underlying Community Directives applied, as published in the Official Journal of the European Communities**.**
The Netherlands		
Artikel 2, 3 Warenwetbesluit drukapparatuur	**Artikel 2** In afwijking van artikel 1, onder e en j, wordt onder drukapparatuur, onderscheidenlijk samenstellen, niet verstaan: a. transportleidingen met een pijp of een geheel van pijpen voor het vervoer van of naar een installatie te land of ter zee, vanaf en met inbegrip van de laatste afsluiter binnen de grenzen van de installatie, inclusief alle bijbehorende apparatuur die speciaal voor de transportleiding is ontworpen, met uitzondering van standaarddrukapparatuur zoals in reduceerstations en compressorstations; b. netten voor de aanvoer, distributie en de afvoer van water en de bijbehorende apparaten alsmede leidingen voor aandrijfwater, zoals sluispoorten, drukleidingen en drukschachten voor waterkrachtinstallaties en bijbehorende specifieke appendages; c. apparatuur die valt onder het Warenwetbesluit drukvaten van eenvoudige vorm; d. aërosolen die vallen onder het Warenwetbesluit drukverpakkingen; e. apparatuur voor de werking van voertuigen als bedoeld in: 1. Richtlijn nr. 70/156/EEG van de Raad van de Europese Gemeenschappen van 6 februari 1970 inzake de onderlinge aanpassing van de wetgevingen van de Lidstaten betreffende de goedkeuring van motor-voertuigen en aanhangwagens daarvan	**Article 2** Notwithstanding Article 1, point e, j, is under pressure equipment, respectively compose, not to include: a. pipelines comprising piping or a system of pipes to transport to or from an installation on land or at sea, from and including the last isolation within the boundaries of the installation, including all the annexed equipment designed specifically for pipelines designed, with the exception of standard equipment as in pressure reduction stations or compression stations; b. networks for the supply, distribution and discharge of water and associated equipment and headraces water, such as penstocks, pressure tunnels, pressure shafts for hydroelectric installations and their related specific accessories; c. equipment covered by the Decree on simple pressure vessels; d. aerosols covered by the Decree on packaging printing; e. equipment for the operation of vehicles referred to in: 1. Council Directive 70/156/EEC of the Council of the European Communities of 6 February 1970 on the approximation of the laws of the Member States concerning the approval of motor vehicles and their trailers (OJ L 42).; 2. Council Directive No. 74/150/EEC of the European Communities of 4 March 1974 on the approximation of the laws of the Member States relating to the type-approval of wheeled agricultural or forestry tractors (OJ L 84).;

	(PbEG L 42); 2. Richtlijn nr. 74/150/EEG van de Raad van de Europese Gemeen-schappen van 4 maart 1974 inzake de onderlinge aanpassing van de wetgevingen van de Lidstaten betreffende de goedkeuring van landbouw- of bosbouwtrekkers op wielen (PbEG L 84); 3. Richtlijn nr. 2002/24/EG: richtlijn nr. 2002/24/EG van het Europees Parlement en de Raad van de Europese Unie van 18 maart 2002 (PbEG L 124) betreffende de goedkeuring van twee- of driewielige motorvoertuigen en de intrekking van richtlijn nr. 92/61/EEG van de Raad; f. apparatuur die ten hoogste valt onder categorie I, bedoeld in artikel 9 van de richtlijn, en die tevens onder één of meerdere van de volgende besluiten valt: 1. Besluit gastoestellen; 2. Warenwetbesluit explosieveilig materieel; 3. Warenwetbesluit liften; 4. Besluit medische hulpmiddelen; 5. Warenwetbesluit elektrotechnische producten; 6. Warenwetbesluit machines; g. apparatuur als bedoeld in artikel 223, eerste lid, onderdeel b, van het Verdrag tot oprichting van de Europese Gemeenschap; h. speciaal voor nucleair gebruik ontworpen apparatuur die bij defecten de verspreiding van radioactiviteit kan veroorzaken; i. putregelingsapparatuur voor de exploratie en winning van aardolie, aardgas of geothermische energie of voor de ondergrondse opslag om de druk van de put te behouden of te regelen; j. apparatuur die uit kasten en mechanismen bestaat waarvan de afmetingen, de materiaalkeuze en de fabricagevoorschriften voornamelijk berusten op de criteria sterkte, stijfheid en stabiliteit bij statische en dynamische bedrijfsbelastingen of op andere functioneringseigenschappen waarvoor de druk geen wezenlijke ontwerpfactor is; k. hoogovens, met inbegrip van de ovenkoeling, windverhitters, stofafzuigers en gaswassers voor afvoergassen en koepelovens voor directe reductie, met inbegrip van de ovenkoeling, gasconvertors en pannen voor het smelten, hersmelten,	3. Directive No. 2002/24/EC: Directive 2002/24/EC of the European Parliament and of the Council of the European Union of 18 March 2002 (OJ L 124) on the approval of two-or three-wheel motor vehicles and repeal of Directive 92/61/EEC; f. equipment classified as no higher than category I under Article 9 of the Directive and covered by one or more of the following decisions is: 1. Decision gas appliances; 2. Decree for explosion proof equipment; 3. Decree elevators; 4. Decree for medical devices; 5. Decree for electrical products; 6. Decree machines; g. equipment referred to in Article 223, paragraph b, of the Treaty establishing the European Community; h. specifically designed for nuclear use, failure of equipment that can cause the spread of radioactivity; i. putregelingsapparatuur for the exploration and extraction of oil, gas or geothermal for the underground storage to maintain well pressure or control; j equipment in cabinets and mechanisms, of which the dimensions, material and manufacturing rules are based primarily on the strength criteria, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics which pressure is not a significant design factor; k. blast furnaces including the furnace cooling, wind heaters, dust collectors and scrubbers for exhaust gases and cupola furnaces for direct reduction, including the furnace cooling, gas converters and pans for melting, re-melting, de-gassing and casting of steel and non-ferrous metals; l. enclosures for high-voltage electrical equipment; m pressurized pipes for the containment of transmission; n. ships, rockets, aircraft and mobile offshore units and equipment specifically intended for installation on machines or the propulsion thereof; o equipment with a flexible outer wall; p. bottles or cans for carbonated drinks for final consumption; q. containers for transport or distribution of drinks having the maximum allowable pressure (PS) and volume (V) is at most

	ontgassen en gieten van staal en non-ferrometalen; l. omhullingen voor elektrische hoogspanningsapparatuur; m. mantels onder druk rond de onderdelen van transmissiesystemen; n. schepen, raketten, luchtvaartuigen en mobiele offshore-eenheden en apparatuur die uitdrukkelijk bedoeld is voor installatie op dergelijke machines of de voortbeweging daarvan; o. drukapparatuur met een flexibele buitenwand; p. flessen of blikjes voor koolzuurhoudende dranken, bestemd voor eindconsumptie; q. vaten voor vervoer of distributie van dranken waarin het product van de maximaal toelaatbare druk (PS) en volume (V) ten hoogste 500 bar.L en de maximaal toelaatbare druk (PS) 7 bar bedraagt; r. apparatuur die valt onder de ADR-overeenkomst, de IMDG-code, het RID- of het ICAO-verdrag; s. radiatoren en buizen in systemen voor warmwaterverwarming; t. vaten voor vloeistoffen, waarin de gasdruk boven de vloeistof ten hoogste 0,5 bar bedraagt; u. inlaat- en uitlaatgeluiddempers. Werkingssfeer **Artikel 3** 1. Dit besluit is van toepassing op het ontwerp, de fabricage, de overeenstemmingsbeoordeling, de ingebruikneming en het gebruik van drukapparatuur, samenstellen en druksystemen waarvan de maximaal toelaatbare druk (PS) meer dan 0,5 bar bedraagt. 2. Dit besluit en de daarop berustende bepalingen zijn eveneens van toepassing op drukapparatuur, samenstellen en druksystemen indien deze onroerend zijn. 3. De artikelen 12b, 12c, 12d en 14a zijn niet van toepassing ten aanzien van: a. draagbare brandblussers als bedoeld in artikel 1 van het Besluit draagbare blustoestellen 1997; b. snelkookpannen als bedoeld in bijlage II, tabel 5, bij de richtlijn; c. de krachtens artikel 21, tweede lid, van het Besluit kerninstallaties, splijtstoffen en ertsen aangewezen	500 bar.l and the maximum allowable pressure (PS) exceeding 7 bar; r. equipment covered by the ADR, the IMDG Code, the RID or the ICAO Convention; s. radiators and pipes in warm water heating systems; t. containers for liquids, in which the gas pressure above the liquid of more than 0,5 bar; u. inlet and exhaust silencers. **Article 3** 1. This Decision shall apply to the design, manufacture and conformity assessment, commissioning and use of equipment, assemblies and pressure systems with a maximum allowable pressure (PS) more than 0,5 bar. 2. This decision and the ensuing provisions also apply to pressure equipment, assemblies and pressure systems if they are real. . 3 Articles 12b, 12c, 12d and 14a shall not apply to: a portable fire extinguishers provided for in Article 1 of the Decree 1997 portable fire extinguishers; b. pressure cookers referred to in Annex II, Table 5 of the Directive; c. under Article 21, second paragraph, of the Nuclear plants, fuels and ores designated equipment, assemblies and pressure systems.

	drukapparatuur, samenstellen en druksystemen.	
Art. 7 **Warenwetbesluit drukapparatuur**	**Artikel 7** De volgende drukapparatuur voldoet aan de essentiële veiligheidseisen, genoemd in bijlage I bij de richtlijn. Het betreft: a. drukvaten, met uitzondering van de onder c bedoelde, voor gassen, vloeibare gassen, onder druk opgeloste gassen, dampen en vloeistoffen waarvan de dampdruk bij de maximaal toelaatbare temperatuur meer dan 0,5 bar hoger is dan de normale atmosferische druk (1013 mbar), binnen de volgende grenzen: 1. voor stoffen, ingedeeld in groep 1, wanneer het volume groter is dan 1L en het product van PS en V groter is dan 25 bar.L, of wanneer de druk PS groter is dan 200 bar; 2. voor stoffen, ingedeeld in groep 2, wanneer het volume groter is dan 1L en het product van PS en V groter is dan 50 bar.L, of wanneer de druk PS groter is dan 1000 bar, alsmede alle draagbare brandblussers en flessen voor ademhalingstoestellen; b. drukvaten, met uitzondering van de onder c bedoelde, voor vloeistoffen waarvan de dampdruk bij de maximaal toelaatbare temperatuur 0,5 bar of minder boven de normale atmosferische druk (1013 mbar) ligt, binnen de volgende grenzen: 1. voor stoffen, ingedeeld in groep 1, wanneer het volume groter is dan 1L en het product van PS en V groter is dan 200 bar.L of, wanneer de druk PS hoger is dan 500 bar; 2. voor stoffen, ingedeeld in groep 2, wanneer de druk PSmeer is dan 10 bar en het product van PS en V groter is dan 10 000 bar.L, of wanneer de druk PS meer dan 1000 bar is; c. brandstofgestookte of anderszins verwarmde drukapparatuur waarbij gevaar voor oververhitting bestaat, bestemd voor de productie van stoom of oververhit water met een temperatuur hoger dan 110°C met een volume van meer dan 2L, alsmede alle snelkookpannen; d. installatieleidingen bestemd voor gassen, vloeibare gassen, onder druk opgeloste gassen, dampen en vloeistoffen waarvan de dampdruk bij de maximaal toelaatbare temperatuur meer dan 0,5 bar hoger is dan de normale atmosferische druk (1013 mbar), binnen de volgende grenzen:	**Article 7** The following equipment complies with the essential safety requirements referred to in Annex I to the Directive. These are: a pressure vessel, with the exception of the c referred to gases, liquefied gases, gases dissolved under pressure, vapors and those liquids whose vapor pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1013 mbar), within the following limits: 1. for fluids in Group 1 with a volume greater than 1L and a product of PS and V exceeds 25 bar.l, or with a pressure PS greater than 200 bar; 2. For fluids in Group 2 with a volume greater than 1L and a product of PS and V exceeds 50 bar.l, or with a pressure PS greater than 1 000 bar, and all portable extinguishers and bottles for respirators; b. Vessels, except those referred to in c, for liquids whose vapor pressure at the maximum allowable temperature 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: 1. for fluids in Group 1 with a volume greater than 1L and a product of PS and V exceeds 200 bar.l or, where the pressure PS greater than 500 bar; 2. for fluids in Group 2 with a pressure PSmeer than 10 bar and a product of PS and V greater than 10 000 bar.l, or with a pressure PS greater than 1 000 bar; c. Fired or otherwise heated pressure equipment with the risk of overheating intended for generation of steam or superheated water at a temperature higher than 110 ° C with a volume of more than 2L, and all pressure cookers; d. Piping intended for gases, liquefied gases, gases dissolved under pressure, vapors and those liquids whose vapor pressure at the maximum allowable temperature is greater than 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: 1. for fluids in Group 1 with a DN greater than 25; 2. for fluids in Group 2 with a DN greater than 32 and a product of PS and DN greater than 1000 bar; e. Piping intended for liquids whose vapor pressure at the

	1. voor stoffen, ingedeeld in groep 1, met een DN groter dan 25; 2. voor stoffen, ingedeeld in groep 2, met een DN groter dan 32 en een product van PS en DN groter dan 1000 bar; e. installatieleidingen bestemd voor vloeistoffen waarvan de dampdruk bij de maximaal toelaatbare temperatuur 0,5 bar of minder boven de normale atmosferische druk (1013 mbar) ligt binnen de volgende grenzen: 1. voor stoffen, ingedeeld in groep 1, met een DN groter dan 25 en een product van PS en DN groter dan 2000 bar; 2. voor stoffen, ingedeeld in groep 2, met een PS groter dan 10 bar en een DN groter dan 200 en een product van PS en DN groter dan 5000 bar; f. veiligheidsappendages en onder druk staande appendages, bestemd voor drukapparatuur als bedoeld onder a tot en met e.	maximum allowable temperature 0,5 bar above normal atmospheric pressure (1013 mbar) within the following limits: 1. for fluids in Group 1 with a DN greater than 25 and a product of PS and DN greater than 2000 bar; 2. for fluids in Group 2 with a PS greater than 10 bar, a DN greater than 200 and a product of PS and DN greater than 5000 bar; f. safety accessories and pressure accessories intended for equipment provided under a to e.
UK		
The Pressure Equipment Regulations 1999 ("the PER" – SI 1999/2001) implemented the Pressure Equipment Directive ("PED" 97/23/EC) in the United Kingdom and entered fully into force on 29 November 1999. The PER were amended in two respects by the Pressure Equipment (Amendment) Regulations 2002 (SI 2002/1267) with effect from 30 May 2002. (with regards to 'Exclusions' and 'Penalties' respectively). From 30 May 2002, pressure equipment and assemblies placed on the market	SCHEDULE 1 EXCLUDED PRESSURE EQUIPMENT AND ASSEMBLIES 1. Pipelines comprising piping or a system of piping designed for the conveyance of any fluid or substance to or from an installation (onshore or offshore) starting from and including the last isolation device located within the confines of the installation, including all the annexed equipment designed specifically for pipelines. This exclusion does not apply to standard pressure equipment such as may be found in pressure reduction stations or compression stations; 2. Networks for the supply, distribution and discharge of water and associated equipment and headraces such as penstocks, pressure tunnels, pressure shafts for hydroelectric installations and their related specific accessories; 3. Equipment covered by Directive 87/404/EEC(21)on simple pressure vessels; 4. Equipment covered by Council Directive 75/324/EECof 20 May 1975 on the approximation of the laws of the member States relating to aerosol dispensers(22); 5. Equipment intended for the functioning of vehicles defined by the following Directives and their Annexes: — Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the member States relating to the type-approval of motor vehicles and their trailers(23); — Council Directive 74/150/EEC of 4 March 1974 on the approximation of the laws of the member States relating to the type-approval of wheeled agricultural or forestry tractors(24); — Council Directive 92/61/EEC of 30 June 1992 relating to the type-approval of two or threewheel motor vehicles(25); 6. Equipment classified as no higher than category I under Article 9 of this Directive and covered by one of the following Directives: — Council Directive 89/392/EEC of 14 June 1989 on the approximation of the laws of the member States relating to machinery(26); — European Parliament and Council Directive 95/16/ECof 29 June 1995 on the approximation of the laws of the member States relating to lifts(27);	

and put into service in the United Kingdom must comply with the PER.	— Council Directive 73/23/EEC of 19 February 1973 on the harmonisation of the laws of the member States relating to electrical equipment designed for use within certain voltage limits(28); — Council Directive 93/42/EECof 14 June 1993 concerning medical devices(29); — Council Directive 90/396/EECof 29 June 1990 on the approximation of the laws of the member States relating to appliances burning gaseous fuels(30); — Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the member States concerning equipment and protective systems intended for use in potentially explosive atmospheres(31); 7. Equipment covered by Article 296(1)(b) of the Treaty; 8. Items specifically designed for nuclear use, failure of which may cause an emission of radioactivity; 9. Well-control equipment used in the petroleum, gas or geothermal exploration and extraction industry and in underground storage which is intended to contain and/or control well pressure, that is to say the wellhead (Christmas tree), the blow out preventers (BOP), the piping manifolds and all their equipment upstream; 10. Equipment comprising casings or machinery where the dimensioning, choice of material and manufacturing rules are based primarily on requirements for sufficient strength, rigidity and stability to meet the static and dynamic operational effects or other operational characteristics and for which pressure is not a significant design factor, such equipment may include: — engines including turbines and internal combustion engines, — steam engines, gas/steam turbines, turbo-generators, compressors, pumps and actuating devices; 11. Blast furnaces including the furnace cooling system, hot-blast recuperators, dust extractors and blast-furnace exhaust-gas scrubbers and direct reducing cupolas, including the furnace cooling, gas converters and pans for melting, re-melting, de-gassing and casting of steel and non-ferrous metals; 12. Enclosures for high-voltage electrical equipment such as switchgear, control gear, transformers, and rotating machines; 13. Pressurised pipes for the containment of transmission systems, including for example electrical power and telephone cables; 14. Ships, rockets, aircraft and mobile off-shore units, as well as equipment specifically intended for installation on board or the propulsion thereof; 15. Pressure equipment consisting of a flexible casing, including for example tyres, air cushions, balls used for play, inflatable craft, and other similar pressure equipment; 16. Exhaust and inlet silencers; 17. Bottles or cans for carbonated drinks for final consumption; 18. Vessels designed for the transport and distribution of drinks having a PS.V of not more than 500 bar-L and a maximum allowable pressure not exceeding 7 bar; 19. Equipment covered by the ADR(32), the RID(33), the IMDG(34) and the ICAO Convention(35); 20. Radiators and pipes in warm water heating systems; 21. Vessels designed to contain liquids with a gas pressure above the liquid of not more than 0.5 bar. (21) OJ No. L220, 8.8.87, p. 48.

	(22) OJ No. L147, 9.6.1975, p. 40. Directive as last amended by Commission Directive 94/1/EC(OJ No. L23, 28.1.1994, p. 28). (23) OJ No. L42, 23.2.1970, p. 1. Directive as last amended by Commission Directive 95/54/EC(OJ No. L266, 8.11.1995, p. 1). (24) OJ No. L84, 28.3.1974, p. 10. Directive as last amended by the 1994 Act of Accession. (25) OJ No. L225, 10.8.1992, p. 72. Directive as last amended by the 1994 Act of Accession. (26) OJ No. L207, 23.7.98, p. 1. (27) OJ No, L213, 7.9.1995, p. 1. (28) OJ No. L77, 26.3.1973, p. 29. Directive as last amended by Directive 93/68/EEC(OJ No. L220, 30.8.1993, p. 1). (29) OJ No. L169, 12.7.1993, p. 1. (30) OJ No. L196, 26.7.1990, p. 15. Directive as last amended by Directive 93/68/EEC(OJ No. L220, 30.8.1993, p. 1). (31) OJ No. L100, 19.4.1994, p. 1. (32) ADR=European Agreement concerning the International Carriage of Dangerous Goods by Road. (33) RID=Regulations concerning the International Carriage of Dangerous Goods by Rail. (34) IMDG=International Maritime Dangerous Goods Code. (35) ICAO=International Civil Aviation Organisation
Poland	
To be completed	

APPENDIX C

UNI CEN/TR 1749, Appendix A5: Classification of gas appliances according to the method of evacuation of the combustion products (types) for GAHP

For GAHP, basing on EN 12309-2: 2011, in addiction to outdoor installation the following typical flue gas systems are indicated:

- **Type B12.** A type B1 appliance designed for a natural draught flue incorporating a fan downstream of the combustion chamber/heat exchanger and upstream of the draught diverter.
- **Type B12BS.** A type B1 appliance designed for a natural draught flue incorporating a fan downstream of the combustion chamber/heat exchanger and upstream of the draught diverter.
- **Type B13BS**. A type B1 appliance designed for a natural draught flue incorporating a fan upstream of the combustion chamber/heat exchanger.
- (where BS stands for “blocked safety “ which means fitted with a clearance monitoring device which reacts to blockage or restriction of the flue system.
- **Type B14**. A type B1 appliance having an integral fan downstream of both the combustion chamber/heat exchanger and the draught diverter.
- **Type B22.** A type B2 appliance incorporating a fan downstream of the combustion chamber/heat exchanger.
- **Type B23**. A type B2 appliance incorporating a fan upstream of the combustion chamber/heat exchanger.
- (where Type B2. is a type B appliance without a draught diverter.)
- **Type C12**. A type C1 appliance incorporating a fan downstream of the combustion chamber/heat exchanger.
- **Type C13**. A type C1 appliance incorporating a fan upstream of the combustion chamber/heat exchanger.
- **Type C32**. A type C3 appliance incorporating a fan downstream of the combustion chamber/heat exchanger.
- **Type C33**. A type C3 appliance incorporating a fan upstream of the combustion chamber/heat exchanger.

Where Type C3 is a type C appliance that is designed for connection via its ducts to a vertical terminal, which at the same time admits fresh air to the burner and discharges the products of combustion to the outside through orifices that are either concentric or close enough to come under similar wind conditions. Evacuation type schematic representations can be found in UNI CEN/TR 1749:2013.