

	EUROPEAN COMMISSION RESEARCH AND INNOVATION DG	Final Report
---	---	--------------

Project No: 285158

Project Acronym: HEAT4U

Project Full Name: Gas Absorption Heat Pump solution for existing residential buildings

Final Report

Period covered: from 01/11/2011 to 31/10/2014

Date of preparation: 23/12/2014

Start date of project: 01/11/2011

Date of submission (SESAM): 30/12/2014

Project coordinator name:
Mr. Luigi Tischer

Project coordinator organisation name:
ROBUR SPA

Version: 1

Final Report

PROJECT FINAL REPORT

Grant Agreement number:	285158
Project acronym:	HEAT4U
Project title:	Gas Absorption Heat Pump solution for existing residential buildings
Funding Scheme:	FP7-CP-IP
Project starting date:	01/11/2011
Project end date:	31/10/2014
Name of the scientific representative of the project's coordinator and organisation:	Mr. Luigi Tischer ROBUR SPA
Tel:	+39 035 888 248
Fax:	
E-mail:	ltischer@robur.it
Project website address:	www.heat4u.eu

Final Report

Please note that the contents of the Final Report can be found in the attachment.

4.1 Final publishable summary report

Executive Summary

The HEAT4U project aimed to develop the GAHP technology, already available in Europe the light commercial segment, in order to allow its cost-effective application in existing residential buildings.

The project was conceived to overcome a number of technological and non-technological barriers which prevented GAHP application in single family dwellings (detached or semidetached houses) or small multi-storey buildings.

HEAT4U main objectives were:

- i) development of Appliance with specifications suitable for the residential market (10 – 25 kW);
- ii) integration of the technology in existing heating and DHW architectures;
- iii) development of a Decision Support System, enabling the optimal design in different building operating conditions;
- iv) dissemination activity to promote the awareness of the benefits of the GAHP technology.

Clear evidences (laboratory testing, field testing, quantitative and qualitative analyses) have been provided in the Deliverables that demonstrate full achievement of project objectives.

Summary description of project context and objectives

Project context

Residential buildings represent 60% of the building stock and the area where most of the potential to drastically reduce energy use and CO₂ emissions lies. New directives push for deep retrofitting efforts, in order to achieve energy efficiency and RES adoption targets for 2020 and beyond. These require acting both on envelope and on energy use systems, mainly heating and DHW equipment that representing 51% of final energy use in Europe.

Frequently the upgrade of the envelope insulation is subject to constraints (i.e. historical centres, availability of space, need to relocate the tenants, costs and time issues) and acting on the heating plant is the only viable option. Current solutions are not always suitable or cost effective in existing buildings (presence of radiators, need of DHW, absence of solar radiation in winter).

Therefore to accelerate the improvement in energy efficiency and in the use of renewable energy in the residential building, a specifically designed solution needed to be made available.

HEAT4U is an Industry led project whose main objective was to develop a Gas Absorption Heat Pump (GAHP) solution to allow a cost-effective use of renewable energy in existing residential building for heating and DHW services.

Project objectives

The Project objectives were:

- 1) Development of GAHP Appliance with specifications suitable for the residential market (10 – 25 kW) and able to reduce energy consumption and environmental impact of buildings. In detail, the goal of the HEAT4U project was to develop a heating system providing global efficiency rated in the range 150 – 170% (EN12309) based on GAHP technology, capable of maintaining high efficiency levels even when operating at partial load. The proposed system, which uses as renewable energy source the external environment air, is “hydronic” and therefore designed for easy integration with additional renewable energy sources, such as solar system and/or biomass boilers;
- 2) Integration of the technology in existing heating and DHW systems;

3) Development of a decision support system, enabling the optimal design in different building operating conditions;

4) Dissemination activity to promote the awareness of the benefits of the GAHP technology. The results have been demonstrated in 5 real cases.

Description of main S & T results/foregrounds

In the following pages, the list of main achievements of the project is reported.

The role of each partner is being detailed with reference to each work package, with a brief description of main activities. Further details are reported in the referenced deliverable documents.
WP1 – Value Chain

WP LEADER: P2 BTT

Duration

Start month: 1

End Month: 20

Partners involved

P1 Robur, P2 BTT, P4 GDF Suez, P5 GrDF, P7 E.ON, P8 ENEA, P13 ZAG, P14 DAPP

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D1.1 Month 20 31/07/2013 D1.1 aims to provide the characteristics of the optimal GAHP System for each homogenous market region

D1.2 Month 20 31/07/2013 D1.2 aims to identify the main cost items, in building retrofitting and for the different steps of installation.

Milestone N. Due Date Actual date Milestone Description

MS01 Month 18 30/04/2013 MS01 assessed the achievement by the development of the value-chain for the product. Verification of the properties of the systems and working capabilities of the prototypes.

Description of the main S&T results

The major goal of WP1 activities was to perform a multi-local parametric analysis aimed to identify:

- geographical benchmark of central heating technologies available on the market;
- European context in terms of norms and incentive programs for GAHP technology;
- specific engineering requirements of GAHP Systems for most relevant European homogenous areas in line with the recommendations of the E2BA platform; the defined parameters have been useful for the GAHP Appliance development phase (WP2) and the GAHP System development phase (WP3);
- market potential, product positioning and pricing levels for the GAHP technology applied in residential environment;
- value chain of the GAHP technology;
- economic and energy benefits and environmental savings related to the GAHP technology introduction;

Detailed information has been gathered from market research and was mirrored with local sales professionals to establish a realistic view.

This analysis defines all needed requirements and details information regarding the current situation in each market with respect e.g. to building stock, type and share of heat sources, standards and building regulations and incentive programs.

Key selling points were based on the efficiency of a GAHP air/water system that exceeds that of a boiler with solar support and that of an electrical heat pump and is therefore much better suited for the use in a retrofit situation for renovation. In addition air as renewable source compared to a borehole system for ground source provides a cost advantage.

For the success of the GAHP appliances the ability to combine the existing heating system (in particular the distribution system) without changes is essential. Ideally a GAHP system can be treated like a known heating system fitted with a condensing boiler. Requested heat demand has to be provided as with condensing appliances. Installers of the European market expect the same installation time and handling as a condensing appliance, maintenance and serviceability like standard heating appliances.

The study has defined a set of quantitative and qualitative specifications for the GAHP Appliance and GAHP System design and concluded that gas absorption heat pumps offer a range of major advantages over competing systems for the heat supply of existing building stocks, with a market potential estimated in hundred of thousands of installations per annum in Europe.

Final comments:

Deliverables 1.1 and 1.2 has been finalized as per Amendment 2.

WP2 – Appliance Development

WP LEADER: P1 Robur

Duration

Start month: 1

End Month: 26

Partners involved

P1 Robur, P2 BTT, P3 PINF, P9 POLIMI

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D2.1 Month 6 12/04/2012 D2.1 aims to study the optimal design for working across a wide range of operating conditions and addressing the requirement of the residential application: improvements will deal with the Solution Generator, the Heat Exchangers and the design of the solution pump.

D2.2 Month 26 06/12/2013 D2.2 aims to developed the prototype of GAHP appliance in order to be ready to be installed in the field testing applications

Milestone N. Due Date Actual date Milestone Description

MS01 Month 18 30/04/2013 MS01 assessed the achievement by the development of the value-chain for the product. Verification of the properties of the systems and working capabilities of the prototypes.

MS02 Month 12 31/10/2012 MS02 assessed the achievement by the availability of a preliminary element in order to verify the acceptance for classes of end users

Description of the main S&T results

In a first phase of the work the feasibility of the technical specification has been demonstrated by measurements on a preliminary conceptual prototype (breadboard sample) specifically developed to validate architecture and project viability. In particular the issues addressed were:

1. Technical solutions identified to address stability of efficiency at partial load conditions.
2. Technical solutions selected for key sealed circuit components (solution generator, heat exchangers, solution pump for volume production, cost targets)

3. Combustion system and thermal insulation material identified to guarantee performances.
4. Noise reduction solutions for ventilation, enclosures and oil pump identified for achieving Project quantitative target.
5. In parallel the architecture (HW and FW) for electronic control of appliance has been developed.

At the conclusion of the experimental tests on the breadboard sample of absorption heat pump with extended power modulation range (down to 1/3) powered by natural gas for heating and domestic hot water production (with buffer tank), it is worthwhile highlighting:

- values of efficiency are maintained at levels that justify the use of this equipment in residential single application (standalone) as detailed in Deliverable 4.3;
- experimental results relating to the sound power of the initial sample prototype are in line with initial targets of the project allowing to position GAHP as the quietest heat pump technology;
- target of electrical power consumption is close to the required value (<2.5% of nominal power) as detailed in Deliverable 4.3;
- power density of the machine (kW/kg and kW/m³) has already reached levels of best available EHPs and could be further improved during the industrialization phases.

On completion of the previous preparatory phases, the procurement, manufacturing and assembly activity has been performed to create the set of prototypes for Laboratory Tests and Field Test purposes.

The purpose of these units was to be representative of the way in which the GAHP technology can be introduced in the residential market. The construction of the units and the manufacturing and assembly technology are therefore based on industrial technologies used for the construction of these units are suitable for the manufacturing of demonstrators/prototypes.

The batch of units was finalized and declared ready for shipment as per HEAT4U original schedule (OCT 1st 2013 one month ahead of deadline: month 24th). The delivery of units to installation sites followed needs and readiness of each individual test site.

The lab tests and field tests were in fact very important sources of information on the improvement of some subsets of the units. Thanks to the continuous return of feedbacks and the excellent cooperation of the partners on this issue, the work of improving the performance of the machine has been able to continue and give very favorable results.

Therefore, the evidence gathered during development activities within Work Package 2 confirms that no elements today prevent GAHP technology from achieving of full and successful deployment of GAHP solutions in residential and retrofit market.

Final comments:

In the first period, as documented in the Amendment 1, in the frame of the overall reallocation of responsibility consequent to the withdrawal of Primorje, Task 2.2 Modulating combustion train for application to GAHP technology has been reallocated. No impact on overall Project has been verified.

Weight target will be achieved throughout further and subsequent industrialization for high volume production.

WP3 – System Development and building integration

WP LEADER: P2 BTT

Duration

Start month: 6

End Month: 34

Partners involved

P1 Robur, P2 BTT, P3 PINF, P4 GDF Suez, P9 POLIMI, P10 Fraunhofer

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D3.1 Month 26 03/12/2013 D3.1 aims to define the optimal GAHP Systems schemes for each local market by defining the optimal building interface, the system architecture and the specific design, construction, installation and commissioning procedures

D3.2 Month 29 28/03/2014 D3.2 aims to experiment the behaviour of the machine in the integration into building

D3.3 Month 34 21/10/2014 D3.3 aims to provide the optimal GAHP systems control algorithms for each system configuration with both indication of instantaneous and average consumptions and self diagnostic capabilities

Milestone N. Due Date Actual date Milestone Description

MS03 Month 24 31/10/2013 MS03 assessed the achievement by the verification of expected performances into the buildings selected for the demonstration

Description of the main S&T result

The principal goal of the WP3 activities was the development of the architecture for the GAHP System and its effective integration with the building.

The principal results can be summarized in three main areas of activities:

1. based upon the input from WP1, definition of a set of simple building interfaces, overall architectures and hydraulic.

The hydraulic system a GAHP is integrated into determines certain boundary conditions, which, in turn, influence the efficiency of the GAHP. Hence this fact had to be considered. The hydraulic scheme, which was identified to suit best the different existing hydraulic systems in European buildings, has the following properties:

- The flexibility of the hydraulic system is ensured by subdividing it into two parts: the heat generation side (“new”) and the heat emission/distribution side (“old”). The former contains the GAHP and a hydraulic architecture, which considers the specific requirements of a GAHP. The latter represents an arbitrary heat distribution system, which can differ drastically from case to case (radiators/floor heating, mixed/unmixed heating circuits). Both parts are recommended to be divided by a hydraulic separator, i.e. either a low loss header or a buffer tank. This way, a single hydraulic architecture of the heat generation side can be connected to various different heat distribution systems, ensuring the possibility to easily integrate a GAHP into existing heating systems all over Europe.
- The size of the above mentioned hydraulic separator (buffer tank) has significant influence on the efficiency of the overall system. In general, the larger the buffer tank, the higher the annual efficiency. On the other hand, in view of costs, required space, and heat losses, a buffer tank as small as possible is desirable. By means of simulations using computer models of the GAHP, of the hydraulic system, and of the control system, the size of the buffer tank does not deliver efficiency improvement above 150-200 liters.
- In case a bivalent system is required by the application, especially in existing buildings colder climate zones, the appropriate control of a peak boiler will be required.
- The domestic hot water (DHW) production is allocated to the heat generation side, since it as to be harmonized with the characteristic of the GAHP. Considering the comfort for the user, a DHW tank with internal coil was identified to fulfill those requirements the best.

The resulting hydraulic architecture ensures a comfortable and efficient operation of the GAHP and can be implemented easily in the variety of existing heating systems.

2. Development of a prototype of GAHP System control

Based on the hydraulic schemes defined, a prototype of the control system has been built up in the lab and measurements have been executed to determine the behavior of the appliance in different conditions and heating systems. This was possible as the test stand is coupled to a simulation environment that allows creating different demands and testing conditions in the climatic chamber depending on the chosen country or building- and heating system type.

Also a prototype of the system controller has been created that manages the related components in the defined prototype system. This system controller has been tested and software was optimized according to test results.

As an outcome of the work done within this task, a package containing all relevant components to setup the specified system including tanks for domestic hot water and buffer storage as well as low loss header, switching valve and system controller has been sent to each field test site in order to allow all partners to have the same setup in all field tests. The system controller is further suitable to operate locally adapted systems.

A specifically dedicated lab facility for testing GAHP System control has been set up. Performance during initial tests in the lab on several hydraulic schemes built up in combination with the GAHP appliance yielded promising results indicating the correct definition of the systems and the suitability and good efficiency in a residential retrofit installation.

A first set of algorithms and functions established in a software development platform was able to suitably control the GAHP appliance and deliver heat into the system for generation of domestic hot water or central heating.

Two main reasons led to the decision to use also an alternative System Controller (a commercially available Control Platform) for three of the Field Test installations:

- Partners preference towards the ability to test hydraulic solutions as close as possible to their specific requirements;
- opportunity to compare different System Controllers behavior, in particular in order to assess the suitability of a commercially available product and the possible improvement in a specifically developed solution

3. Development of Plant Control

The plant control system allows the efficient integration of a gas heat pump in a heating system and is able to manage the related components that are therefore necessary and that have been defined in previous work package (WP1).

A Plant control system was developed by Bosch taking into account the specific appliance behavior. In a first step a calculation model of the GAHP was established and by this a first version of the system controller was also implemented in a simulated environment in MATLAB. Several simulations and real tests have been done to adapt and optimize the system controller in a way to achieve optimal appliance behavior as well as user comfort.

In a second step the controller software was put onto a hardware prototype and again tested in a lab setup with all the relevant system components. With this controller all required functionalities are available, i.e.:

- Integration of the GAHP;
- management and control of related system components;
- integration of peak boiler in case of bivalent system;
- control of one unmixed heating circuit;
- control of DHW-tank.

Also a HMI was created to allow for parameter settings and adjustments on the specific appliances during commissioning and field test period. This system controller was then delivered to the field test sites and was put into operation together with the other system components.

From Robur a similar system controller was developed with similar development process and also included in some field test installations.

As a result of several field installations the need of some kind of hydraulic module was deduced. This offers the advantage of lower installation effort and lower risk of possible faults during installation on site. All components inside this module are managed by the plant control system and also the hardware of the system controller can be included in the casing. Such a module including all necessary system components already preinstalled in one casing was developed and a prototype was built.

In conclusion, the ability to efficiently and effectively integrate (both from the control point of view

and from the hydraulic point of view) the GAHP technology into the large variety of plant schematics of the European existing dwellings has been demonstrated by the results of Work Package 3 activities.

Final comments

In the first period the activities within this Work Package were on time to support the planned field trials for the heating season 2013/2014 as of September 2013 as well as laboratory testing planned at the project partners. However, the HEAT4U program when initially conceived by the Consortium was based on an overall schedule that included considerations for the time interval between “program kick-off” (expected in May 2011) and start of “field tests” (planned for September 2013 winter season). Since the program was started in November 2011 with a delay of five months against the expected start date, the overall program resulted under pressure since the winter season could not be postponed accordingly. This delay has compressed the time available for several development activities and in WP3 allowed only for a basic definition and development of building interface, overall architecture, hydraulic schemes and GAHP System Control before Field Test start.

WP4 – Lab Performance Verification

WP LEADER: P9 POLIMI

Duration:

Start month: 1

End Month: 34

Partners involved

P1 Robur, P2 BTT, P3 PINF, P4 GDF Suez, P7 E.ON, P9 POLIMI, P10 Fraunhofer, P13 ZAG

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D4.1 Month 18 09/05/2013 D4.1 aims to provide test protocol based on the certification standards requirements. It includes application rating conditions and the complete experimental characterization of the GAHP Appliance and System

D4.2 Month 29 04/03/2014 D4.2 aims to explain the installation solutions in different laboratories of the GAHP as far as particular rising problems or needs are concerned

D4.3 Month 34 31/10/2014 D4.3 aims to explain the testing campaign on the GAHP in different laboratories in order to give feedback about installation and interaction with the building. The report includes tests for the GAHP System to highlight the capabilities of such systems to fulfill the thermal needs of the building while complying with the requirements of the residential environment.

Milestone N. Due Date Actual date Milestone Description

MS03 Month 24 31/10/2013 MS03 assessed the achievement by the verification of expected performances into the buildings selected for the demonstration

Description of the main S&T results

The main target of WP4 was the performance of the GAHP appliance and system assessment through laboratory tests.

A preliminary activity to lab tests was the definition of a comprehensive test protocol which has to be defined taking into account the on-going revision process of EN standards. The main results on this activity are:

- EN12309 reviewed, closure of public enquiry, preparation for submission of final publication, formal vote from national entities with formal release of EN12309 by 26th November 2014.

- The results of initial measurements on a preliminary conceptual prototype by means of a protocol based on prEN12309 on an air/water absorption gas heat pump were found to be very time-consuming. The lab tests were finished in October 2012. A very high efficiency can be realized

with this air/water gas heat pump.

- Publication of the lab test protocol based on the prEN12309;
- Test conditions for a complete definition of the appliance performance map have been chosen;
- The protocol has been tested on the most critical conditions and it has been verified that many of the requirements can be fulfilled even with a test facility not specifically designed for the purpose;

In order to perform the test campaign on the GAHP prototypes two independent test laboratories based at POLIMI (Milan, Italy) and Fraunhofer (Freiburg, Germany) was specifically conceived for air-to-water gas fired absorption heat pump:

- Construction of the laboratory at Politecnico di Milano has been completed and the commissioning phase has been successfully completed. The laboratory is able to perform the tests required by the standards about thermally driven appliances and to meet the required tolerances.
- At Politecnico di Milano safety issues related to the testing of a gas driven appliance in a close environment have been addressed with CH₄ and CO sensor connected to the main gas valve of the laboratory. One sensor for detecting NH₃ leakages has also been installed to alert the operators of the presence of ammonia in the testing room.
- Fraunhofer ISE finalized and awarded the calls for tender for both the climatic chamber and the modules for air and water loops control and measurement.
- Construction of the laboratory at Fraunhofer ISE has been completed and the commissioning phase has been successfully completed. The laboratory is able to perform the tests required by the standards about thermally driven appliances and to meet the required tolerances.

In both the laboratories, the GAHP appliance has been tested according to the test conditions defined in the protocol and updated according to the experience acquired during the first tests.

Performance measured by Laboratories meets or exceeds the target (A7W35@100 GUE=165). Full discussion of the results of laboratory tests is provided in Deliverable 4.3.

The last task within WP4 activities was to develop and perform tests for the GAHP Appliance and to highlight the capabilities of such systems to fulfill the thermal needs of the building while demonstrating the full compliance with the safety and environmental requirements of the residential application and the built environment. The main results of this activity are:

- Complete experimental study about release of refrigerant in the environment by a GAHP Appliance with favorable results.
- specific methodologies to perform testing of releases from appliances have been identified;
- Preliminary tests have been carried out, using a bottle of ammonia to simulate the leakage;
- Based on test on a real GAHP, large and small leakages have been simulated using nozzle of different size and the ammonia concentration in the air in the close proximity of the appliance (0.5-1.0 m) have been measured over time;
- Test results were the basis for the Risk Assessment (Deliverable 7.1). These data proved to be critically important because the amount of refrigerant release is so small that the traditional modeling and simulation methodologies could not provide reliable results and prediction for a solid Risk Assessment Analysis.
- Noise and Thermal losses measurements were performed to validate the work done in the reduction of noise generation (activities performed within WP2);

Final comments

The test facilities preparation has been delayed due to several factors (finding qualified providers for the test facility equipment, complexity of the issues related to the construction and to the commissioning, etc.). Therefore, it was not possible to perform the lab test campaign before the field test trials. In addition, not all the development and progresses of the GAHP technology during the HEAT4U project was captured by laboratory testing

A contingency plan was agreed upon with the Coordinator and the partners involved in this activity. Field survey showed (WP1, task 1) that there is high interest in the European market for residential GAHP unit, but there is also the need to confirm with solid evidence the absence of possible risk associated with refrigerant leakages. On the basis of this outcome the decision of focusing significant resources on the risk assessment was taken. ZAG specific competence and ability to model and test such peculiar conditions in a repeatable and controllable way was instrumental to perform test on possible refrigerant leakage.

WP5 – Demonstration and Field Testing

WP LEADER: P4 GDF Suez

Duration

Start month: 6

End Month: 36

Partners involved

P1 Robur, P2 BTT, P4 GDF Suez, P5 GrDF, P6 British Gas, P7 E.ON, P8 ENEA, P9 POLIMI, P10 Fraunhofer, P11 Flowair, P13 ZAG

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D5.1 Month 15 17/01/2013 D5.1 aims to provide the coordination across different operating conditions and in different Countries and to enable a direct comparison of the performances a common protocol for field testing

D5.2 Month 30 22/04/2014 D5.2 aims to provide the installation solutions in different field test sites of the GAHP as far as particular rising problems or needs

D5.3 Month 36 31/10/2014 D5.3 aims to give feedback about installation and interaction with the building. The report includes tests for the GAHP System to highlight the capabilities of such systems to fulfill the thermal needs of the building while complying with the requirements of the environment.

Milestone N. Due Date Actual date Milestone Description

MS02 Month 12 31/10/2012 MS02 assessed the achievement by the availability of a preliminary element in order to verify the acceptance for classes of end users

MS05 Month 36 31/10/2014 MS05 assessed the achievement by the analysis of the data collected from the systems.

Description of the main S&T results

In the first period, the field testing common protocol has been published according to the expected deadline. This work has allowed reaching agreements on measurement, system layout, performance calculation aspects among all mainly involved partners, i.e:

- Definition of hydraulic schemes for all field test facilities (with variation of the numbers of heating circuits; with/without buffer tank; with/without peak boiler; with/without solar support), based on the definition of the system controller out of WP3.
- Agreement on data transmission.
- Agreement on the appropriate sites for field testing:
- French field test in a typical existing individual house with Monovalent system (with back up boiler for contingency);
- German field test in average climate conditions – existing individual house with Monovalent system (with back up boiler for contingency);
- Poland field test in Cold climate conditions – existing individual house with bivalent system (with peak load boiler)
- UK field test, typical Semi Detached house with Monovalent system (with back up boiler for contingency);
- Italian Field test in warm climate conditions. The house is simulated by a load simulator that controls the heat.

Field Tests were intended to deliver primarily opportunity for real life engineering/optimization. With the completion of the HEAT4U Field Test sessions instrumental information has been made available for future use:

- availability of a protocol for performing field testing of GAHP Appliances

- data for comparing performance of difference schematics/installation practices
- a set of guidelines of what appropriate and what not for planning/installation/commissioning

Despite the presence of several unfavorable factors described in Deliverable 5.3, the first few months of operation were an excellent opportunity to complete the development and optimization work of the GAHP Appliance and GAHP System Control and to gain an initial assessment of the suitability of the technology for the residential market and its performances.

During field test some of the most prominent advantages of the GAHP technology have been validated:

- demonstrated no need to modify the emission systems (retrofit is limited to machinery room)
- demonstrated ability to operate in a building fitted with high temperature radiators
- demonstrated ability to operate in outdoor even at -17 °C (in the Lab -22 °C)
- demonstrated reliable operation with absence of failure or discomfort for end users
- demonstrated infrequent defrosting cycles and totally transparent to end users

The HEAT4U field test program results obtained during the observation periods demonstrate that, despite the extreme partial load conditions in which they were performed, the following achievements have been reached:

- Efficient operation in Space Heating mode: 131% to 151% NCV (118% to 136% expressed in terms of GCV);
- Efficient operation even in the combined operation (Space Heating and DHW): 124% to 138% NCV (112% to 124% expressed in terms of GCV);
- Efficient operation even at very low partial load conditions (lower than 20% of nominal power output) and even when delivering DHW service only (summer time): up to 135% NCV (121% GCV).
- Energy Saving (and therefore saving on the “end user gas bill”) ranged from 25 up to 39%

During HEAT4U field tests, in order to obtain a neutral benchmarks on the same specific applications, also condensing boilers have been measured for comparison (i.e. in several circumstances GAHP have been deliberately switch-off and the heat demand of the building was delivered by condensing boilers). In such similar operating conditions, the performance measured (GUE2) of condensing boilers was ranging in the approximately 95% to 102% NCV.

The large amount of available data makes already possible achieving solid evidence of energy performance in application. HEAT4U field tests reported efficiencies estimated 30% better than a condensing boiler in the same application/circumstances/conditions.

Clearly when the GAHP technology will replace a “standard boiler” (by far the most common technology for heating in the existing buildings across Europe) the anticipated increase in energy efficiency, and the corresponding saving in emissions and environmental pollution, will be correspondingly higher.

Such improvements in energy efficiency lead to a resulting increase in energy labeling classification of the building (commonly laid down with steps of specific consumption in kWh/m²/annum of 30% from each other) of at least 1 and possibly 2 classes. This improvement in energy classification will also translate in a corresponding increased value of the real estate property.

The unanticipated challenging conditions encountered during the execution of the field tests (poor load matching, mild winter, etc.) offered the opportunity to demonstrate the achieved resilience of performance of the GAHP technology. This was indeed a major objective to be demonstrated within HEAT4U. In consideration of the above performances and also of the boundary conditions in which such performances have been delivered, such objective can be considered fully achieved. These results demonstrate that the adaptation of the GAHP technology to a residential application has been successfully achieved by providing a solution able to deliver substantial energy saving even while demonstrating at the same time tolerant to heat load mismatch.

All inhabitants involved in field test sites have interest in extending field test session to a second year

The Field Test performed demonstrate with solid evidence that the GAHP technology delivers the anticipated substantial energy efficiency improvement in existing buildings (SH and DHW), while maintaining the comfort level expected by the dwelling owner and showing an unanticipated tolerance to installations where a significant heat load mismatches occur. We could therefore consider the GAHP technology ready for deployment in residential market.

Final comments

On the basis of the results of WP1, it has been approved to change the site nature for the French field test and come back to a typical existing individual house, which is the typical market for this technology in France.

The delayed start of the HEAT4U Project (November 2011 instead of April 2011) has put the entire Consortium under stress to complete the preparation work for the crucial field test activity, but also prevent that all improvements made to the GAHP Appliance and to the GAHP System after field test start could be captured in the field test session. For this reasons the WP5 has discussed several times the option of extending the field test to a second winter season where the optimization work could be exploited to the benefit of the overall HEAT4U Project.

During first part of field tests a number of tests and resulting adjustments in operating parameters have been performed to optimize performance and to understand system behavior response to changes.

Nevertheless, the global objective of WP5 has been achieved:

- Analyses of the results are focused on periods that can be considered representative of typical use and for which the performance of the GAHP technology in application can be accurately described (See main conclusions in part 2).
- Furthermore, results from these field tests, as calculated efficiencies, (particularly from BG, E.ON and Flowair installations related to the different climate conditions according to ErP) have been used to validate the mathematical model developed in the frame of WP6 dedicated to the Decision Support System.

WP6 – Decision Support System

WP LEADER: P10 Fraunhofer

Duration

Start month: 6

End Month: 36

Partners involved

P1 Robur, P2 BTT, P4 GDF Suez, P9 POLIMI, P10 Fraunhofer, P13 ZAG

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D6.1 Month 36 31/10/2014 D6.1 aims to develop a specific SW tool in order to integrate information of local market, information about the heating demand, performance indexes and cost information about alternative technologies.

Milestone N. Due Date Actual date Milestone Description

MS03 Month 24 31/10/2013 MS03 assessed the achievement by the verification of expected performances into the buildings selected for the demonstration

Description of the main S&T results

In the first period, the main S&T results have been:

- Agreement on the approach to be followed for the development of the Decision Support System;
- Development of a first Trnsys Type for a black box approach to the GAHP modeling;
- Development of a system and building model in Trnsys;
- First simulations to verify the correct coupling of the appliance with the system;
- First simulations results, useful to plan the next steps of the investigation.

In the second period, the main S&T results have been:

- Requirements on gas absorption heat pump models and on system simulation models were defined;
- Mathematical models of a gas absorption heat pump were developed and transferred into TRNSYS types for system simulation. The final model was based on a large set of laboratory results to reflect the latest state of development of the appliance;
- A physically based simulation model of the GAX cycle was developed and compared to literature figures;
- Different approaches on system simulation were made (TRNSYS simulations, Fast Performance Calculation tool, MBM) and a set of reference systems was defined. Appropriate building models were set-up. The simulations approaches were successfully cross-validated;
- The GAHP simulation model was validated using measured performance data obtained in the field; accuracy of simulation against measured data in the field are well within few points %.
- Domestic hot water preparation was studied in field test data and an implementation strategy for the simulation was defined;
- Two approaches for a Decision Support System DSS (fast pre-planning supporting simulation tool) were made: a Modified Bin Method and a TRNSED application. The latter was successfully developed to the final tool.
- The final DSS was developed as a standalone tool which allows users to parameterize their building of interest and simulate and compare the GAHP solution to the reference technologies standard condensing boiler and standard condensing boiler coupled with solar DHW in various different European locations. The tool also includes an evaluation sheet for the comparison of target figures.
- This validated simulation tool was used to assess energy performance of GAHP in different installations. To exemplify the seasonal Primary Energy Ratio (PER) of an GAHP System installed in a residential dwelling at Strasbourg (FR) is calculated to be 121% (radiator) and 127% (floor heating) in comparison with alternative state of the art heating technologies.

The Decision Support System Tool further enables to calculate other important parameters like CO₂ reduction and Euro savings compared to other technologies. The DSS was therefore used also to calculate the impact of a GAHP installation against “business as usual” (standard boiler) in an average European installation (tariff, climate, size, inhabitants) as detailed in the section “1.1.4 Potential Impact”.

WP7 – LCC, LCA, HSE, Risk Assessment, Certification and Labeling

WP LEADER: P14 DAPP

Duration

Start month: 6

End Month: 36

Partners involved

P1 Robur, P2 BTT, P4 GDF Suez, P5 GrDF, P9 POLIMI, P14 DAPP

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D7.1 Month 28 21/02/2013 D7.1 aims to explain the implementation of GAHP as heating and DHW units in the targeted housing and residential applications in comparison with risk assessment of the most prominent competing technologies in the residential heating sector

D7.2 Month 30 21/10/2014 D7.2 aims to prepare documentations in order to grant the GAHP

products to be certified and homologated according to the European requirements, and in agreement with each single Country where the commercial exploitation is foreseen.

D7.3 Month 34 31/10/2014 D7.3 aims to provide a report on the analysis aimed to assessing environmental impacts procured by the processing exploited into the GAHP production methods, the whole cycle from production to disposal throughout their lifespan, as well as by the use performances. In parallel to the LCA, a similar analysis focused on the economical aspects of the GAHP

Milestone N. Due Date Actual date Milestone Description

MS04 Month 36 31/10/2014 MS03 assessed the achievement by the creation of the model for the business to exploit the potential of the Project results in different cases. Moreover LCA and LCCA grant the availability of data for the systems applied in different environments

Description of the main S&T results

The principal results can be summarized in four main areas of activities

1- Geographical benchmark

A short geographical benchmark of Central Heating technologies available in the EU market has been performed. On the basis of the up-to-date figures available and the prospected scenarios presented, the selection of competing technology included considerations like:

- keeping in mind the need to provide a building with both space heating and DHW,
- the application in single-family and multi-family existing dwellings
- the requirements of EPBD transpositions (that imposes minimum energy efficiency levels or the use of renewable energy)

The heating technologies that were selected as the most competing references for analysis and environmental comparison to the GAHP system proposed in the HEAT4U project are:

1. Wall Hung Condensing Gas Boiler coupled with a Solar Thermal system;
2. Air/Water Electrical Heat Pump.

Clear advantages are demonstrated for GAHP technology for several aspects including operational expenses against these possible alternative heating solutions (detailed discussion is provided in Deliverable 7.3).

2- Risk assessment during manufacturing, installation and operation of GAHP system

Within the framework of the HEAT4U Project, aimed at developing a Gas Absorption Heat Pump (GAHP) solution with high efficiency to allow a cost-effective use of renewable energy in existing residential building for heating and DHW services, one of the foreseen tasks was to evaluate any possible environmental, technical and social risks associated with the whole lifecycle of the appliance, in line with current legislation and Directives.

Within the WP7, Task 7.2 activities were discussed and/or developed:

- the Approach to Risk Analysis;
- the Identification of Hazards;
- the On-field Tests Modeling and Results, and their Interpretation and comparison with standard modeling;
- The Overall Consequences assessment for the Heat4U GAHP;
- The Failure Frequency Assessment;
- The Risk Analysis and Risk Assessment.

Hazards have been identified and grouped into two different families: operational Hazards and nonoperational Hazards.

Concerning operational Hazards, the Risk Assessment has dedicated a particular attention to the modeling of the peculiar Hazards relevant to refrigerant leakages. In fact, other operational Hazards have been demonstrated to be properly controlled through the compliance with the current European and worldwide legislation, which in this respect is prescriptive and whose straightforward application is a sufficient assurance of proper Risk Management and Control. In particular:

- Domestic gas hazards: covered by Gas Appliance Directive (GAD, 2009/142/EC)
- Hazards for Pressure Equipment: covered by Pressure Equipment Directive (PED, 97/23/EC)

- Electrical Hazards: covered by Low Voltage Directive (LVD, 2006/95/EC);

For the operational Risks related to possible refrigerant leaks, the approach implemented in the Risk Assessment has leveraged on the results the actual field tests carried out by ZAG, which have allowed an extremely significant comparison of the actual test evidence with the predicted results of the “standard” modeling tools of Quantitative Risk Analysis, tailored for large industrial assets and large-scale release scenarios, and proven ineffective in correctly model the GAHP behavior.

The Risk associated to refrigerant leakages from the GAHP has been demonstrated by this details risk assessment to be even lower of the commonly accepted and low-perceived Risks associated with the use of domestic gas, in spite of the several conservative assumptions listed below, considered during the performance of the Risk Assessment:

- the on-field test results for the 35 kWth GAHP (with the relevant amount of refrigerant) have been used for the modeling of the smaller Heat4U 18 kWth GAHP;
- when performing the PHAST calculations, the ammonia at the low pressure level of the GAHP circuit has been considered as saturated liquid;
- main conservative assumptions when assessing the failure frequencies (i.e. modification factor and sub factors values, and management factor = 1);
- main conservative assumptions when assessing the scenarios frequencies (i.e. probability of toxic dispersion given release = 100% and probability of low-wind condition = 100%);
- presence of humans at the close proximity (<1m) of the GAHP equal to 8 hours a day;
- IDLH as the corresponding dose as the potential threshold for incipient life-threatening scenarios (conservative assumption);
- societal risk calculated considering incipient life-threatening conditions as "confirmed fatality".

Concerning non-operational Risks, here is a summary of the identified Hazards and relevant findings from the Risk Assessment:

- GAHP manufacturing and assembly in factory: covered by existing and regular safety and environmental procedures;
- Transportation and storage of ammonia to factory: covered by ADR (94/55/EC and 98/91/EC);
- Transportation of GAHP unit as a product: exempted from ADR, safety is ensured by the design/manufacturing of the appliance and by the pre-loaded ready-to-ship concept;
- Installation and start-up: covered by EN378 and Manufacturer’s instructions and procedures;
- Maintenance: the design of the refrigerant circuit is maintenance-free;
- Final disposal: dealt with as part of the Life Cycle Assessment (Deliverable 7.3)

Results and Findings of the present document have fully demonstrated the Risk-Based applicability of Gas Absorption Heat Pump (GAHP) technology in existing residential buildings for heating and DHW service.

3- Labeling and certification

The main focus of this activity has been to show how both European and National 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 realizing 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.

To address the lack of recognition for GAHP encountered throughout the analyses of this activity, it is recommended to include all type of specific requirements for GAHP (design, manufacturing, installation, in-service inspections, and measurements 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.

4- Life Cycle Analysis and Life Cycle Cost Analysis

A Life Cycle Analysis and a Life Cycle Cost Analysis have been performed for GAHP and for the two competing technologies indicated as the most representative comparison references by the market analysis carried out within work package WP1, as reported in Deliverable1.1:

- Condensing Gas Boiler coupled to a Solar Thermal system (State-of-Art product – SoA_1);
- Electric Heat Pump (State-of-Art product – SoA_2);
- GAHP 18 kW(th) (Innovative product - INNO).

The results of these analyses confirm the economic viability as well as the competitiveness of the proposed GAHP technology as compared to the two aforementioned existing heating solutions. Indeed the GAHP shows lower Operating Expenses and improved NPV over the life time of the investment even in case GAHP sell price exceed by 20% the one of SoA_1.

Different boundary conditions have been used for modelling the three products (LCA of GHAP is a cradle to grave life cycle analysis, differently from the other two where LCA is a gate to gate one): the comparison has been performed on the use phase of the systems as this is by far the phase providing the largest contribution both in terms of use of resources and in terms of overall impact over the whole lifecycle

Final comments

In the second period, task 7.2: submission for D7.1 was foreseen at M24, but actual submission was at M28. A draft version of D7.1 was submitted at M24 as scheduled. The aforementioned deviation has occurred in order to include in the deliverable data coming from field tests thus integrating and validating the theoretical assumptions.

Task 7.3 submission for D7.3 was foreseen at M34 but actual submission is M36. This is due to the finalization of simulation results delivered from Fraunhofer to DAPP which was initially not foreseen in the work program. These results are necessary input data to execute calculations and activities foreseen in the LCA/LCC and described in D 7.3

Task 7.4: submission for D7.2 was foreseen at M30 but actual submission is M35. Modifications and updates to the analyzed legislative frameworks have occurred during deliverable implementation, thus requiring consequent changes to the content of the deliverable originally included.

WP8 – Dissemination and Exploitation

WP LEADER: P1 Robur

Duration

Start month: 1

End Month: 36

Partners involved

P1 Robur, P2 BTT, P3 PINF, P4 GDF Suez, P5 GrDF, P6 British Gas, P7 E.ON, P8 ENEA, P9 POLIMI, P10 Fraunhofer, P11 Flowair, P13 ZAG, P14 DAPP, P15 CFc

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D8.1 Month 3 27/05/2012 D8.1 aims to disseminate information about the HEAT4U project (public area), to the scientific community and the general public, and to be an instrument for information exchange and sharing among the partners (public and reserved areas)

D8.2 Month 6 01/06/2012 D8.2 aims to identify the communication objectives, activities and tools for dissemination.

D8.2 covers the plan for HEAT4U dissemination activities

D8.3 Month 12 17/12/2012 D8.3 aims to explain the construction of the E-learning course in order to increase the awareness of the GAHP technology among technicians and final users.

D8.4 Month 36 31/10/2014 D8.4 aims to present the analysis of the cost involved in the exploitation of the project results including costs to produce a market offer, launch costs, ongoing sales, and marketing costs

Description of the main S&T results

During the life of the HEAT4U several dissemination activities and tools to better spread out the project to the identified target groups and facilitating the knowledge sharing between project partners. In details:

- 10 publications in peer reviewed journals;
- Participation in 39 conferences;
- Participation in 16 seminars;
- Participation in 5 fairs;
- 39 Workshops;
- 29 Meetings;
- 19 Briefings;
- 5 Exhibitions;
- organization of 12 training courses;
- International and local cooperation reinforced.

An Exploitation report has been performed to define HEAT4U plans and activities towards achieving sustainability after the project completion and the end of the EC funding period. The exploitation considerations and activities have been coordinated by ROBUR (HEAT4U Project Coordinator) in close collaboration with Roland Berger Strategy Consultants - www.rolandberger.com, authorised subcontractor https://www.google.it/?gfe_rd=cr&ei=CxE1VMGAOsqe-waWwYHIAg&gws_rd=ssl with specific competence in the definition of industrial strategies for technology introduction.

An overview of a market analysis was carried on the basis of final outcomes of the project. The drivers that will support Gas Absorption Heat Pumps (GAHP) introduction and the possible obstacles have been identified. The most viable strategic options and the possible actions for such exploitation have been analyzed and its implementation started.

As described in deliverable 8.4, the analysis states that GAHP technology enjoys solid foundations as far as energy, economic, environmental benefits. In addition, all relevant stakeholders will gain advantages by a larger adoption of the technology in the market. Key element that will influence the speed of exploitation of GAHP technology in the residential market is the legislative support that will be adopted on European heating markets.

WP9 – Project Management (Financial and administrative management)

WP LEADER: P1 Robur

Duration

Start month: 1

End Month: 36

Partners involved

P1 Robur, P2 BTT, P3 PINF, P4 GDF Suez, P5 GrDF, P6 British Gas, P7 E.ON, P8 ENEA, P9

Results Achieved

Deliverable N. Due Date Actual date Deliverable Description

D9.1 Month 18 01/07/2013 D9.1 aims to present the activity developed and the costs sustained by HEAT4U partners during the first period of the project.

D9.2 Month 36 07/11/2014 D9.2 aims to present the activity developed and the costs sustained by HEAT4U partners during the second period of the project.

D9.3 Month 36 07/11/2014 D9.3 aims to present all activities (scientific and dissemination) developed by all partners.

Final comments

During the life of the project, three amendments have been requested.

In detail:

1. The PC, supported by P15 CFc, proceeded with the request of an amendment on behalf of the consortium following the termination of a beneficiary P12 PRIMORJE due to a Primorje bankruptcy. After various interactions with the EC Commission, the amendment was fully accepted on April 23th, 2013.

2. The Amendment 2 has been requested for the following reasons:

- Minor administrative updates related to Legal representatives and staff involved;
- Update of partners budget for additional or for removal of activities;
- Inclusion of specific expertise under subcontracting costs;
- Adjustment of delivery date of some Deliverables.

Before the presentation of the Amendment 2 to the European Commission, the PC has organized a Project Coordination Committee meeting through a webinar section, in order to discuss and vote the modification of Annex I.

The Amendment 2 has been accepted by the EC on July 2014.

3. The Amendment 3 has been requested for the following reasons:

- Change of bank account of the Coordinator;
- Partial transfer of rights and obligations” from E.ON Global Commodities SE (“EGC”) to E.ON New Build & Technology GmbH (“ETG”);
- Update of some budget partners.

Overall the management of the project has been implemented as previewed into the Grant Agreement. The Project Coordinator and the entire team also with the support of P15 CFc has ensured a strict schedule of the work in order to reach project progress and quality of the work. Coordination among partners has been smooth, WP leaders have carried on regular technical meetings and conference calls with the participants of the WP and information have been shared within the Consortium.

Potential impact and main dissemination activities and exploitation results

The impact associated to the Project is strictly related to the share of the residential buildings stock that requires renovation of the heating system in order to attain the energy performance index prescribed by national regulations. Single family homes, small detached houses and multi-storey dwellings/social housing are all classes where the adoption of the proposed GAHP system would be very effective under the energy, economic and environmental perspectives.

In order to assess the expected energy and environmental impact, a case study has been carried out, considering as benchmark the regular boiler (representative of what is currently used in the existing residential applications) and the heating load of a detached house located at the intermediate European latitude. Energy, environmental and economic advantages account basically for three aspects:

- reduced primary energy consumption;

- reduction in CO2 emissions;
- exploitation of renewable resources (enthalpy from outdoor air, as per Renewable Energy Directive);
- reduction in the cost of energy for the end-user.

These impact evaluations have been performed by means of the Decision Support System developed within WP6 by Fraunhofer Institute. It needs to be pointed out that the DSS has been validated on the basis of both in depth laboratory and field test analyses performed during HEAT4U on still preliminary GAHP System prototypes.

Evaluation of the energy and emission savings is performed in comparison to the reference gas condensing boiler which is the most commonly diffused heating technology in Europe and with an estimated annual of efficiency of 86% NCV (or 95% GCV) which clearly represents a conservative assumption (Ecoboiler preparatory report shows that real efficiency are frequently lower) .

Evaluation of energy cost savings has taken into account average prices of electricity and natural gas, updated to 2014 rates.

As an example, a simulation for a 200 m² building of old building standard in Strasbourg (~36 MWh heating + DHW demand) is given. As it is possible to observe, the adoption of GAHP provides large savings of primary energy. Indeed the primary energy saving improve by more than 20% compared to the reference. By means of utilization of the GAHP solution, CO2 emissions of a European dwelling can also be reduced by more than 20%.

Last but not least, also operational costs of the heating and DHW functions of the dwelling are accordingly reduced by 20%.

These quantitative results, demonstrated both during laboratory test and during field tests (despite the adverse conditions), confirm the expected impact of the introduction of GAHP technology in the European residential market.

The WP1 Value chain analysis and the WP8 Exploitation Plan have estimated the potential market for GAHP technology in the European residential dwellings. Such analysis, based on an accurate segmentation of the market, considering the currently achieved performances, suggests that GAHP residential technology can address a total European market of ≈ 380k units p.a. and 2 – 2,5 EUR billion in value.

It needs to be pointed out that this potential market is approximately 5% in quantity (15% in value) of the annual European heating market estimated to be approximately 7Million unit p.a. in volume and 15 Billion Euro in revenues.

Considerations about all stakeholders of the value chain could be meaningful in assessing the potential for impact that the GAHP technology might have in the building and heating industry. Indeed most of the stakeholders will benefits by the introduction of the technology.

End users

- Reduction of the fuel costs for heating without increasing maintenance costs with respect to the reference boiler;
- Cost effective solution to integrate renewable energy for the heating and DHW function in an existing or retrofitted house;
- Use of renewable energy without affecting the architectural design of the dwelling (frequently associated with the solar solutions) and without installation of a back up systems or new electrical meter (as required by EHP);
- Freeing up indoor space thanks to outdoor installation and high power density compared to competing solutions.

Heating Equipment Manufactures and Service Organizations

- Installation and service requirements substantially identical to regular gas condensing boilers;
- Core technology (absorption) existing in Europe (vs. PV, EHP and Fuel Cells heavily relying on far east competences/industry);

- Technology with high entrance barriers.

Planners and Installers

- Easier and safer installation thanks to the self-contained design where there is neither the need to integrate the system with back-up boiler nor to climb on the roof;
- Cost effective way to achieve high percentage of renewable energy in the building and to increase the Energy Classification (EPBD) of the building being erected or retrofitted;
- Ability to design new buildings with more degree of freedom (window size, form factor, etc.) without compromising Energy Classification.

Utilities

- Converting the natural gas from a “clean heat source” into an “enabler of the largest possible amount of renewable energy for the heating function”;
- Synergies with Biogas and Power to Gas production (i.e. a GAHP running on 15% mixture of biogas and natural gas will be able to deliver heating that is based approximately of 50% of renewable energy);
- Avoiding investment in the electrical power plants and grids that might be needed/justified only for the peak loads driven by the high seasonality of the heating function;
- Ability to promptly introduce an energy efficient technology based on natural gas which does not have a negative impact on the gas distribution grid, differently from the large scale deployment of distributed electricity generation (smart grids, micro-CHP, Fuel Cells, PV and wind power) which would require proper control of the overall electrical grid.

Energy policy makers, institution, Member states and EC

- Rely on a technology that do not require a massive, expensive and socially debatable upgrades of the electrical grid and power plants;
- Reduce energy dependency from extra EC countries;
- Rely on a European based technology that will position Europe in the leading spot in terms of efficiency for the space heating and DWH production;
- Generate European based Research & Development and Manufacturing related activities and jobs that can become vehicle for increasing the export of European based products into both North American and Asian markets.

The variables that will influence the adoption rate of the technology will include external factors such as: legislation, energy price, and the acceptance of the system for domestic applications. The last limit is non-technical, nevertheless of great importance as it is expected to strongly influence the market response: end-users are not even aware of the GAHP potential benefits since only 5,000 GAHP plants have been deployed until now and none of these in residential applications. Therefore attention and emphasis need to be put not only on the RTD effort, in order to create a GAHP system compatible with the residential requirements, but also on the dissemination, highlighting the economic and environmental benefits for all of the actors involved.

On the basis of the above mentioned considerations, the impact anticipated at time of submission of HEAT4U proposal for 7th Frame Program Call, are confirmed. These evaluations of possible impact were based on three different scenarios for market penetration (limited, medium and high) at European level by 2020 (i.e. at the 6th year after project completion).

These projections are extrapolated on the basis of the reference case study and are based on the average climate conditions in Europe. Data concerning emission reduction, RES use and energy bill reduction for European citizens associated to total sales volumes of the new GAHP System at 2020 are included.

On the basis of the obtained values, it is straightforward to evaluate the impact that an adoption of such type of system could have on the objectives for energy efficiency in buildings, and as well the support in the exploitation of renewable energy (with reference to the recent “European Council 2030 climate and energy framework” that consider targets of at least 40% greenhouse reductions, at least 27% renewable energy and at least 27% energy savings).

Therefore, member States widely adopting GAHP technology will benefit from a cost effective contribution in achieving their specific targets of CO₂ reduction and/or in reducing the costs of

possible sanctions.

Furthermore, the potential deployment attainable outside Europe is not considered in the scope of the Project, and the effects potentially achievable by such an approach have not been considered yet. Nevertheless, the global need for improved energy efficiency levels and the constraints on CO2 emissions are expected to drive worldwide interest to this European initiative and technology.

The business implications of these scenarios can be grossly approximated in:

Limited market penetration (20k/year): 200 Million Euro

Medium market penetration (80k/year): 800 Million Euro

High market penetration (150k/year): 1,500 Million Euro

This business impact will be correspondingly translated in creation of “green jobs” is an opportunity that converts the current “operational cost for heating” in “investment in know-how for reduction of emission and reduction of energy dependency”.

Address of project public website and relevant contact details

<http://www.heat4u.eu/en/>

Mr. Luigi Tischer

ROBUR SPA

Via Parigi 4/6

24040 Verdellino (BG) – Italy

Tel: +39 035 888 248

Fax: +39 035 884 165

E-mail: ltischer@robur.it

4.2 Use and dissemination of foreground

Section A (public)

Publications

LIST OF SCIENTIFIC PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
No.	Title / DOI	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Date of publication	Relevant pages	Is open access provided to this publication ?	Type
	Schulgebäude mit thermischer Wärmepumpe	W. Weßing	W. Weßing?BINE Informations dienst	I/2013	FIZ Karlsruhe	Bonn, Germany	31/12/2013	9-10	Yes	Article
	Wärmepumpen - Heizen - Kühlen - Umweltenergie nutzen	M. Miara, C. Bongs, D. Günther, S. Helmling, T. Kramer, T. Oltersdorf, J. Wapler	BINE-Fachbuch		Fraunhofer Irb Verlag	Stuttgart, Germany	31/12/2013	39-42	No	Article
	ZAG sodeluje v projektih GE2O in HEAT4U	F. Knez, J. Hafner	GRADBENIK		Tehnis, d.o.o.	Ljubljana	31/12/2013	19	Yes	Article
	A gas absorption heat pump for existing residential building: HEAT4U preliminary achievements	P. Robinet, J. Promelle	Conference proceedings International Gas Union Research Conference 2014		IGRC 2014	Denmark	30/09/2014	Page 13	Yes	Conference
	Experimental characterization of a newly developed air-source water-ammonia gas absorption heat pump for residential applications	T. Toppi, M. Aprile, M. Guerra, M. Motta	International Sorption Heat Pump Conference (ISHPC 2014)		Center for Environmental Energy Engineering (CEEE)	Maryland, USA	31/03/2014	Volume 1, page 589-598	No	Conference
	Seasonal performance calculation and transient simulation of a newly developed 18 kW air-source water-ammonia gas heat p	T. Toppi, M. Aprile, M. Motta, C. Bongs	11th IEA Heat Pump Conference 2014		IEA Heat Pump Centre	Montreal, Canada	01/05/2014		No	Conference

	ump for residential applications									
	Technologia absorpcyjna	J. Doroszkiewicz	B##kitna Energia		Quixi Media Sp. z o.o		31/03/2014		Yes	Conference
	Heat4U – projekt rozwoju technologii gazowych absorpcyjnych pomp ciepła	M. Moskal	Polski Instalator		Instalator Polski sp. z o.o.		31/03/2014		No	Conference
	Seasonal Performance Simulation of an Air Sourced Gas Absorption Heat Pump	C. Bongs, M. Kleinstück, B. Nienborg, M. Aprile, T. Toppi, P. Robinet	International Sorption Heat Pump Conference (ISHPC 2014)		Center for Environmental Energy Engineering (CEEE)	Maryland, USA	31/03/2014	991-1001	No	Conference
	Modeling and Simulation of a Gas Absorption Heat Pump	F. Carlucci, G. Starace, C. Bongs	International Sorption Heat Pump Conference (ISHPC 2014)		Center for Environmental Energy Engineering	Maryland, USA	31/03/2014		No	Conference

LIST OF DISSEMINATION ACTIVITIES								
No.	Type of activities	Main Leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Oral presentation to a scientific event	GDF SUEZ	Meeting TC299 for EN12309 Revision	07/11/2011	Paris	Scientific community (higher education, Research) - Policy makers	15	Europe
2	Oral presentation to a scientific event	ROBUR SPA	Meeting TC299 for EN12309 Revision	13/12/2011	France	Scientific community (higher education, Research) - Industry - Policy makers	15	Europe
3	Presentations	ROBUR SPA	HEAT4U Opening Events and Kick-Off Meeting	26/01/2012	Italy	Scientific community (higher education, Research) - Policy makers - Medias	50	Europe
4	Web sites/Applications	ROBUR SPA	HEAT4U PROJECT WEBSITE	01/02/2012	Milan, Italy	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias		All
5	Oral presentation to a scientific event	ROBUR SPA	Mostra convegno EXPOCOMFORT	27/03/2012	Milan, Italy	Scientific community (higher education, Research) - Industry - Policy makers - Medias	50	Europe
6	Exhibitions	FLOWAIR GLOGOWSKI BRZEZINSKI SPOLKA JAWNA	Instacje 2012	01/04/2012	Poznan, Poland	Civil society	1000	POLAND
7	Oral presentation to a wider public	ROBUR SPA	Whole Saler Event	11/04/2012	Italy	Industry	20	Italy
8	Oral presentation to a wider public	ROBUR SPA	Planner Event - HVAC Designers	13/04/2012	Italy	Industry	20	Italy
9	Oral presentation to a scientific event	ROBUR SPA	Seminar - Planner Event - HVAC Designers	18/04/2012	Italy	Scientific community (higher education, Research) - Civ	20	Italy

						il society		
10	Organisation of Workshops	ROBUR SPA	TECHNICAL TABLE-EMILIA ROMAGNA	19/04/2012	EMILIA ROMAGNA	Scientific community (higher education, Research) - Industry	20	Italy
11	Oral presentation to a scientific event	ROBUR SPA	Whole Saler Event	24/04/2012	Italy	Scientific community (higher education, Research) - Industry	20	All
12	Organisation of Conference	PININFARINA SPA	HEAT4U Logo Contest Award Ceremony	08/05/2012	Italy	Scientific community (higher education, Research) - Civil society - Medias	20	Italy
13	Oral presentation to a scientific event	ROBUR SPA	5th EHPA FORUM	08/05/2012	Milano	Scientific community (higher education, Research) - Industry - Medias	100	Europe
14	Oral presentation to a scientific event	ROBUR SPA	Planner Event - HVAC Designers	11/05/2012	Italy	Scientific community (higher education, Research)	20	Italy
15	Oral presentation to a scientific event	ROBUR SPA	Seminar - Planner Event - HVAC Designers	22/05/2012	Italy	Scientific community (higher education, Research)	20	Italy
16	Oral presentation to a scientific event	E. ON RUHRGAS AG	Expert's Forum - TGA Fachforum	24/05/2012	Germany	Scientific community (higher education, Research) - Industry - Civil society	100	Germany
17	Oral presentation to a scientific event	E. ON RUHRGAS AG	Workshop: Working group on Thermal Heat Pumps	25/05/2012	-	Scientific community (higher education, Research) - Industry	16	Europe
18	Oral presentation to a scientific event	E. ON RUHRGAS AG	Expert's Forum - TGA Fachforum	31/05/2012	Germany	Scientific community (higher education, Research) - Industry - Civil society	100	Germany
19	Oral presentation to a scientific event	ROBUR SPA	Planner Event-Netherland-Incentive Travel	06/06/2012	The Netherlands	Scientific community (higher education, Research)	22	Europe
20	Oral presentation to a wider public	ROBUR SPA	Planner Event - HVAC Designers	07/06/2012	Italy	Industry	20	Italy

21	Oral presentation to a scientific event	E. ON RUHRGAS AG	Effizienzdialog	11/06/2012	Germany	Scientific community (higher education, Research) - Policy makers	50	Germany
22	Oral presentation to a scientific event	E. ON RUHRGAS AG	Expert's Forum - TGA Fachforum	21/06/2012	Germany	Scientific community (higher education, Research) - Industry - Civil society	100	Germany
23	Oral presentation to a scientific event	E. ON RUHRGAS AG	Expert's Forum - TGA Fachforum	28/06/2012	Germany	Scientific community (higher education, Research) - Industry - Civil society	100	Germany
24	Oral presentation to a scientific event	E. ON RUHRGAS AG	Conference/Trade Fair: GAT	24/09/2012	Germany	Scientific community (higher education, Research) - Industry	50	Europe
25	Oral presentation to a scientific event	ROBUR SPA	Le strategie energetiche per il retail in Italia	02/10/2012	Italy	Industry	100	Italy
26	Flyers	ROBUR SPA	HEAT4U First Year Results	11/10/2012	Italy	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	1000	Italy
27	Organisation of Conference	ROBUR SPA	HEAT4U Presentation of first year results	11/10/2012	Bergamo	Industry - Policy makers - Medias	50	Europe
28	Oral presentation to a wider public	ROBUR SPA	Potenzialità e sviluppi delle pompe di calore nella climatizzazione degli edifici	12/10/2012	Italy	Civil society	100	Italy
29	Oral presentation to a wider public	ROBUR SPA	MADE EXPO PER LA RIQUALIFICAZIONE; M.MESSINA PRESENTATION	20/10/2012	Italy	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	40	Europe
30	Oral presentation to a scientific event	BRITISH GAS TRADING LIMITED	Delta EU Gas Heat Pump Seminar	27/10/2012	Paris	Industry	30	Europe
31	Oral presentation to a scientific event	ROBUR SPA	Confindustria "Settimana per l'energia"	06/11/2012	Italy	Industry	100	Italy

32	Media briefings	BRITISH GAS TRADING LIMITED	National Grid Engagement and Support for Gas Heat Pumps % Hybrids	28/11/2012	UK	Industry	4	UK
33	Oral presentation to a scientific event	E. ON RUHRGAS AG	Seminar: In-house training	06/12/2012	Latvia	Industry	30	Latvia
34	Oral presentation to a scientific event	ROBUR SPA	Workshop: UK Microgeneration Certification Gas absorption HEAT Pump Working Group	13/12/2012	UK	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	8	UK
35	Organisation of Workshops	BRITISH GAS TRADING LIMITED	British Gas Technology Lab Tour: Future of Gas Boilers	02/01/2013	London	Scientific community (higher education, Research) - Industry - Civil society	20	UK
36	Organisation of Conference	BRITISH GAS TRADING LIMITED	British Gas Central Heating Leadership Conference: Future of Gas Boilers	17/01/2013	London	Industry	250	UK
37	Oral presentation to a scientific event	BRITISH GAS TRADING LIMITED	British Gas Stockport - National Central Heating Office	12/02/2013	London	Scientific community (higher education, Research) - Industry - Policy makers	150	UK
38	Media briefings	BRITISH GAS TRADING LIMITED	National Grid Engagement and Support for Gas Heat Pumps and Hybrids	14/02/2013	London	Industry	4	UK
39	Oral presentation to a scientific event	ROBUR SPA	Workshop: Gas absorption Heat Pumps & Benefits for the UK Heat Strategy	26/02/2013	UK	Policy makers	10	UK
40	Oral presentation to a scientific event	ROBUR SPA	GAS NATURALLY WORKSHOP: How Gas technologies and infrastructure are providing solutions to our EU energy and climate challenges	05/03/2013	Brussels	Industry - Policy makers	80	Europe

41	Oral presentation to a scientific event	ROBUR SPA	EEB Impact Workshop	12/03/2013	Bruxelles	Scientific community (higher education, Research)	30	Europe
42	Exhibitions	ROBUR SPA	Trade Fair ISH 2013	12/03/2013	Germany	Scientific community (higher education, Research) - Industry	200000	EU
43	Oral presentation to a scientific event	ROBUR SPA	Forum Retail & GDO Energy Maintenance	19/03/2013	Italy	Industry	240	Europe
44	Organisation of Conference	ROBUR SPA	Conto termico e strategie Energetiche Regionali: opportunità e applicazioni degli incentivi al riscaldamento verde	21/03/2013	Italy	Scientific community (higher education, Research) - Industry - Civil society	210	Italy
45	Oral presentation to a wider public	ROBUR SPA	TIGR Meeting	01/04/2013	Slovenia	Scientific community (higher education, Research) - Industry	30	Slovenia
46	Oral presentation to a scientific event	POLITECNICO DI MILANO	Meeting TC299 for EN12309 Revision	03/04/2013	Italy	Scientific community (higher education, Research) - Industry - Policy makers	15	Europe
47	Oral presentation to a wider public	ROBUR SPA	Conto termico e Strategie energetiche regionali: opportunità e applicazioni degli incentivi al riscaldamento verde	04/04/2013	Italy	Industry	100	Italy
48	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	British Gas Executive Leadership Team Meeting	10/04/2013	London	Industry	8	Europe
49	Oral presentation to a wider public	ROBUR SPA	Conto Termico e Strategie Energetiche Regionali: opportunità e applicazioni degli incentivi al riscaldamento verde	11/04/2013	Italy	Industry	160	Italy
50	Oral presentation to	ROBUR SPA	Conto termico e stra	18/04/2013	Italy	Scientific comm	155	Italy

	a scientific event		ategie energetiche Nazionali. opportunità e applicazioni degli incentivi al riscaldamento verde			community (higher education, Research) - Industry		
51	Oral presentation to a wider public	ROBUR SPA	Conto Termico e Strategie Energetiche Nazionali: opportunità e applicazioni degli incentivi al riscaldamento verde	18/04/2013	Italy	Industry	155	Italy
52	Oral presentation to a scientific event	ROBUR SPA	Workshop: Residential Gas Absorption Heat Pumps	19/04/2013	London	Industry	12	UK
53	Oral presentation to a scientific event	BRITISH GAS TRADING LIMITED	Workshop: National Grid Engagement and Support for Gas Heat Pumps & Hybrid	30/04/2013	London	Industry	3	Europe
54	Oral presentation to a wider public	ROBUR SPA	Polish Incentive travel	07/05/2013	Poland	Industry	28	Poland
55	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Parliamentary Renewable Energy Group - Gas Heat Technologies	14/05/2013	United Kingdom	Scientific community (higher education, Research) - Policy makers	25	United Kingdom
56	Oral presentation to a wider public	ROBUR SPA	Conto Termico e Strategie Energetiche Nazionali: opportunità e applicazione degli incentivi al riscaldamento verde	15/05/2013	Italy	Industry	150	Italy
57	Oral presentation to a wider public	ROBUR SPA	MC-TER pompe di calore: una tecnologia al servizio dell'efficienza energetica e delle fonti rinnovabili	24/05/2013	Italy	Industry	400	Europe
58	Oral presentation to a wider public	ROBUR SPA	Czech Incentive TRavel	27/05/2013	Czech Republic	Industry	25	Czech Republic
59	Oral presentation to a wider public	ROBUR SPA	AiCARR Conference: Innovazione e te	30/05/2013	Italy	Industry	40	Italy

			ndenze nella tecnologia e nelle applicazioni delle pompe di calore					
60	Oral presentation to a wider public	ROBUR SPA	EGATEC 2013 Successful development of gas heat pumps in domestic and commercial heating markets	30/05/2013	France	Industry - Civil society - Policy makers	200	All
61	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	BG Connected Homes Team Day	03/06/2013	United Kingdom	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	70	Europe
62	Oral presentation to a wider public	ROBUR SPA	Netherlands Incentive travel	06/06/2013	The Netherlands	Industry	22	The Netherlands
63	Oral presentation to a wider public	ROBUR SPA	Polish Incentive travel	06/06/2013	Poland	Industry	28	Poland
64	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Renewable Heat Team Annual Conference. Adrian Richardson:Heat Technology Development in the UK	04/07/2013	United Kingdom	Industry - Civil society - Policy makers	13	United Kingdom
65	Oral presentation to a wider public	GDF SUEZ	Congrès français des pompes à chaleur 2013	19/09/2013	Paris, France	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	200	Europe
66	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	DECC Green Deal Meeting	01/11/2013	United Kingdom	Industry - Policy makers	3	United Kingdom
67	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	DECC Market Reform Consultation	01/11/2013	United Kingdom	Industry - Civil society - Policy makers	10	United Kingdom
68	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Delta Heat Pump Evidence	01/02/2014	United Kingdom	Scientific community (higher education, Research) - Industry - Civil society	4	United Kingdom
69	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Delta Heat Roundtable	06/02/2014	Paris, France	Industry - Civil society	40	UK, USA, Italy, Germany, Belgium, Austria, Norway,

								Denmark, The Netherlands, France, Ireland
70	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	DECC Green Deal Meeting	27/02/2014	United Kingdom	Policy makers	6	United Kingdom
71	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	GAHP Advocacy	01/03/2014	UK	Civil society	1	United Kingdom
72	Organisation of Conference	BRITISH GAS TRADING LIMITED	Annual Training Academy Conference	01/03/2014	United Kingdom	Industry	120	United Kingdom
73	Oral presentation to a wider public	ROBUR SPA	Delta Heat Pump Evidence. Kevin Lowe DECC Gas Heat Pump Review of Provided Evidence	01/03/2014	United Kingdom	Scientific community (higher education, Research) - Industry - Civil society	4	UK
74	Oral presentation to a scientific event	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	ISHPC 2014	31/03/2014	Maryland (USA)	Scientific community (higher education, Research)	80	Europe, USA
75	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	UK Energy Networks Association	07/04/2014	United Kingdom	Industry	10	UK, France, Austria, Germany, The Netherlands, Belgium, Ireland
76	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Commercial Potential for New Gas Technology	01/05/2014	United Kingdom	Industry	6	United Kingdom
77	Posters	POLITECNICO DI MILANO	11th IEA HPC 2014	12/05/2014	Montreal	Scientific community (higher education, Research)	80	All
78	Flyers	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	11th IEA HPC 2014	12/05/2014	Montreal	Scientific community (higher education, Research)	80	All
79	Organisation of Workshops	ROBUR SPA	EHPA Heat Pump Forum	20/05/2014	Brussels	Industry	30	Europe

80	Organisation of Workshops	BRITISH GAS TRADING LIMITED	SEA - Residential Technology Working Group	22/05/2014	United Kingdom	Industry - Civil society	10	United Kingdom
81	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Ecuity - British Gas Technology Review	04/06/2014	United Kingdom	Civil society - Policy makers	5	United Kingdom
82	Oral presentation to a scientific event	BRITISH GAS TRADING LIMITED	Eurogas EUREW	24/06/2014	United Kingdom	Industry - Policy makers	80	Europe
83	Organisation of Workshops	BRITISH GAS TRADING LIMITED	TSB Projects & Technology Opportunities in the UK	22/07/2014	United Kingdom	Industry	10	United Kingdom
84	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Technology Trends	30/07/2014	United Kingdom	Industry - Civil society	6	United Kingdom
85	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Customer Led Network Revolution - Residential Sector	06/08/2014	United Kingdom	Scientific community (higher education, Research) - Industry	16	Europe
86	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Customer Led Network Revolution - Commercial sector	14/08/2014	United Kingdom	Scientific community (higher education, Research) - Industry	12	Europe
87	Oral presentation to a scientific event	POLITECNICO DI MILANO	Eurosun 2014	16/09/2014	France	Scientific community (higher education, Research)	200	All
88	Oral presentation to a scientific event	E.ON TECHNOLOGIES GMBH	International Gas Union Research Conference 2014. Practical experience of Gas Heat Pump Technology in both Domestic and Commercial Heating Sector	17/09/2014	Copenhagen, Denmark	Scientific community (higher education, Research)	120	All
89	Oral presentation to a scientific event	GDF SUEZ	International Gas Union Research Conference 2014	17/09/2014	Copenhagen, Denmark	Scientific community (higher education, Research)	100	Europe
90	Oral presentation to a scientific event	GDF SUEZ	Congrès français des pompes à chaleur 2014	18/09/2014	Paris, France	Scientific community (higher education, Research) - Industry - Civil society	100	France
91	Organisation of	FRAUNHOFER	WGTHP EHPA	30/09/2014	Brussels	Scientific comm	15	Europe

	Workshops	-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V				unity (higher education, Research) - Industry - Civil society - Policy makers		
92	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Market Opportunities for Innovative Microgeneration	01/10/2014	United Kingdom	Industry - Policy makers	5	United Kingdom
93	Organisation of Workshops	BRITISH GAS TRADING LIMITED	HHIC Pathways Workshop	09/10/2014	United Kingdom	Industry - Civil society	50	Europe
94	Oral presentation to a wider public	FRAUNHOFER -GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	Chillventa Congressing 2014	13/10/2014	Nurnberg, Germany	Industry	80	All
95	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Connected Homes	01/12/2014	United Kingdom	Scientific community (higher education, Research) - Industry - Civil society	80	United Kingdom
96	Organisation of Workshops	ZAVOD ZA GRADBENISTVO SLOVENIJE	TIGR meeting	01/12/2014	Slovenia	Scientific community (higher education, Research) - Industry	30	Slovenia
97	Organisation of Workshops	E.ON TECHNOLOGIES GMBH	Anforderungen an Gaswärmepumpen	01/04/2014	Germany	Industry - Civil society - Policy makers	5	Germany
98	Organisation of Workshops	E.ON TECHNOLOGIES GMBH	Gaswärmepumpe - Stand der Geräteentwicklung Herstellerinformationen aus dem Heat Pump Day 2013	01/04/2014	Germany	Industry - Civil society - Policy makers	6	Germany
99	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Future Gas Technologies for the UK	01/03/2014	United Kingdom	Civil society	3	United Kingdom
100	Organisation of Workshops	BRITISH GAS TRADING LIMITED	DECC visit to BG Technology Lab	01/01/2014	United Kingdom	Civil society - Policy makers	12	United Kingdom
101	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Sustainable Energy Association Priorities for 2014 Advocacy	01/01/2014	United Kingdom	Industry	8	United Kingdom
102	Organisation of	BRITISH GAS TRADING LIMITED	Public Affairs	01/01/2014	United Kingdom	Policy makers	4	UK

	Workshops	DING LIMITED	Engagement on Microgeneration innovation for the UK					
103	Organisation of Workshops	ROBUR SPA	TIGR meeting	01/12/2013	Slovenia	Scientific community (higher education, Research) - Industry	30	Slovenia
104	Organisation of Workshops	GDF SUEZ	EHPA WGTHP	19/11/2013	Brussels	Scientific community (higher education, Research) - Industry	20	Europe
105	Organisation of Workshops	ROBUR SPA	Kick off meeting	09/10/2013	Paris, France	Scientific community (higher education, Research) - Industry	20	Europe
106	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Scottish Government - Gas Technology Briefing	09/10/2013	UK	Industry - Policy makers	8	UK
107	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Microgeneration Deep Dive	13/09/2013	UK	Industry	6	UK
108	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Central Heating Installation Conference	03/09/2013	United Kingdom	Industry	8	United Kingdom
109	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Gas Technology Developments	24/05/2013	UK	Industry	10	UK
110	Organisation of Workshops	ROBUR SPA	WGTHP EHPA	23/05/2013	Brussels	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	10	Europe
111	Organisation of Workshops	BRITISH GAS TRADING LIMITED	DECC Renewable Heat Team Workshop	01/05/2013	UK	Industry - Policy makers	5	UK
112	Organisation of Workshops	BRITISH GAS TRADING LIMITED	Gas Heat Pump & Hybrid Workshop - Heating & Hot Water Industry Council & UK Department of Energy & Climate Change	30/11/2012	UK	Policy makers	10	UK
113	Organisation of	BRITISH GAS TRADING LIMITED	UK Heat Strategy	10/05/2012	UK	Policy makers	50	United Kingdom

	Workshops	DING LIMITED	Response					
114	Organisation of Workshops	ROBUR SPA	Technical Table - Emilia Romagna	19/04/2012	Italy	Industry	20	Italy
115	Oral presentation to a wider public	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	Annex 43 Working Meeting	04/05/2014	Paris, France	Scientific community (higher education, Research) - Industry	20	All
116	Oral presentation to a wider public	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	Annex 43 Kickoff Meeting	09/10/2013	Germany	Scientific community (higher education, Research) - Industry	20	All
117	Exhibitions	GDF SUEZ	Interclima	04/08/2013	France	Scientific community (higher education, Research) - Industry - Policy makers	1000	Europe
118	Exhibitions	E. ON RUHRGAS AG	SHK	17/04/2012	Moscow	Industry	50000	Europe
119	Exhibitions	E. ON RUHRGAS AG	E-world	07/02/2012	Germany	Scientific community (higher education, Research) - Industry - Civil society - Policy makers	18000	Europe
120	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Macrogas - Standing Committee, Groningen	28/10/2014	UK	Industry	16	Europe
121	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Energy & Public Affairs Event	27/10/2014	UK	Policy makers	10	UK
122	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	TSB Projects & Technology Opportunities in the UK	15/10/2014	UK	Scientific community (higher education, Research) - Industry - Civil society	8	UK
123	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	I-STUTE Thermal Technology Board	02/10/2014	UK	Scientific community (higher education, Research) - Industry - Civil society	18	EU

124	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Retail Market Review	23/09/2014	UK	Industry - Policy makers	6	UK
125	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	TSB Projects & Technology Opportunities in the UK	04/09/2014	UK	Scientific community (higher education, Research) - Industry	5	UK
126	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	New Gas Heat Pump Developments	22/08/2014	UK	Industry	5	UK & North America
127	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Energy Networks Association - Gas Safety Forum	15/08/2014	UK	Industry - Civil society	15	EU
128	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Business Development Opportunities in Microgeneration	11/08/2014	UK	Civil society	9	UK
129	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	SEA - Smart Working Group	12/08/2014	United Kingdom	Industry	10	United Kingdom
130	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	CHI Guildford Project	25/07/2014	UK	Industry - Civil society	4	UK
131	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	DECC RHI Inclusion of Gas Heat Pumps	21/07/2014	UK	Industry - Policy makers	9	UK
132	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Public Affairs Briefing	21/07/2014	UK	Industry	6	UK
133	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	UK Biomethane Developments & Benefits with GAHPs	16/07/2014	United Kingdom	Industry	4	United Kingdom
134	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	New Gas Heat Pump Developments	22/06/2014	UK	Industry	5	Europe
135	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Generation Green Developments	04/06/2014	UK	Industry	3	UK
136	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	PRASEG - Gas Heating Innovation	12/05/2014	UK	Industry - Policy makers	25	Europe
137	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Technologies to be included in RHI Scheme	01/03/2014	United Kingdom	Policy makers	7	UK
138	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Sustainable Energy Association Westminster Reception	01/12/2014	United Kingdom	Policy makers	100	UK

139	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	EST-UK Heat Pump Trials Steering Group - Conclusions	20/05/2013	United Kingdom	Industry - Civil society	20	UK
140	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Microgeneratuon Certification Scheme - Sub Group for Gas Absorption Heat Pump Inclusion	24/05/2013	United Kingdom	Industry - Civil society - Policy makers	12	UK
141	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Newcastle University, Microgeneration Opportunities	22/05/2013	UK	Scientific community (higher education, Research)	4	UK
142	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	National Grid	09/05/2013	UK	Industry	4	UK
143	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Enertek - Future Support on New Gas Technologies	15/05/2014	UK	Industry - Civil society	8	UK
144	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Centrica CDP Submission	14/05/2014	UK	Industry - Civil society	5	UK
145	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	HHIC Pathways Strategy Group	13/05/2014	UK	Industry	4	UK
146	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	National Grid Update	01/03/2014	UK	Industry	2	UK
147	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Developments in Microgeneration Technology	01/03/2014	UK	Industry	2	UK
148	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Developments in Microgeneration Technology	01/02/2014	UK	Industry	3	UK
149	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Developments in Microgeneration Technology	01/02/2014	UK	Industry	5	UK
150	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	GAHPs in the UK	01/02/2014	UK	Industry	4	UK
151	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	GAHPs in the UK	01/02/2014	UK	Industry	3	UK
152	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	BG Leadership Meeting	01/01/2014	UK	Industry	9	UK
153	Oral presentation to	BRITISH GAS TRADING LIMITED	Heat4U GAHP Tec	01/01/2014	UK	Industry	2	UK

	a wider public	DING LIMITED	hnology					
154	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Marcogaz Meeting Presentation Briefing	31/10/2013	UK	Industry - Civil society	16	Europe
155	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Commercial Services Team, Briefing on Gas Absorption Heat Pump Technology	09/09/2013	UK	Industry	4	UK
156	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Centrica Strategy Team Briefing on New Gas Technologies	07/08/2013	UK	Industry	4	UK
157	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Equity Gas Absorption Heat Pump Advocacy	01/04/2013	United Kingdom	Industry	6	UK
158	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	BG Health and Safety Field Technical Compliance	28/02/2012	UK	Industry	5	UK
159	Exhibitions	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Instalacje 2014	01/04/2014	Poland	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	1000	EU
160	Exhibitions	GRDF SA	Interclima	04/11/2013	Paris, France	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	4000	Europe
161	Oral presentation to a wider public	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	KIT (Karlsruhe Institute of Technology): Gaswärmepumpen in the course of the lecture series TEEG - Technologies for energy efficient buildings	01/06/2014	Germany	Scientific community (higher education, Research) - Civil society	20	Europe
162	Oral presentation to a wider public	AGENZIA NAZIONALE PER LE NUOVE TECN	Online course: Pompe di calore ad assorbimento di gas	01/03/2014	Italy	Scientific community (higher education, Research) - Ind	5000	EU

		OLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE	http://www.enea.it/it/enea_informazioni/news/corso-online-2014-pompe-di-calore-ad-assorbimento-a-gas2014			Industry - Civil society - Policy makers - Medias		
163	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/01/2014	Poland	Industry - Civil society	8	Poland
164	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/11/2013	Poland	Industry - Civil society	9	Poland
165	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/10/2013	Poland	Industry - Civil society	15	Poland
166	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/08/2013	Poland	Industry - Civil society	5	Poland
167	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/06/2013	Poland	Industry - Civil society	12	Poland
168	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/04/2013	Poland	Industry - Civil society	14	Poland
169	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/01/2013	Poland	Industry - Civil society	20	Poland
170	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/10/2012	Poland	Industry - Civil society	35	Poland
171	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI	Technical training in the field of gas absorption heat	01/06/2012	Poland	Industry - Civil society	16	Poland

		SPOLKA JAWNA	pumps					
172	Oral presentation to a wider public	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical training in the field of gas absorption heat pumps	01/03/2012	Poland	Industry - Civil society	16	Poland
173	Oral presentation to a wider public	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	Gas Absorption Heat Pump Testing	07/10/2014	Germany	Scientific community (higher education, Research) - Civil society	12	Germany
174	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Future of Gas Boilers	01/05/2014	UK	Industry - Civil society	20	UK
175	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Future of Gas Boilers	01/11/2013	UK	Industry - Civil society	20	UK
176	Oral presentation to a wider public	BRITISH GAS TRADING LIMITED	Future of Gas Boilers	01/05/2013	UK	Industry - Civil society	20	UK
177	Flyers	FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V	HPC: 11th International Heat Pump Conference	12/05/2014	Montreal, Canada	Scientific community (higher education, Research)	80	EU, Canada, USA
178	Flyers	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Instalacje 2014, spread by traders	01/04/2014	Poland	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	5000	EU
179	Flyers	ZAVOD ZA GRADBENISTVO SLOVENIJE	DOM fair Ljubljana	01/03/2014	Slovenia	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	60000	Slovenia, Croatia
180	Articles published in the popular press	FLOWAIR GLOGOWSKI I BRZEZINSKI SPOLKA JAWNA	Technical catalogue	01/06/2014	Poland	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias	2000	Poland

181	Web sites/Applications	FLOWAIR GLOGOWSKI BRZEZINSKI SPOLKA JAWNA	Landingpage Heat4U	01/08/2014	Poland	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias		Europe
182	Web sites/Applications	E.ON TECHNOLOGIES GMBH	Innovation City Ruhr Initiative http://www.icruhr.ce/index.php?id=322	01/10/2013	Germany	Scientific community (higher education, Research) - Industry - Civil society - Policy makers - Medias		EU

Section B (Confidential or public: confidential information marked clearly)

LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS, UTILITY MODELS, ETC.					
Type of IP Rights	Confidential	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant(s) (as on the application)

OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND

Type of Exploitable Foreground	Description of Exploitable Foreground	Confidential	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use or any other use	Patents or other IPR exploitation (licences)	Owner and Other Beneficiary(s) involved
Commercial exploitation of R&D results	GAHP Appliance. New heating appliance (or part of the appliance)	Yes		Residential GAHP appliance	HVAC market	2016	Yes, possible exploitation approach	Robur
Commercial exploitation of R&D results	GAHP System Controls. New Hydraulic Modules and Accessories control and accessories	Yes		Control for GAHP residential appliance	HVAC industry	2016	Yes, possible exploitation approach	Robur and BTT
Commercial exploitation of R&D results	Enclosure design. Industrial design and models	Yes		GAHP residential appliance	HVAC industry	2016	Yes, possible	Robur and PINF
Exploitation of R&D results via standards	Product certification services. Laboratory testing according to EN12309	No		Product certification services	HVAC industry	2015	No	POLIMI and Fraunhofer
Commercial exploitation of R&D results	GAHP Field Test Services. Protocols, Methodologies, Instrumentation, Remote monitoring, Web site access	Yes		Field Test services	HVAC industry, Governmental authorities, energy policy makers	2015	Yes	POLIMI, Fraunhofer, ENEA, British Gas, GrDF Suez, GrDF, Flowair, ETG
Commercial exploitation of R&D results	GAHP Modelling services. GAHP studies and evaluations	Yes		mathematical modelling	HVAC industry, Governmental authorities, energy policy makers	2015	Yes	POLIMI and Fraunhofer
Commercial exploitation of R&D results	Refrigerant release test services. Protocols, methodologies and instruments	Yes		refrigerant release test services	HVAC industry	2015	Yes	ZAG and DAPP
Exploitation of results through (social) innovation	Learning courses. Training for planners and installers	No		Learning courses	HVAC industry	2015	Yes	ENEA

ADDITIONAL TEMPLATE B2: OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND

Description of Exploitable Foreground	Explain of the Exploitable Foreground
GAHP Appliance. New heating appliance (or part of the appliance)	Purpose: efficient heating. How the foreground might be exploited: Sales of GAHP solution. IPR exploitable measures taken or intended. Exploitation through direct sales or OEM agreement or technology licencing. Further research necessary for industrialisation and commercialisation. Potential impact: the potential addressable market is measurable in hundreds of thousands of units per year. The total revenue is in the order of billions Euros. Each unit reduces the CO2 emissions of 3 tons and reduces energy bills by more than 1000 Euros per annum per average EU family.
GAHP System Controls. New Hydraulic Modules and Accessories control and accessories	Purpose: efficient heating. How the foreground might be exploited: Sales of GAHP solution. IPR exploitable measures taken or intended. Exploitation through direct sales or OEM agreement or technology licencing. Further research necessary for industrialisation and commercialisation. Potential impact: the potential addressable market is measurable in hundreds of thousands of units per year. The total revenue is in the order of billions Euros. Each unit reduces the CO2 emissions of 3 tons and reduces energy bills by more than 1000 Euros per annum per average EU family.
Enclosure design. Industrial design and models	Purpose: support optima integration of GAHP technology. Exploitation through direct sales or OEM agreement or licencing.
Product certification services. Laboratory testing according to EN12309	Product development or certification for European regulations and local legislation. Exploitation by execution of testing for HVAC industry by certified laboratories. Impact: Enable EU absorption industry to grow.
GAHP Field Test Services. Protocols, Methodologies, Instrumentation, Remote monitoring, Website access	Product development or certification for European regulations and local legislation. Exploitation by execution of testing for HVAC industry by certified laboratories. Impact: Enable EU absorption industry to grow.
GAHP Modelling services. GAHP studies and evaluations	Product development or certification for European regulations and local legislation. Exploitation by execution of testing for HVAC industry by certified laboratories. Impact: Enable EU absorption industry to grow.
Refrigerant release test services. Protocols, methodologies and instruments	Product development or certification for European regulations and local legislation. Exploitation by execution of testing for HVAC industry by certified laboratories. Impact: Enable EU absorption industry to grow.
Learning courses. Training for planners and installers	To inform personnel concerned about the technology and optimal installation

4.3 Report on societal implications

B. Ethics

1. Did your project undergo an Ethics Review (and/or Screening)?	No
If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final reports?	
2. Please indicate whether your project involved any of the following issues :	
RESEARCH ON HUMANS	
Did the project involve children?	No
Did the project involve patients?	No
Did the project involve persons not able to consent?	No
Did the project involve adult healthy volunteers?	No
Did the project involve Human genetic material?	No
Did the project involve Human biological samples?	No
Did the project involve Human data collection?	No
RESEARCH ON HUMAN EMBRYO/FOETUS	
Did the project involve Human Embryos?	No
Did the project involve Human Foetal Tissue / Cells?	No
Did the project involve Human Embryonic Stem Cells (hESCs)?	No
Did the project on human Embryonic Stem Cells involve cells in culture?	No
Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	No
PRIVACY	
Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	No
Did the project involve tracking the location or observation of people?	No
RESEARCH ON ANIMALS	

Did the project involve research on animals?	No
Were those animals transgenic small laboratory animals?	No
Were those animals transgenic farm animals?	No
Were those animals cloned farm animals?	No
Were those animals non-human primates?	No
RESEARCH INVOLVING DEVELOPING COUNTRIES	
Did the project involve the use of local resources (genetic, animal, plant etc)?	No
Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	No
DUAL USE	
Research having direct military use	No
Research having potential for terrorist abuse	No

C. Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator	0	1
Work package leaders	1	8
Experienced researchers (i.e. PhD holders)	4	9
PhD student	2	2
Other	14	39

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	10
Of which, indicate the number of men:	10

D. Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project ?	No
6. Which of the following actions did you carry out and how effective were they?	
Design and implement an equal opportunity policy	Not Applicable
Set targets to achieve a gender balance in the workforce	Not Applicable
Organise conferences and workshops on gender	Not Applicable
Actions to improve work-life balance	Not Applicable
Other:	
7. Was there a gender dimension associated with the research content - i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?	No
If yes, please specify:	

E. Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?	Yes
If yes, please specify:	University Students
9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?	Yes

F. Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?	
Main discipline:	
Associated discipline:	2.3 Other engineering sciences (such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other applied subjects)
Associated discipline:	

G. Engaging with Civil society and policy makers

11a. Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)	Yes
11b. If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?	No
11c. In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	
12. Did you engage with government / public bodies or policy makers (including international organisations)	Yes, in communicating /disseminating / using the results of the project
13a. Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?	Yes - as a primary objective (please indicate areas below multiple answers possible)
13b. If Yes, in which fields?	
Agriculture	No
Audiovisual and Media	No
Budget	No
Competition	No
Consumers	No
Culture	No
Customs	No
Development Economic and Monetary Affairs	No
Education, Training, Youth	No
Employment and Social Affairs	No
Energy	Yes
Enlargement	No
Enterprise	No
Environment	No
External Relations	No
External Trade	No
Fisheries and Maritime Affairs	No
Food Safety	No
Foreign and Security Policy	No
Fraud	No

Humanitarian aid	No
Human rightsd	No
Information Society	No
Institutional affairs	No
Internal Market	No
Justice, freedom and security	No
Public Health	No
Regional Policy	No
Research and Innovation	No
Space	No
Taxation	No
Transport	No
13c. If Yes, at which level?	European level

H. Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	10
To how many of these is open access provided?	4
How many of these are published in open access journals?	4
How many of these are published in open repositories?	0
To how many of these is open access not provided?	6
Please check all applicable reasons for not providing open access:	
publisher's licensing agreement would not permit publishing in a repository	Yes
no suitable repository available	No
no suitable open access journal available	Yes
no funds available to publish in an open access journal	No
lack of time and resources	No
lack of information on open access	No
If other - please specify	
15. How many new patent applications ('priority filings') have been made? ('Technologically unique': multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).	0

16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).

Trademark	0
Registered design	0
Other	0

17. How many spin-off companies were created / are planned as a direct result of the project?

Indicate the approximate number of additional jobs in these companies: 0

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:

Increase in employment, In small and medium-sized enterprises

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:

0Difficult to estimate / not possible to quantify

I. Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?

Yes

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?

No

22. Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?

Press Release	Yes
Media briefing	No
TV coverage / report	No
Radio coverage / report	No
Brochures /posters / flyers	Yes
DVD /Film /Multimedia	No
Coverage in specialist press	Yes
Coverage in general (non-specialist) press	Yes
Coverage in national press	Yes
Coverage in international press	No
Website for the general public / internet	Yes

Event targeting general public (festival, conference, exhibition, science café)	No
--	----

23. In which languages are the information products for the general public produced?

Language of the coordinator	No
Other language(s)	Yes
English	Yes

Attachments	Annex I.pdf, Annex Table 1.pdf, Annex Table 2.pdf
Grant Agreement number:	285158
Project acronym:	HEAT4U
Project title:	Gas Absorption Heat Pump solution for existing residential buildings
Funding Scheme:	FP7-CP-IP
Project starting date:	01/11/2011
Project end date:	31/10/2014
Name of the scientific representative of the project's coordinator and organisation:	Mr. Luigi Tischer ROBUR SPA
Name	
Date	30/12/2014

This declaration was visaed electronically by Luigi TISCHER (ECAS user name ntischlu) on 30/12/2014