

**iSERVcmb – a survey of the existing metering, data collection and handling protocols  
found across Eurovent Association members**

**Technical report of findings to April 2014  
Report in support of the aims of iSERVcmb**

By

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Intelligent Energy – Europe (IEE) SAVE Project

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Project websites:

Main website: <http://www.iservcmb.info>

Database website: <http://www.iservcmb.eu>

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## Executive Summary

This report takes place in the context of iSERVcmb, a European project designed to look at end use of HVAC systems across Europe. The iSERV project provides an approach to achieving this in practice and allowing to be used across all building types in the EU Member States. The iSERV approach introduces an electronic method of using existing metering and sensors, along with information on buildings assets and activities, such that benchmarks, powerful in diagnostic work, can be derived from that data - and produced for individual building configurations and activities supported.

To obtain feedback about the elements of the iSERV approach from the view point of HVAC manufacturers, a survey was designed and distributed to members of Eurovent Association.

The aim of this survey was:

to extract information regarding

- what manufacturers find valuable in such an approach
- what manufacturers consider as necessary or unnecessary,

to highlight

- what is already taking place in practice

and check

- whether manufacturers would wish to use such an approach to manage your systems if it were available as a tool, and under what conditions.

The results of this survey are used in iSERVcmb to underpin the assertion that the iSERVcmb approach is potentially applicable and that its specifics agree with what exists in the market.

Participants were recruited from Eurovent Association, an organisation in which 14 National Associations from 12 countries are participating.

This report focuses on data collection conducted between 1/2/2014 and 7/4/2014.

The main findings are:

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- ✓ The majority of the survey's respondent's work for HVAC manufacturers located in NW Europe and primarily manufacturing Air Handling units.
- ✓ Continuous monitoring of HVAC components is clearly considered to be helpful in reducing overall energy consumption in buildings.
- ✓ Current HVAC products can provide energy and other performance data over the internet for use by their customers with energy Use (kWh), Air Temperatures (°C), Flow rates (l/s or m<sup>3</sup>/s), Fluid Temperatures (°C) and Pressure drops (Pa) readily available in most products. Data for Power Demand (W), Relative Humidity (RH) and Flow velocity (m/s) appear not to be as available compared to the aforementioned metrics.
- ✓ HVAC Manufacturers appear to be divided regarding the prospect of providing HVAC energy and performance data, with those willing to share data being able to provide data primarily for Air Handling Units for use by their customers.
- ✓ From the HVAC manufacturers' point of view, the main barriers preventing them from integrating online monitoring within their products are related to the technical know-how/technology behind the use of online monitored data, followed by cost (cost to manufacturer, investment and maintenance cost for customer) and the lack of coherent standards for these systems.
- ✓ According to HVAC manufacturers, it appears that the main advantages for integrating online monitoring systems within their products would be the Additional value for the customer and the Ability to comply with forthcoming legislation aimed at nearly Zero Energy Buildings.
- ✓ Amongst those manufacturers that knew about iSERV, there is unanimous agreement that similar projects can be helpful for their companies, indicating that the immediate benefit from iSERV is to "Obtain information, comparison and analysis of the in-use energy consumption of my systems and components". The vast majority also agreed they would be interested in participating in a follow-up project to iSERV.
- ✓ It would appear that HVAC manufacturers are sceptical to the prospect of complying with a standard covering data requirements from HVAC components to allow their products to participate in an iSERV-type process. There is a widespread belief that a possible agreement to this issue would depend on the final data standard agreed, on the numbers of competitors participating, and on ensuring that all extra costs would be imposed fairly across competing technologies.
- ✓ In the case of the creation of an iSERV type of standard, manufacturers would be interesting in seeing HVAC component energy consumption and Outdoor climate conditions recorded, with Whole building energy consumption and Comfort related

parameters following. To such a standard, most manufacturers indicated that they can provide non sub-hourly data.

To conclude there is great potential of an iSERV type process being implemented across Europe. HVAC Manufacturers consider that continuous monitoring of HVAC components is clearly helpful in reducing overall energy consumption in buildings, and most can provide energy and other performance data over the internet for use by their customers. Further cooperation with the HVAC manufacturing industry is required to address:

- The HVAC industry's hindrance to provide HVAC energy and performance data for use by their customers.
- The main barriers HVAC manufacturers believe to be preventing them from integrating online monitoring within their products.
- The HVAC industry's scepticism on complying with a standard covering data requirements from HVAC components to allow their products to participate in an iSERV-type process.

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## **Acknowledgements**

We would like to thank the many people who have supported this project.

Firstly, we would like to thank Sylvain Courtey, Deputy Certification Manager of Eurovent Certification, who assisted in the collation and distribution of this questionnaire to the Eurovent Association members.

We would also like to thank the participants who have agreed to take part in this study, and for giving up their time to fill out this questionnaire.

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## Background of survey research

### iSERV cmb Project Overview

This is a report in support of the aims of the E.C. funded project “Inspection of HVAC Systems through continuous monitoring and benchmarking (iSERV cmb)”.

The project shows the practical operation and benefits of an automatic monitoring and feedback system, as now allowed for in the recast EPBD, applied to Heating, Ventilation and Air-Conditioning systems in EU Member States. It is an important project as previous work has indicated real savings of up to 60% are achievable in individual HVAC systems through the iSERVcmb project approach. The project has recruited over 1000 operating HVAC systems from around Europe. It has the support of the two main professional bodies for HVAC systems in Europe – CIBSE and REHVA – eight universities, an HVAC Maintenance company and an Energy Database SME, as well as input and interest from HVAC component manufacturers and property developers.

Building on the results of its predecessor projects, AUDITAC (2005-2007) and HARMONAC (2007-2010), the iSERVcmb project seeks to understand how energy is used in HVAC systems and buildings through evidence based analysis of real-world energy performance data. The project demonstrates how significant electrical savings, ranging from 5% to 30% on average, can be achieved by understanding the details of energy usage at the level of individual components within buildings.

The specific objectives of EACI from this funding call, and iSERV’s impact in response to these objectives, are:

- **Reduce energy consumption across the EU MS over the life of the project in line with the EU 2020 targets.**
- **To build strong foundations for further reductions after the project officially finishes.**
- **Projects to have a significant impact in terms of energy efficiency.**
- **Strong replicability across the EU MS.**
- **To create the right market conditions for their use**

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## Introduction to the survey research

The iSERV project provides an approach to achieving this in practice which can be used across all building types in the EU Member States. Key to this approach is the establishment of statistically robust benchmarks of energy use at HVAC component level, derived from sub-hourly automatic monitoring data collected from over 1000 HVAC systems across the EU. The iSERV approach introduces an electronic method of using existing metering and sensors, along with information on buildings assets and activities, such that benchmarks, powerful in diagnostic work, can be derived from that data - and produced for individual building configurations and activities supported.

To obtain feedback about the elements of the iSERV approach from the view point of HVAC manufacturers, a survey was designed and distributed to members of Eurovent Association.

## Identify research objectives

The aim of this survey was:

to extract information regarding

- what manufacturers find valuable in such an approach
- what manufacturers consider as necessary or unnecessary,

to highlight

- what is already taking place in practice

and check

- whether manufacturers would wish to use such an approach to manage your systems if it were available as a tool, and under what conditions.

The results of this survey are used in iSERVcmb to underpin the assertion that the iSERVcmb approach is potentially applicable and that its specifics agree with what exists in the market.

Participants were recruited from Eurovent Association, an organisation in which 14 National Associations from 12 countries are participating. The survey targeted HVAC manufacturers. A total of 57 individuals responded to this survey.

This report focuses on data collection conducted between 1/2/2014 and 7/4/2014.

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The results of this survey are used in iSERVcmb to underpin the assertion that the iSERVcmb approach is potentially applicable and that its specifics agree with what exists in the market.

## Methodology

The survey was designed using Survey Monkey, a web based survey platform. The link of the survey was then sent to 14 National Associations from 12 countries are participating in Eurovent Association, by Sylvain Courtey, Deputy Certification Manager of Eurovent Certification, along with an introductory email asking members to contribute to the iSERV project's survey.

The European Committee of Air Handling and Refrigeration (Eurovent), is the European trade association for the European refrigeration, air conditioning, air handling, heating and ventilation industry. Within the 14 member national trade associations it represents more than 150 000 employees.

The design of the survey aimed primarily at capturing the view of manufacturers on the following themes:

- the continuous monitoring of HVAC components,
- what exists in the market in terms of the energy and performance data collected by existing HVAC systems,
- the integration of online monitoring within HVAC products,
- and
- the iSERV project.

In accordance to the themes listed above, the survey was divided into two parts. The first part of the survey aimed to capture the view of manufacturers on concepts related to the continuous monitoring of HVAC components. The second part focused on capturing the reaction of manufacturers to the iSERV project.

**“Are you working for an HVAC manufacturer?”** was used as the survey's first question to ensure that the targeted audience is reached. Participants, who replied negatively, were directed to the end of the survey.

**“Do you know about the iSERV project?”** was used as the survey's eleventh question to ensure that feedback about the iSERV project was collected from respondents that were aware of the project. Participants, who replied negatively, were directed to the end of the survey and the project's website.

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Upon completion of the survey, participants were asked if they wanted to be informed about the project findings, and were prompted to provide their contact info, as well as they were given the chance to send any general comments.

No rewards were sent upon receipt of the questionnaire.

The responses given in the questionnaire were exported to Excel and analysed using descriptive statistics. Findings are presented in tables which contain frequencies of responses. We also include percentages to help comparison of responses across questions.

Table 1 gives a summary of the survey questions. A copy of the questionnaire can be found in the Appendix.



**Table 1 : Summary of Survey Questions**

No	Question	Qualifying Answers	Disqualifying Answers	If Qualified directed to:	If Disqualified directed to:	No. Answers	No. Skips
Q1	Are you working for an HVAC manufacturer?*	Yes	No	Q2	End of Survey	57	0
Q2	Please select your country of residence. *	<List of Countries>		Q3		49	8
Q3	Which HVAC product does your company manufacture? Please tick all that apply:**	<List of HVAC products>		Q4		49	8
Q4	Do you agree that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings? *	Yes, No		Q5		48	9
Q5	Can/could your current HVAC products provide energy and other performance data over the internet for use by your customers?*	Yes	No	Q6	Q7	46	11
Q6	Please tick all the parameters you can or could provide: **	<List of parameters>		Q8		31	26
Q7	Do you have plans to provide such information? *	Yes	No	Q8	Q9	11	46
Q8	For which products/components can/could you provide energy and other performance data over the internet for use by your customers? **	<List of components>		Q9		34	23
Q9	In your view, what are the main barriers preventing HVAC manufacturers from integrating online monitoring within their products? Please tick all that apply:**	<List of barriers>		Q10		37	20
Q10	In your view, what are (would be) the main advantages of HVAC product/component manufacturers integrating online monitoring systems within their products? **	<List of advantages>		Q11		37	20
Q11	Do you know about the iSERV project?*	Yes	No	Q12	Q24	37	20
Q12	How did you hear about the iSERV project? Please tick the main introduction route.**	<List of routes>		Q13		6	51
Q13	Do you consider projects like iSERV to be helpful for your company?*	Yes, No		Q14		6	51
Q14	What are the immediate benefits you see from iSERV? Please tick all that apply:**	<List of benefits>		Q15		6	51

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Q15	The project is achieving significant energy savings in systems across Europe but the process used requires greater access to data at the HVAC component level to have the maximum impact. Would you be happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process? Please choose one option:*	Yes, No, Maybe		Q16		5	52
Q16	Please give reasons in box below:	Free Text		Q17		5	52
Q17	In addition to the building related data that iSERV collects, which performance-related continuous data parameters would you like to see recorded according to such a standard? Please tick all that apply:**	<List of parameters>		Q18		5	52
Q18	What data collection frequency could you provide for such a scheme? Please choose one option:**	<List of data>		Q19		5	52
Q19	Are there any other any other outputs you would like to see from the iSERV system to enable HVAC system energy improvements to take place? Please describe each one briefly:	Free Text		Q20		2	55
Q20	As an HVAC product/component manufacturer, would you be interested in participating in a follow-up project to iSERV?*	Yes, No		Q21		5	52
Q21	Will you be using or planning to use any of the iSERVcmb project results in improving your corporate image? Please choose one option and provide a comment if possible:*	Yes, No, Maybe		Q22		5	52
Q22	Do you want to be informed about the iSERV project final findings?*	Yes, No		Q23		5	52
Q23	Contact Page. Please complete if you wish us to keep you in touch with the project.	Contact Info Fields		Q24		3	54
Q24	If you have any other general comments, please write them here:	Free Text		End of Survey		2	55

\*Questions allowing one possible answer

\*\*Questions allowing multiple answers

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## Reporting strategy

We have presented the data in two sections:

- Sample demographics and representativeness - overviewing the sample at the beginning of the data collection, and drop-out as the survey proceeds
- Findings - overview of the findings which were collected through the survey monkey by those who qualified in terms of level of metering.

A number of tables are referred to throughout the report, some of which may be found in the appendix. The data is presented in terms of both numbers and percentages. As our sample numbers are low, the percentages should be interpreted cautiously, and numbers within individual cells of tables referred to at all times.

## Sample demographics and representativeness

### Project sample and population

In this section, the survey sample is examined to see how representative it is of the population from which participants were recruited.

One important consideration is whether the sample of 57 participants we received responses from is representative.

Tables presenting the demographic data may be found in the appendix.

The survey was distributed through Eurovent Association, an organisation in which 14 National Associations from 12 countries are participating. The survey targeted HVAC manufacturers. The group was deemed as the most appropriate channel through which the survey was to be circulated as its objectives are as follows:

- To represent the European air conditioning, heating, ventilation and refrigeration manufactures and their national trade associations on international and European issues;
- To represent the members interests towards relevant European, national and worldwide bodies;

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- To keep members informed of relevant legislation emanating from the European Union or other bodies and be the key player to European legislations and regulations;
- To develop and keep a reliable global statistic reporting system through Eurovent Market Intelligence;
- To develop third party product certification programmes for our industry through Eurovent Certification Company;
- To assure participation in international standardisation;
- To improve communication on general issues as refrigerant, energy efficiency or indoor air quality;
- To publish guides and technical manuals;
- To develop co-operative pre-competitive research;
- To prepare the Association as an organisation that can self- regulate our Industry;
- To encourage the exchange of information and experience amongst the members;
- To promote efficient and environmentally friendly systems
- To co-operate with associations in similar fields

A total of 57 individuals responded to this survey. However, 4 were deemed unsuitable to complete it as there were not working for an HVAC manufacturer.

The small sample size must be taken into account when assessing the representativeness of our sample to the population. The following points are noted regarding the survey **respondents**:

1. The majority of the respondents are based in France (20.4%) or Non EU countries (30.6%)
2. The majority of the respondents are based inside the EU (69.4%)
3. There is an underrepresentation of SE European countries (14.2%).
4. Participants from NW European countries amount to more than half of the respondents (55.2%).
5. The majority of respondents work for manufacturers that produce Air Handling Units (57.14%).
6. Smaller groups of respondents work for manufacturers that produce chillers (28.6%), Air-to-water, water-to-water Heat-pumps (26.5%), and Air-to-air, water-to-air Air conditioners (24.5%).

### **Participant drop-out**

Participant drop-out is summarised as follows:

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- 7% of initial survey respondents were disqualified from the survey as they were not working for an HVAC manufacturer.
- From Q2 to Q3 that are mostly concerned with gathering demographic data from the respondents, there is a steady dropout rate ranging from 0 to 14%.
- Out of the 53 participants stating they work for an HVAC manufacturer, only 11% knew about the iSERV project.

This information is summarised in the Table 2.

**Table 2: Responses for each question**

<b>No.</b>	<b>No. Answers</b>	<b>No. Skips</b>	<b>% of drop out compared to previous question</b>	<b>% of drop out compared to Q1</b>
<b>Q1</b>	57	0	0%	0%
<b>Q2</b>	49	8	14%	14%
<b>Q5</b>	49	8	16.3%	14%
<b>Q6</b>	48	9	18.8%	15.8%
<b>Q7</b>	46	11	23.9%	19.3%
<b>Q8</b>	31	26	83.9%	45.6%
<b>Q9</b>	11	46	-	80.7%
<b>Q10</b>	34	23	67.6%	40.35%
<b>Q11</b>	37	20	54%	35.1%
<b>Q12</b>	6	51	-	89.5%
<b>Q13</b>	6	51	-	89.5%
<b>Q14</b>	6	51	-	89.5%
<b>Q15</b>	6	51	-	89.5%
<b>Q16</b>	6	51	-	89.5%
<b>Q17</b>	5	52	-	91.2%
<b>Q18</b>	5	52	-	91.2%
<b>Q19</b>	5	52	-	91.2%
<b>Q20</b>	5	52	-	91.2%
<b>Q21</b>	2	55	-	96.5%
<b>Q22</b>	5	52	-	91.2%
<b>Q23</b>	5	52	-	91.2%
<b>Q24</b>	5	52	-	91.2%

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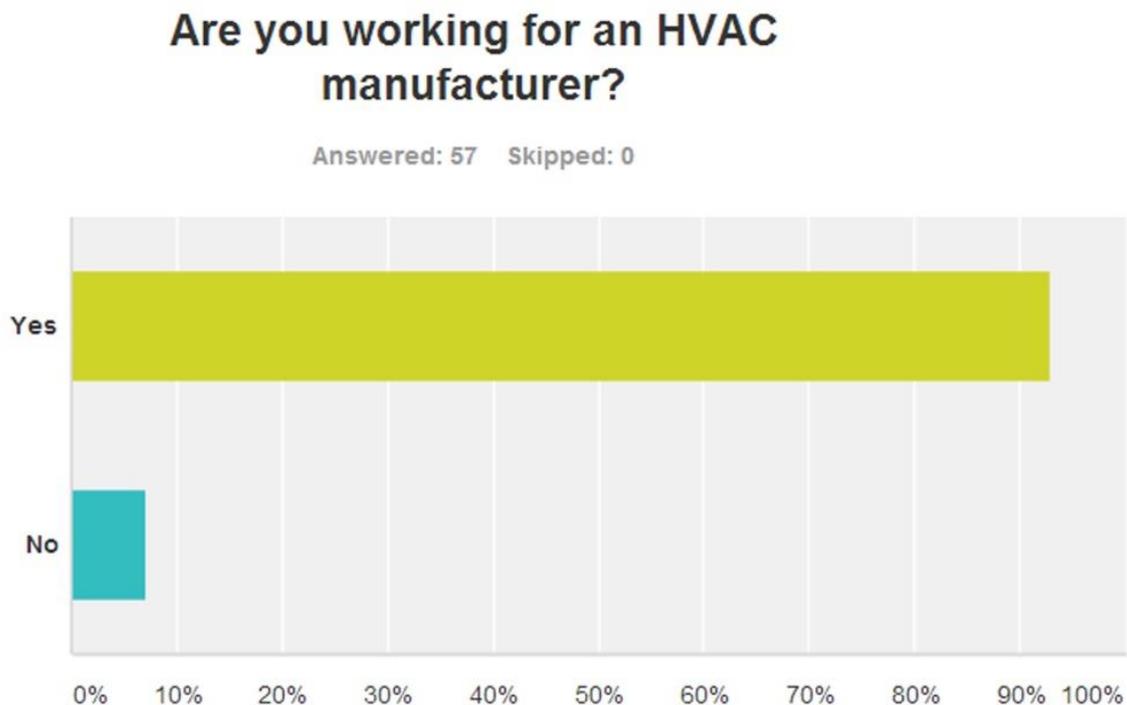
## Findings

### Q1: Are you working for an HVAC manufacturer?

The survey's first question ensured that the targeted audience is reached. Participants, who replied negatively, were directed to the end of the survey.

Figure 1 shows that the majority of the total respondents (93%) were working for an HVAC manufacturer at the time of the survey.

Figure 1 : Distribution of Survey Respondents working for HVAC manufacturers.



#### Summary of Findings:

- ✓ **The majority of the survey respondents worked for an HVAC manufacturer at the time of the survey (93%)**

➤ Please refer to table 3 in the appendix.

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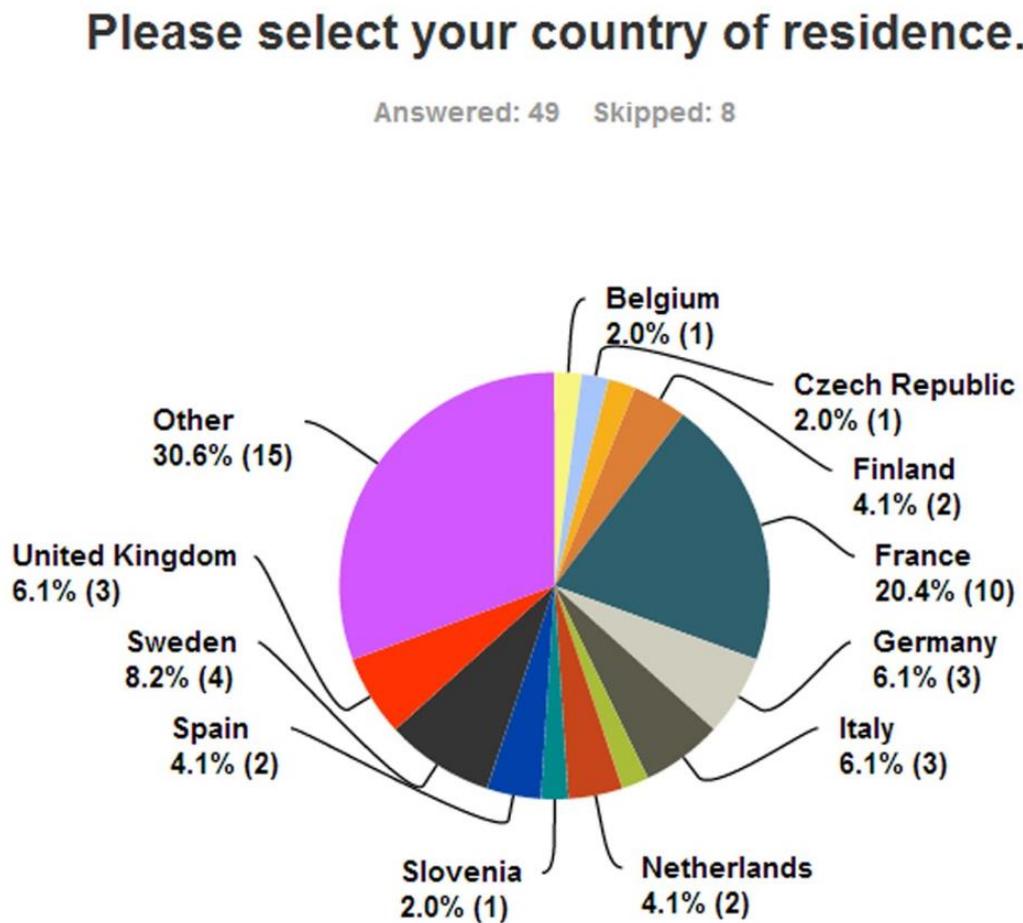
**Q2: Please select your country of residence.**

Overall, the majority of the respondents were based inside the EU (69.4%) with most of them based in France (20.4%) (Figure 2). Participants from Non EU Countries amounted to 30.6%.

SE European countries are under presented in the survey (14.2%) with participants from NW European countries amounting to more than half of the respondents (55.2%).

Respondents from other countries included respondents from Turkey (6.1%), China (4.1%) and Serbia (4.1%) amongst other countries.

**Figure 2: Geographic distribution of qualified survey respondents**



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**Summary of Findings:**

- ✓ **One third of the respondents were based outside the EU (30.6%).**
- ✓ **Participants from NW European countries amount to more than half of the respondents (55.2%).**
- ✓ **The majority of the respondents were based in the France (20.4%).**
- ✓ **There is an underrepresentation of SE European countries (14.2%).**

➤ Please refer to tables 4 and 5 in the appendix.

**Q3: Which HVAC product does your company manufacture? Please tick all that apply:**

A major characteristic of the survey sample is that the majority of respondents work in companies that manufacture Air Handling units (57.1%) (Figure 3). Almost a third of the respondents replied that the company they were working for manufactured chillers (28.6%). Approximately a quarter of the respondents listed Air-to-water, water-to-water Heat-pumps (26.5%), Air-to-air, water-to-air Air conditioners (24.5%) and Rooftops (22.4%). In order of occurrence, other products that were listed were Air-to-water, water-to-water Chillers (18.4%), Fan coils (18.4%), Condensing Units (16.3%) and Chilled Beams (14.3%).

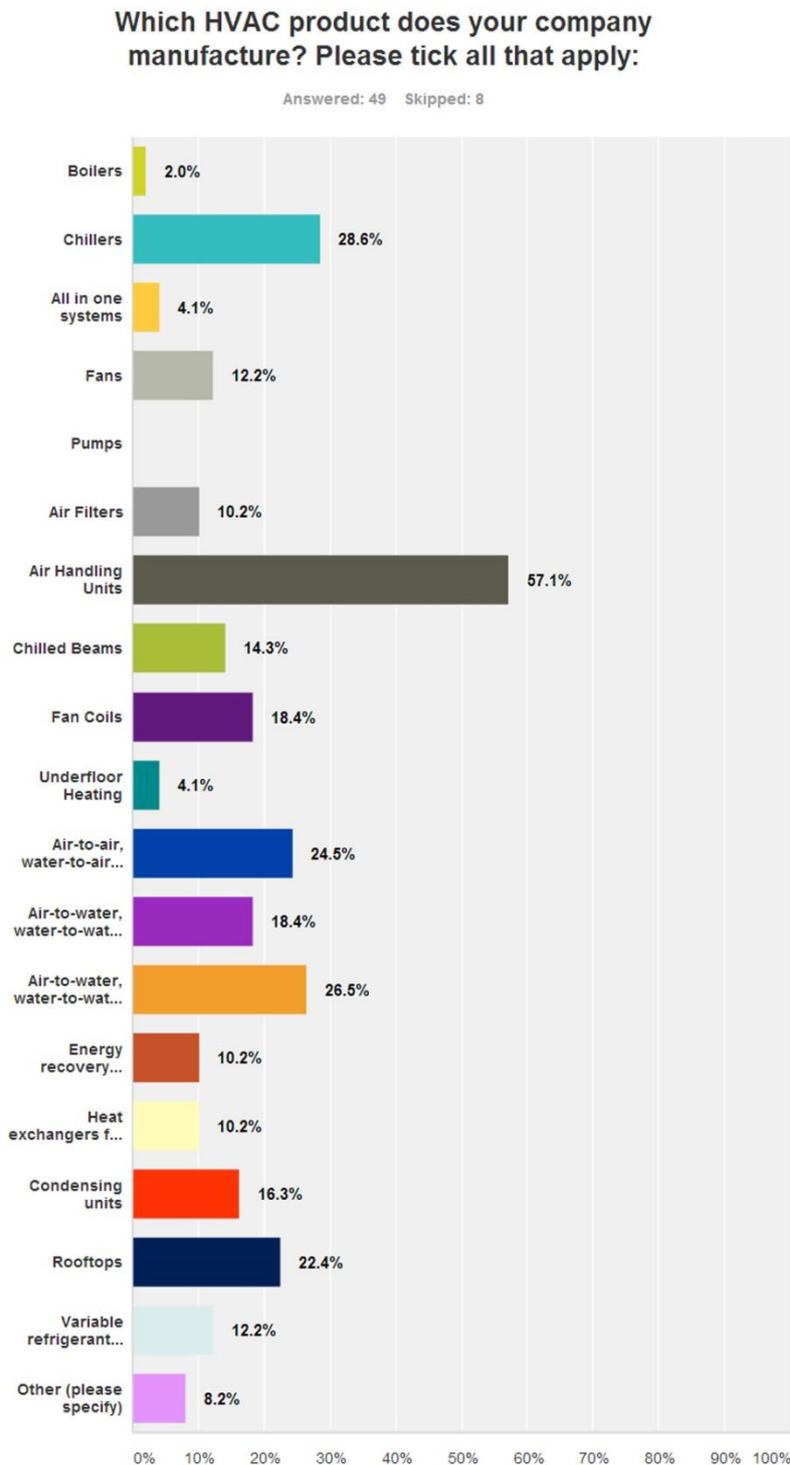
**Summary of Findings:**

- ✓ **The majority of respondents work in companies that manufacture Air Handling units (57.1%)**
- ✓ **Almost a third of the respondents work for companies that manufacture chillers (28.6%).**
- ✓ **Approximately a quarter of the respondents work for companies that manufacture Air-to-water, water-to-water Heat-pumps (26.5%), Air-to-air, water-to-air Air conditioners (24.5%) and Rooftops (22.4%).**

➤ Please refer to tables 6 and 7 in the appendix.

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Figure 3: Distribution of respondents according to sector they are employed in.



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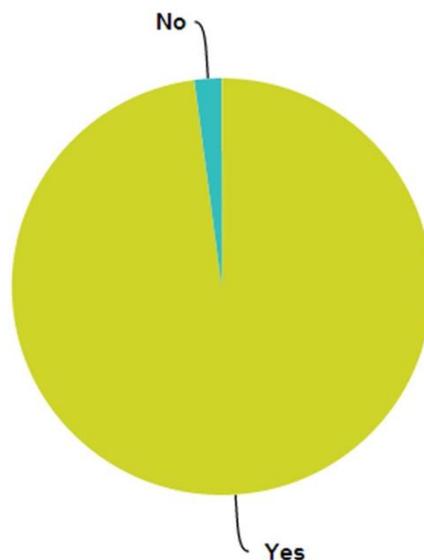
**Q4. Do you agree that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings?**

The vast majority of survey participants (97.9%) agreed that that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings (Figure 4).

**Figure 4 : Q4 -Do you agree that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings?**

**Do you agree that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings?**

Answered: 48 Skipped: 9



**Summary of Findings:**

- ✓ **97.9% of respondents agreed that that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings.**

➤ Please refer to table 8 in the appendix.

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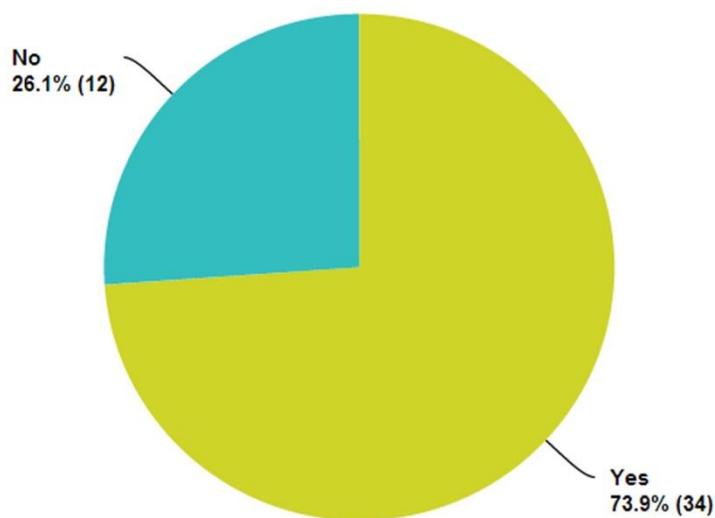
**Q5. Can/could your current HVAC products provide energy and other performance data over the internet for use by your customers?**

More than two quarters of survey participants (73.9%) indicated that their current HVAC products can provide energy and other performance data over the internet for use by their customers (Figure 5).

**Figure 5 : Q5 - Can/could your current HVAC products provide energy and other performance data over the internet for use by your customers?**

**Can/could your current HVAC products provide energy and other performance data over the internet for use by your customers?**

Answered: 46 Skipped: 11



**Summary of Findings:**

- ✓ **The majority of the respondents (73.9%) indicated that their current HVAC products can provide energy and other performance data over the internet for use by their customers.**

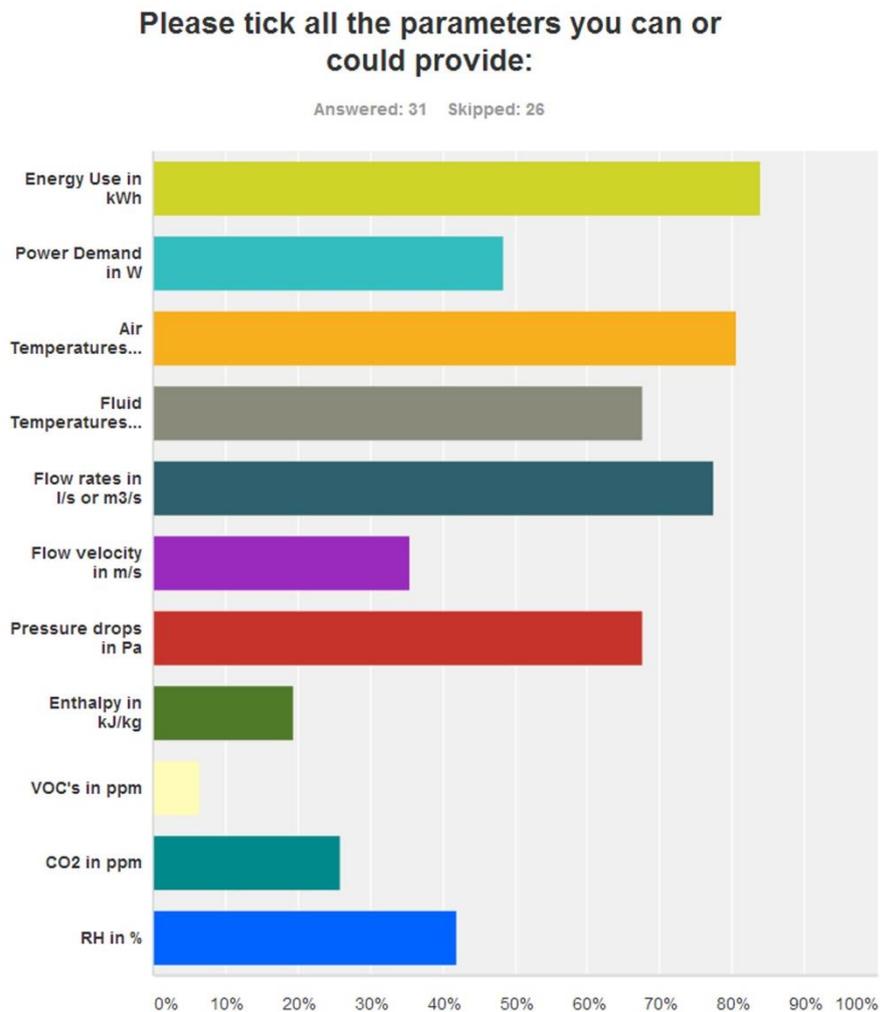
➤ Please refer to table 9 in the appendix.

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**Q6. Please tick all the parameters you can or could provide:**

The majority of the survey respondents indicated that they can provide data on half of the parameters listed in the survey. More than two quarters replied they can provide data for Energy Use in kWh (83.9%), Air Temperatures in °C (80.7%), Flow rates in l/s or m<sup>3</sup>/s (77.4%), Fluid Temperatures in °C (67.7%) and Pressure drops in Pa (67.7%) (Figure 6). Almost half of the respondents indicated that they can provide data for Power Demand in W (48.4%), and more than a third indicated RH in % (41.9%) and Flow velocity in m/s (35.5%). In order of occurrence, other parameters that were listed were CO<sub>2</sub> in ppm (25.8%), Enthalpy in kJ/kg (19.4%), and VOC's in ppm (6.5%).

**Figure 6: Q6- Please tick all the parameters you can or could provide:**



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#### Summary of Findings:

- ✓ **A strong majority of respondents replied they can provide data for Energy Use in kWh (83.9%), Air Temperatures in °C (80.7%), Flow rates in l/s or m<sup>3</sup>/s (77.4%), Fluid Temperatures in °C (67.7%) and Pressure drops in Pa (67.7%).**
- ✓ **Almost half of the respondents indicated that they can provide data for Power Demand in W (48.4%).**
- ✓ **More than a third of the respondents indicated that can provide data for RH in % (41.9%) and Flow velocity in m/s (35.5%).**

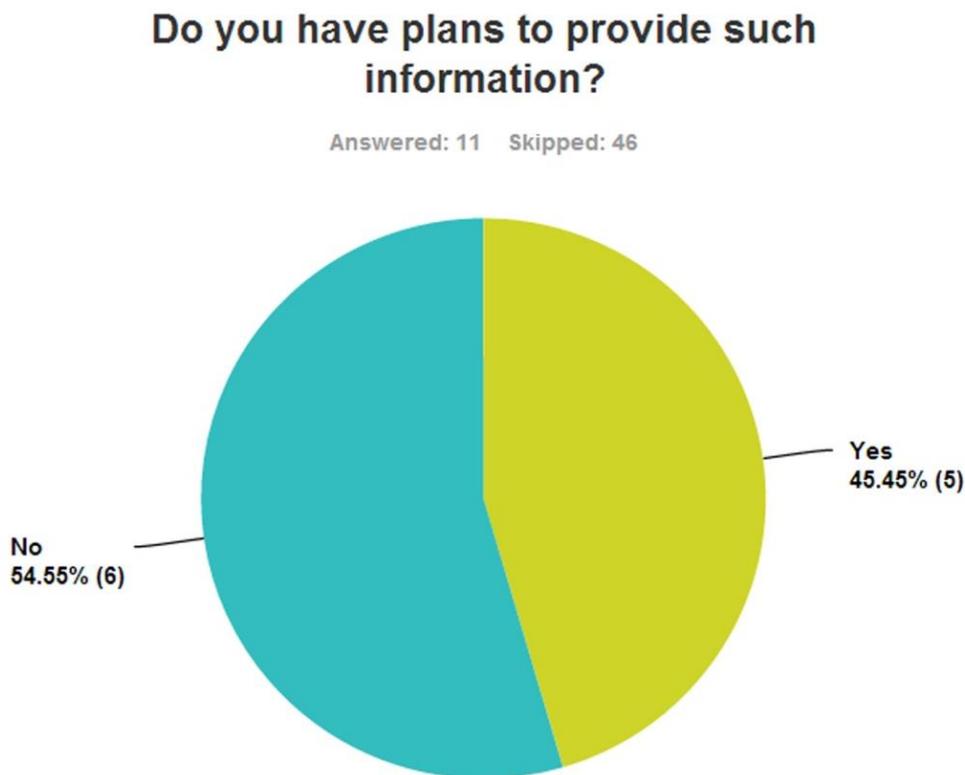
- Please refer to table 10 in the appendix.

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### Q7. Do you have plans to provide such information?

In this question, the respondents appear divided more than half replying negatively to the prospect of providing HVAC energy and performance data (54.6%) and 45.4% replying positively (Figure 7).

Figure 7: Q7 - Do you have plans to provide such information?



#### Summary of Findings:

- ✓ Respondents appear divided when asked about the prospect of providing HVAC energy and performance data with 54.6% replying negatively and 45.4% replying positively.

➤ Please refer to table 11 in the appendix.

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**Q8. For which products/components can/could you provide energy and other performance data over the internet for use by your customers?**

Half of the respondents indicated they can provide energy and other performance data over the internet for use by their customers for Air Handling Units (Figure 8). Almost a third indicated they could do the same for Chillers (29.4%) and Air-to-water, water-to-water Heat-pumps (29.4%). Approximately a fifth of the respondents listed Air-to-water water-to-water Chillers (20.6%), and Rooftops (20.6%). In order of occurrence, other products/components that were listed were Air-to-air, water-to-air Air conditioners (17.6%), Fan Coils (11.8%), Heat Exchangers for refrigeration (8.8%) and All in one systems (8.8%) amongst others.

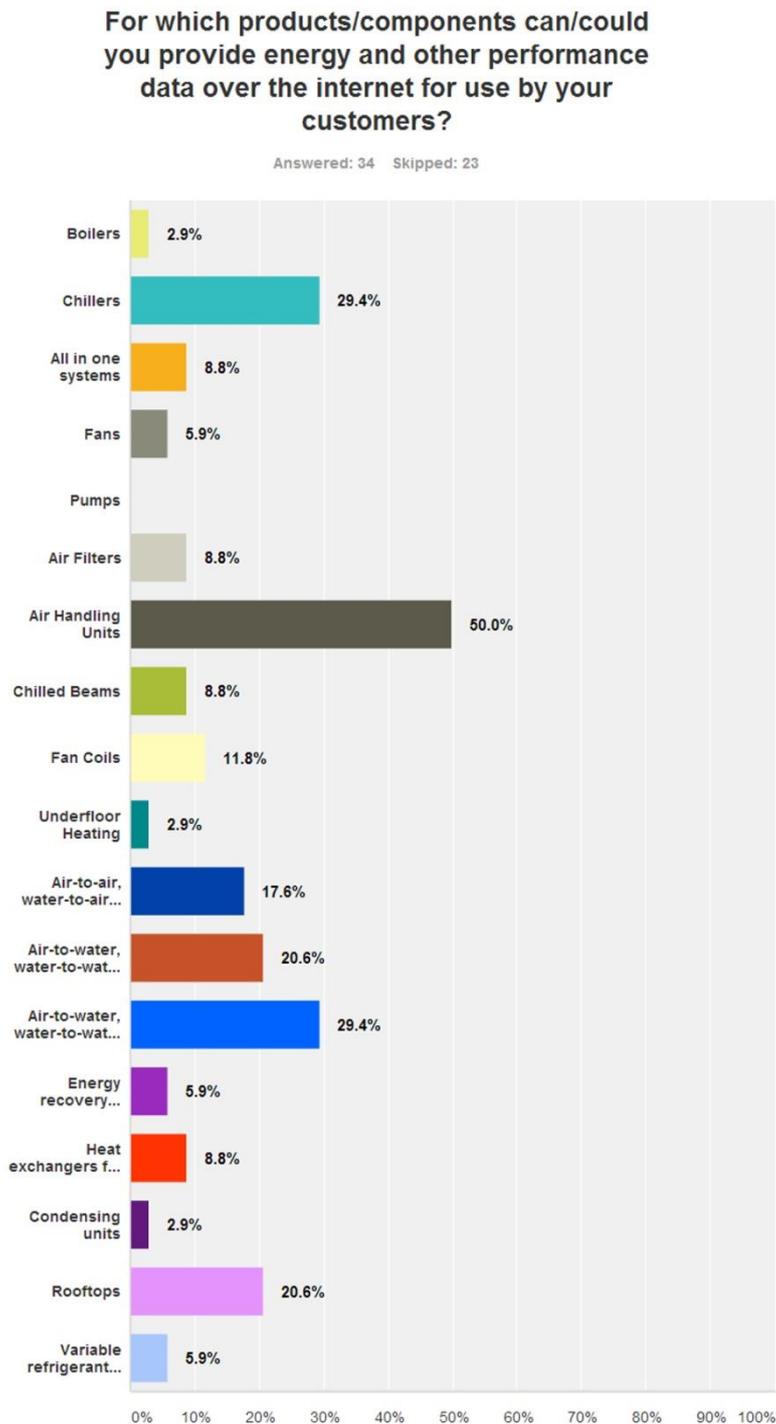
**Summary of Findings:**

- ✓ **Half of the respondents indicated they can provide energy and other performance data over the internet for use by their customers for Air Handling Units.**
- ✓ **Almost a third indicated they could do the same for Chillers (29.4%) and Air-to-water, water-to-water Heat-pumps (29.4%).**
- ✓ **Approximately a fifth of the respondents listed Air-to-water water-to-water Chillers (20.6%), and Rooftops (20.6%).**

➤ Please refer to tables 12 and 13 in the appendix.

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**Figure 8: Q8 - For which products/components can/could you provide energy and other performance data over the internet for use by your customers?**



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**Q9. In your view, what are the main barriers preventing HVAC manufacturers from integrating online monitoring within their products? Please tick all that apply:**

The majority of respondents indicated that the main barriers preventing HVAC manufacturers from integrating online monitoring within their products were “Cost to manufacturer Makes products uncompetitive on price” (67.6%) and “Additional Investment cost for the customer” (64.9%) (Figure 9). More than a third, replied that “Lack of coherent standards for these systems” (43.2%) and “Additional maintenance cost for the customer” (35.1%) were the main barriers. Almost a third indicated the “Lack of interest from customers” (32.4%). In order of occurrence, respondents replied that the main barriers included the “lack of use for the data” (27%), “Technology availability” (24.3%) and the “Lack of manufacturing knowledge” (13.5%). Other replies that were given were:

- *IT projects development, time and complexity* (2.7%)
- *Security of data* (2.7%)
- *The most important figures cannot be measured correctly on site, especially temperature efficiency of plate heat exchangers and rotary wheels (very inhomogeneous temperature profile)* (2.7%)
- *Some customers prefer to handle directly this information about their application and not share them.* (2.7%)
- *The units are all Tailor-made* (2.7%)

**Summary of Findings:**

- ✓ **The majority of respondents indicated that the main barriers preventing HVAC manufacturers from integrating online monitoring within their products were “Cost to manufacturer Makes products uncompetitive on price” (67.6%) and “Additional Investment cost for the customer” (64.9%).**
- ✓ **More than a third indicated that the main barriers were the “Lack of coherent standards for these systems” (43.2%) and “Additional maintenance cost for the customer” (35.1%).**
- ✓ **Almost a third indicated the “Lack of interest from customers” (32.4%).**
- ✓ **The majority of respondents (72.9%) indicated different aspects of the technology behind the use of online monitored data as the main barrier.**

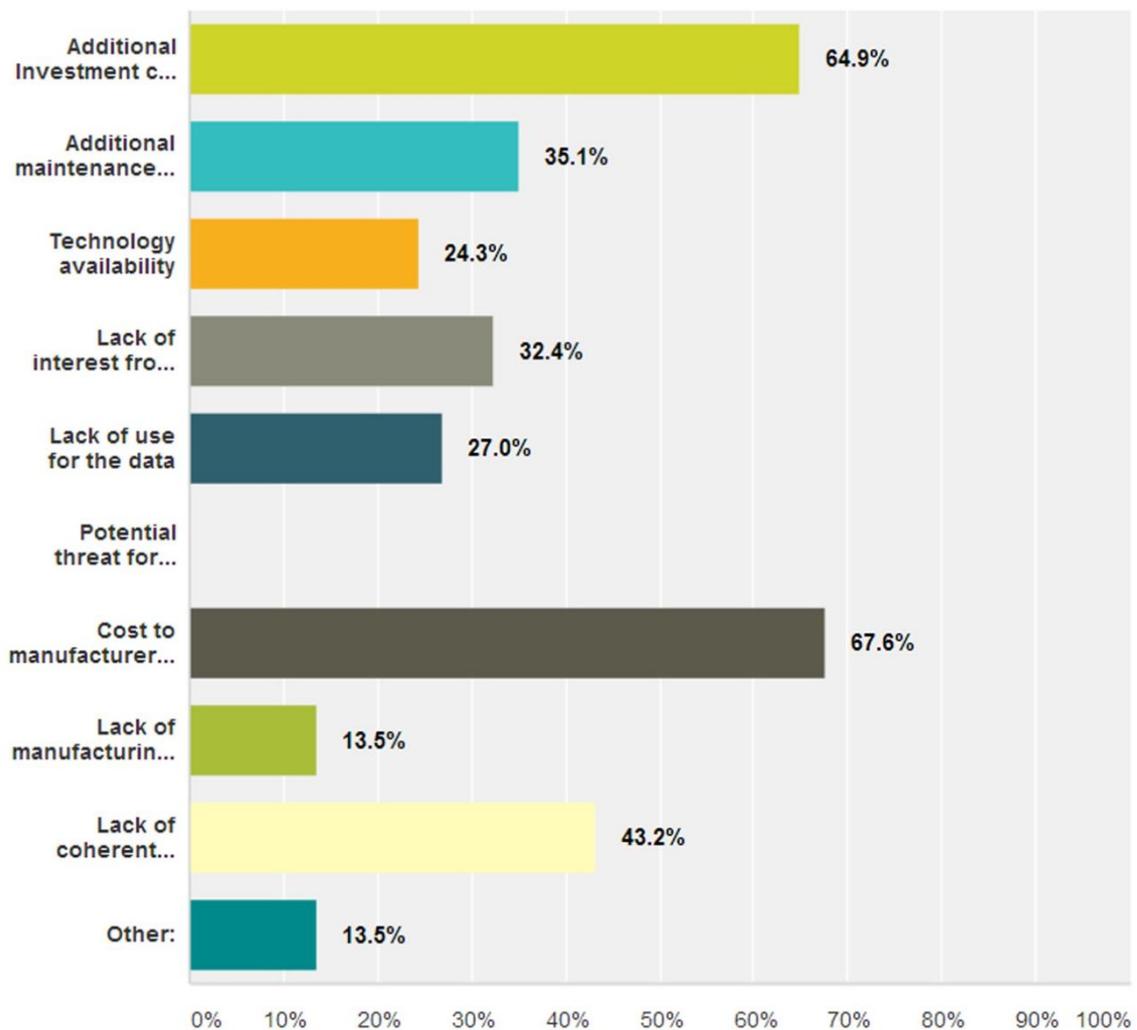
➤ Please refer to tables 14 and 15 in the appendix.

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Figure 9: Q9 - In your view, what are the main barriers preventing HVAC manufacturers from integrating online monitoring within their products? Please tick all that apply

### In your view, what are the main barriers preventing HVAC manufacturers from integrating online monitoring within their products? Please tick all that apply:

Answered: 37 Skipped: 20

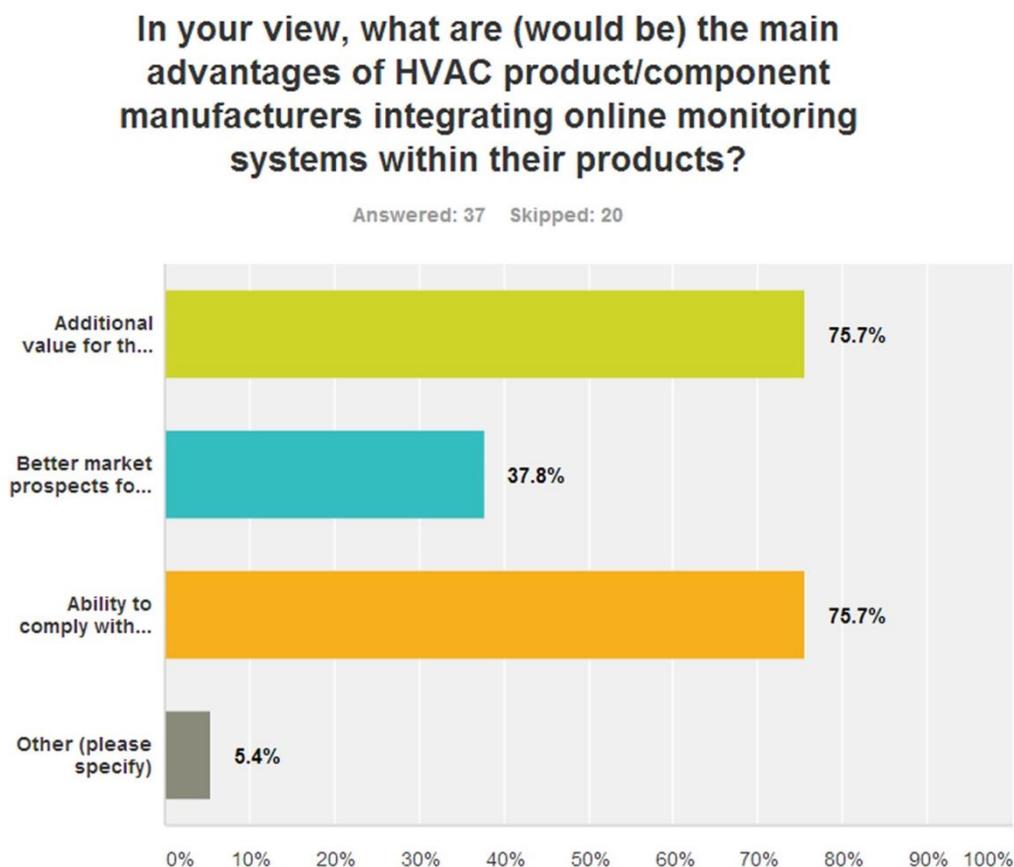


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**Q10. In your view, what are (would be) the main advantages of HVAC product/component manufacturers integrating online monitoring systems within their products?**

A strong majority of the respondents indicated that the main advantages of HVAC product/component manufacturers integrating online monitoring systems within their products are or would be the Additional value for the customer (75.7%) and the Ability to comply with forthcoming legislation aimed at nearly Zero Energy Buildings (75.7%)(Figure 10). More than a third replied that the main advantage is or would be Better market prospects for the Manufacturer (37.8%). A minority of the respondents (5.4%) replied that are or would be no advantages.

**Figure 10: Q10 - In your view, what are (would be) the main advantages of HVAC product/component manufacturers integrating online monitoring systems within their products?**



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**Summary of Findings:**

- ✓ **A strong majority of the respondents indicated that the main advantages of HVAC product/component manufacturers integrating online monitoring systems within their products are or would be the Additional value for the customer (75.7%) and the Ability to comply with forthcoming legislation aimed at nearly Zero Energy Buildings (75.7%).**
- ✓ **More than a third replied that the main advantage is or would be Better market prospects for the Manufacturer (37.8%).**

➤ Please refer to tables 16 and 17 in the appendix.

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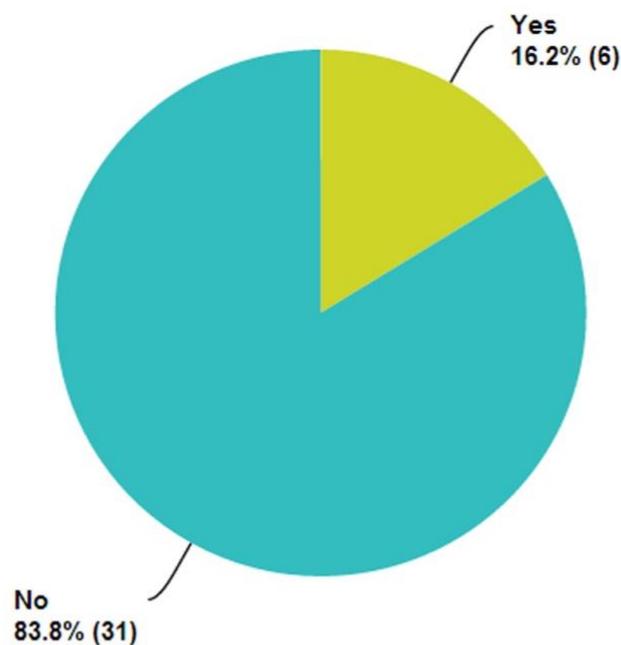
### Q11. Do you know about the iSERV project?

Only a small number of respondents (16.2%) knew about iSERV at the time of the survey (Figure 11).

Figure 11: Q11 - Do you know about the iSERV project?

## Do you know about the iSERV project?

Answered: 37 Skipped: 20



#### Summary of Findings:

- ✓ Only a small number of respondents (16.2%) knew about iSERV at the time of the survey.

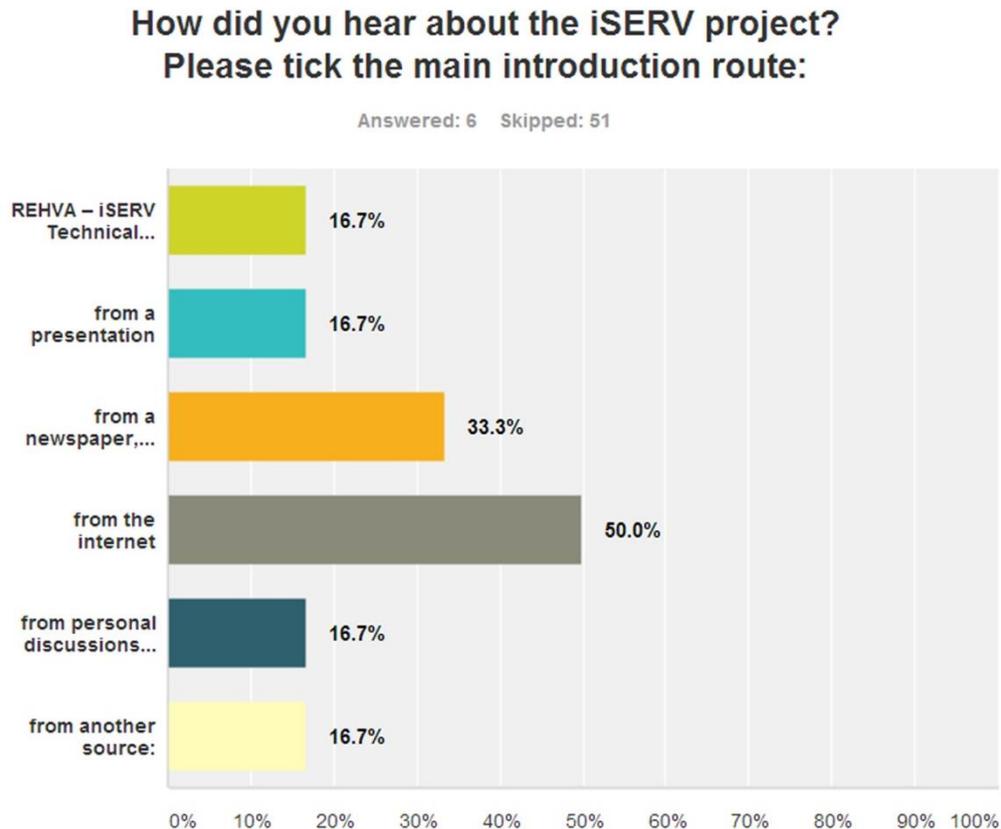
➤ Please refer to table 18 in the appendix.

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**Q12. How did you hear about the iSERV project? Please tick the main introduction route:**

Half of respondents (50%) that knew about iSERV at the time of the project indicated that they had heard about the project from the internet (Figure 12). A third (33.3%) indicated that they had heard about iSERV from a newspaper/technical paper.

**Figure 12: Q12 - How did you hear about the iSERV project? Please tick the main introduction route:**



**Summary of Findings:**

- ✓ **Half of respondents (50%) that knew about iSERV at the time of the project indicated that they had heard about the project from the internet.**
- ✓ **A third (33.3%) indicated that they had heard about iSERV from a newspaper/technical paper.**

➤ Please refer to tables 19 and 20 in the appendix.

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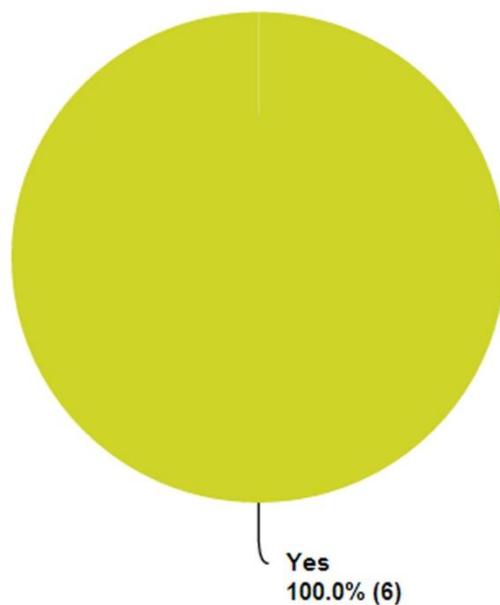
### Q13. Do you consider projects like iSERV to be helpful for your company?

The absolute majority of respondents (100%) that knew about iSERV at the time of the project agree that similar project can be helpful for their company (Figure 13).

Figure 13: Q13 - Do you consider projects like iSERV to be helpful for your company?

## Do you consider projects like iSERV to be helpful for your company?

Answered: 6 Skipped: 51



#### Summary of Findings:

- ✓ **The absolute majority of respondents (100%) that knew about iSERV at the time of the survey agree that similar project can be helpful for their company.**

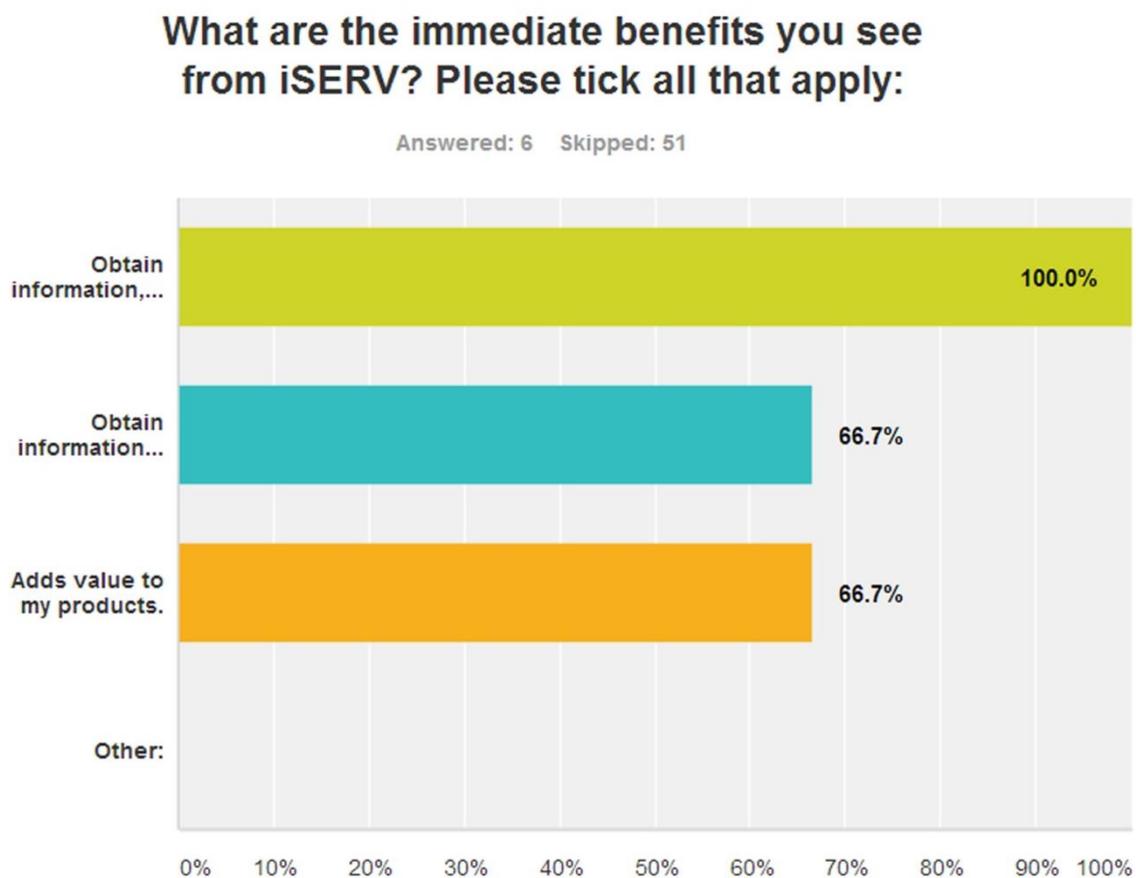
➤ Please refer to table 2 in the appendix.1

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**Q14. What are the immediate benefits you see from iSERV? Please tick all that apply:**

The absolute majority (100%) of the respondents that knew about iSERV at the time of the survey indicated that the immediate benefit from iSERV is to “Obtain information, comparison and analysis of the in-use energy consumption of my systems and components” (Figure 14). Two thirds of the respondents replied that the immediate benefits were “Obtain information that can drive systematic improvements in my products” (66.7%) and “Adds value to my products” (66.7%).

**Figure 14: Q14 - What are the immediate benefits you see from iSERV? Please tick all that apply:**



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**Summary of Findings:**

- ✓ **The absolute majority (100%) of the respondents that knew about iSERV at the time of the survey indicated that the immediate benefit from iSERV is to “Obtain information, comparison and analysis of the in-use energy consumption of my systems and components”.**
- ✓ **Two thirds of the respondents replied that the immediate benefits were “Obtain information that can drive systematic improvements in my products” (66.7%) and “Adds value to my products” (66.7%).**

➤ Please refer to table 22 in the appendix.

**Q15. The project is achieving significant energy savings in systems across Europe but the process used requires greater access to data at the HVAC component level to have the maximum impact. Would you be happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process? Please choose one option:**

Only a fifth (20%) of the respondents that knew about iSERV at the time of the survey indicated stated they would happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process (Figure 15). The majority of the respondents (80%) were sceptical about this proposition and submitted the following reasons:

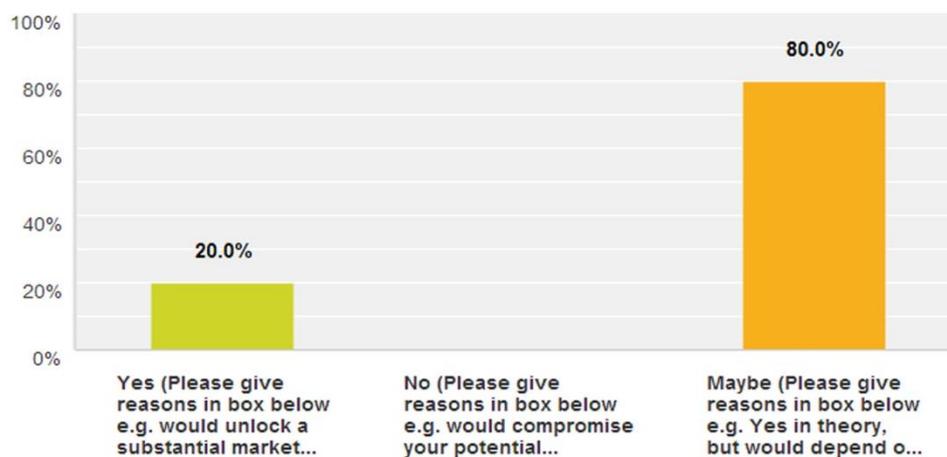
- *Depends on the final data agreed on and on the numbers of competitors participating.*
- *Yes in theory, but would depend on the final data standard agreed on*
- *Depends on the final data standard agreed*
- *May generated business opportunities for companies open to move forward in this market.*
- *It would have to be completely clear that all extra costs would be imposed fairly across competing technologies, for example water-cooled chiller systems vs. air-cooled chiller systems.*

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Figure 15: Q15 - Would you be happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process? Please choose one option:

**The project is achieving significant energy savings in systems across Europe but the process used requires greater access to data at the HVAC component level to have the maximum impact. Would you be happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process? Please choose one option:**

Answered: 5 Skipped: 52



#### Summary of Findings:

- ✓ Only a fifth (20%) of the respondents that knew about iSERV at the time of the survey indicated stated they would happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process.
- ✓ The majority of the respondents (80%) were sceptical about this proposition.

➤ Please refer to table 23 in the appendix.

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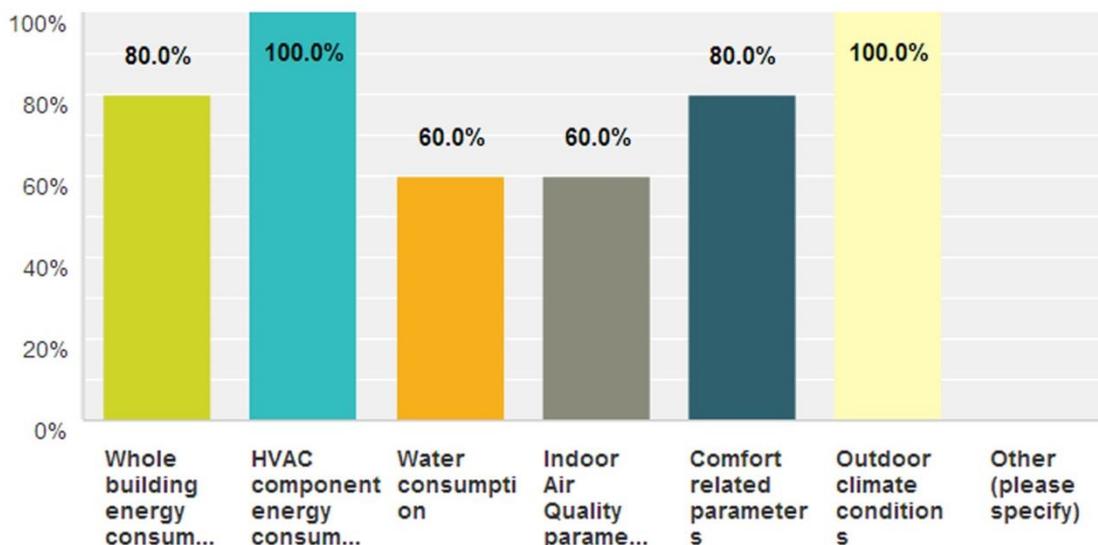
**Q17. In addition to the building related data that iSERV collects, which performance-related continuous data parameters would you like to see recorded according to such a standard? Please tick all that apply:**

The absolute majority (100%) that knew about iSERV at the time of the project indicated that the performance-related continuous data parameters they would you like to see recorded according to an iSERV type of standard are *HVAC component energy consumption* and *Outdoor climate condition* (Figure 16). A strong majority (80%) replied *Whole building energy consumption* and *Comfort related parameters*. More than half (60%) indicated *Water consumption* and *Indoor Air Quality parameters*.

**Figure 16: Q17 - In addition to the building related data that iSERV collects, which performance-related continuous data parameters would you like to see recorded according to such a standard? Please tick all that apply:**

**In addition to the building related data that iSERV collects, which performance-related continuous data parameters would you like to see recorded according to such a standard? Please tick all that apply:**

Answered: 5 Skipped: 52



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**Summary of Findings:**

- ✓ **The absolute majority (100%) that knew about iSERV at the time of the project indicated that the performance-related continuous data parameters they would you like to see recorded according to an iSERV type of standard are *HVAC component energy consumption and Outdoor climate conditions.***
- ✓ **A strong majority (80%) replied *Whole building energy consumption and Comfort related parameters.***
- ✓ **More than half (60%) indicated *Water consumption and Indoor Air Quality parameters.***

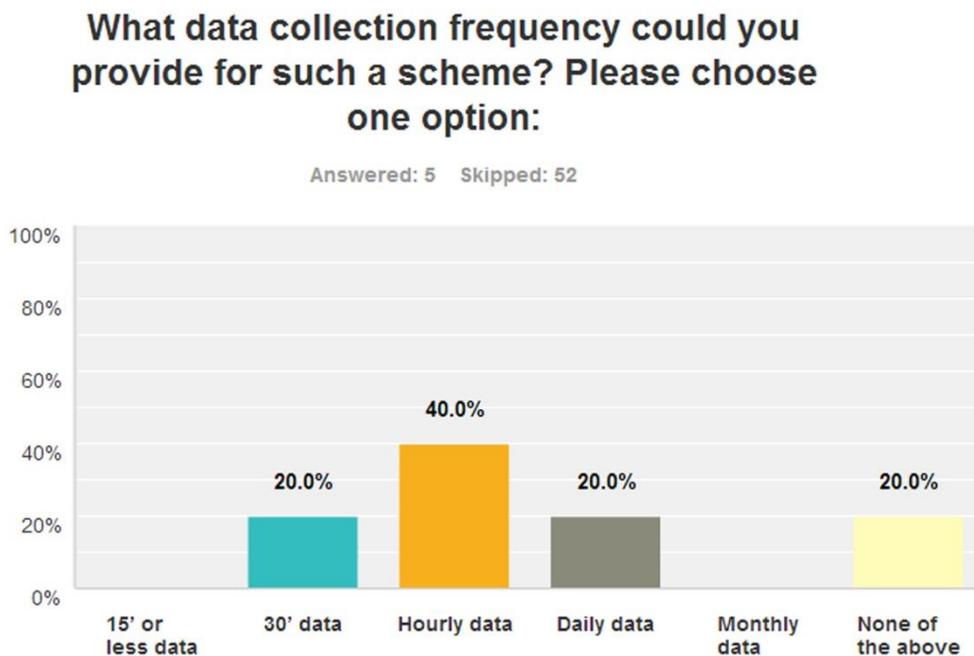
➤ Please refer to table 25 in the appendix.

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**Q18. What data collection frequency could you provide for such a scheme? Please choose one option:**

Less than half (40%) of the respondents that knew about iSERV at the time of the project indicated that the data collection frequency they could provide for such a scheme is hourly data with only a fifth (20%) indicating sub-hourly data (Figure 17). Daily data was listed by one fifth (20%) of the respondents.

**Figure 17: Q18 - What data collection frequency could you provide for such a scheme? Please choose one option:**



**Summary of Findings:**

- ✓ **Less than half (40%) of the respondents that knew about iSERV at the time of the project indicated that the data collection frequency they could provide for such a scheme is hourly data.**
- ✓ **Only a fifth (20%) of the respondents indicated sub-hourly data.**
- ✓ **Daily data was listed by one fifth (20%) of the respondents.**

➤ Please refer to table 26 in the appendix.

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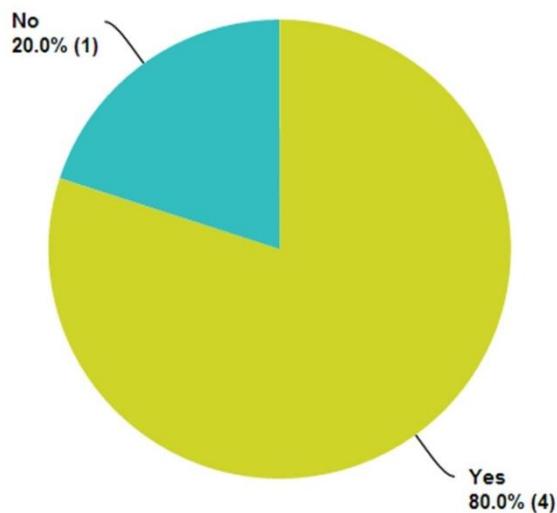
**Q20. As an HVAC product/component manufacturer, would you be interested in participating in a follow-up project to iSERV?**

The vast majority (80%) of the respondents that knew about iSERV at the time of the project indicated that they would be interested in participating in a follow-up project to iSERV (Figure 18).

**Figure 18: Q20 - As an HVAC product/component manufacturer, would you be interested in participating in a follow-up project to iSERV?**

**As an HVAC product/component manufacturer, would you be interested in participating in a follow-up project to iSERV?**

Answered: 5 Skipped: 52



**Summary of Findings:**

- ✓ **The vast majority (80%) of the respondents that knew about iSERV at the time of the project indicated that they would be interested in participating in a follow-up project to iSERV.**

➤ Please refer to table 28 in the appendix.

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## Conclusions and Recommendations

This report takes place in the context of iSERVcmb, a European project designed to look at end use of HVAC systems across Europe. The iSERV project provides an approach to achieving this in practice and allowing to be used across all building types in the EU Member States. The iSERV approach introduces an electronic method of using existing metering and sensors, along with information on buildings assets and activities, such that benchmarks, powerful in diagnostic work, can be derived from that data - and produced for individual building configurations and activities supported.

To obtain feedback about the elements of the iSERV approach from the view point of HVAC manufacturers, a survey was designed and distributed to members of Eurovent Association. The results of this survey are used in iSERVcmb to underpin the assertion that the iSERVcmb approach is potentially applicable and that its specifics agree with what exists in the market. The design of the survey aimed primarily at capturing the view of manufacturers on the following themes:

- the continuous monitoring of HVAC components,
  - what exists in the market in terms of the energy and performance data collected by existing HVAC systems,
  - the integration of online monitoring within HVAC products,
- and
- the iSERV project.

According to the survey results, we can summarize the following:

- ✓ The majority of the survey's respondent's work for HVAC manufacturers located in NW Europe and primarily manufacturing Air Handling units.
- ✓ Continuous monitoring of HVAC components is clearly considered to be helpful in reducing overall energy consumption in buildings.
- ✓ Current HVAC products can provide energy and other performance data over the internet for use by their customers with energy Use (kWh), Air Temperatures (°C), Flow rates (l/s or m<sup>3</sup>/s), Fluid Temperatures (°C) and Pressure drops (Pa) readily available in most products. Data for Power Demand (W), Relative Humidity (RH) and Flow velocity (m/s) appear not to be as available compared to the aforementioned metrics.

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- ✓ HVAC Manufacturers appear to be divided regarding the prospect of providing HVAC energy and performance data, with those willing to share data being able to provide data primarily for Air Handling Units for use by their customers.
- ✓ From the HVAC manufacturers' point of view, the main barriers preventing them from integrating online monitoring within their products are related to the technical know-how/technology behind the use of online monitored data, followed by cost (cost to manufacturer, investment and maintenance cost for customer) and the lack of coherent standards for these systems.
- ✓ According to HVAC manufacturers, it appears that the main advantages for integrating online monitoring systems within their products would be the Additional value for the customer and the Ability to comply with forthcoming legislation aimed at nearly Zero Energy Buildings.
- ✓ Amongst those manufacturers that knew about iSERV, there is unanimous agreement that similar projects can be helpful for their companies, indicating that the immediate benefit from iSERV is to "Obtain information, comparison and analysis of the in-use energy consumption of my systems and components". The vast majority also agreed they would be interested in participating in a follow-up project to iSERV.
- ✓ It would appear that HVAC manufacturers are sceptical to the prospect of complying with a standard covering data requirements from HVAC components to allow their products to participate in an iSERV-type process. There is a widespread belief that a possible agreement to this issue would depend on the final data standard agreed, on the numbers of competitors participating, and on ensuring that all extra costs would be imposed fairly across competing technologies.
- ✓ In the case of the creation of an iSERV type of standard, manufacturers would be interesting in seeing HVAC component energy consumption and Outdoor climate conditions recorded, with Whole building energy consumption and Comfort related parameters following. To such a standard, most manufacturers indicated that they can provide non sub-hourly data.

To conclude there is great potential of an iSERV type process being implemented across Europe. HVAC Manufacturers consider that continuous monitoring of HVAC components is clearly helpful in reducing overall energy consumption in buildings, and most can provide energy and other performance data over the internet for use by their customers. Further cooperation with the HVAC manufacturing industry is required to address:

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- The HVAC industry's hindrance to provide HVAC energy and performance data for use by their customers.
- The main barriers HVAC manufacturers believe to be preventing them from integrating online monitoring within their products.
- The HVAC industry's scepticism on complying with a standard covering data requirements from HVAC components to allow their products to participate in an iSERV-type process.

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## Appendix of Tables

**Table 3 : Q1 Are you working for an HVAC manufacturer?**

Answer	(N)	(%) to all respondents (N=57)
Yes	53	92.98%
No	4	7.02%
TOTAL	57	100%
No. skips	0	

**Table 4 : Q2 - Please select your country of residence.**

Country	(N)	(%) to all respondents (N=49)
Austria	0	0.00%
Belgium	1	2.00%
Bulgaria	0	0.00%
Cyprus	0	0.00%
Czech Republic	1	2.00%
Denmark	1	2.00%
Estonia	0	0.00%
Finland	2	4.10%
France	10	20.40%
Germany	3	6.10%
Greece	0	0.00%
Hungary	0	0.00%
Ireland	0	0.00%
Italy	3	6.10%
Latvia	0	0.00%
Lithuania	1	2.00%
Luxembourg	0	0.00%
Malta	0	0.00%
Netherlands	2	4.10%
Poland	0	0.00%
Portugal	0	0.00%

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Romania	0	0.00%
Slovakia	0	0.00%
Slovenia	1	2.00%
Spain	2	4.10%
Sweden	4	8.20%
United Kingdom	3	6.10%
Other	15	30.60%
TOTAL	49	100%
No. skips	6	

**NW Europe**

**SE Europe**

**Table 5 : Q2 - List of non EU participants.**

Other Countries	(N)	(%) to respondents from other Countries (N=15)	(%) to all respondents (N=49)
Liechtenstein	1	6.6%	2.00%
Saudi Arabia	1	6.6%	2.00%
Serbia	2	13.3%	4.1%
China	2	13.3%	4.1%
Norway	1	6.6%	2.00%
India	1	6.6%	2.00%
Turkey	3	20.00%	6.10%
Malaysia	1	6.6%	2.00%
KSA	1	6.6%	2.00%
USA	1	6.6%	2.00%
Lebanon	1	6.6%	2.00%
Switzerland	1	6.6%	2.00%
TOTAL	15	100%	30.60%

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**Table 6 : Q3 - Which HVAC product does your company manufacture? Please tick all that apply:**

<b>Answer</b>	<b>Total (N)</b>	<b>(%) to all respondents (N=49)</b>
Boilers	1	2.00%
Chillers	14	28.60%
All in one systems	2	4.10%
Fans	6	12.20%
Pumps	0	0.00%
Air Filters	5	10.20%
Air Handling Units	28	57.10%
Chilled Beams	7	14.30%
Fan Coils	9	18.40%
Underfloor Heating	2	4.10%
Air-to-air, water-to-air Air conditioners (cooling only and reversible)	12	24.50%
Air-to-water, water-to-water Chillers (cooling only, reversible)	9	18.40%
Air-to-water, water-to-water Heat-pumps (heating only, reversible)	13	26.50%
Energy recovery component (plate, rotary, ...)	5	10.20%
Heat exchangers for refrigeration	5	10.20%
Condensing units	8	16.30%
Rooftops	11	22.40%
Variable refrigerant Flow systems	6	12.20%
Other (please specify)	4	8.20%
<b>TOTAL</b>	<b>49</b>	<b>100%</b>
No. skips	8	

**Table 7 : Q3 - Other products described by respondents**

<b>Other responses</b>	<b>(N)</b>	<b>(%) to all respondents (N=49)</b>
Precision Air Conditioning	1	2.05%
Evaporative Cooling Towers	1	2.05%

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Cooling Towers, Adiabatic & hybrid coolers, ice thermal storage	1	2.05%
Open and closed circuit cooling towers and evaporative condensers	1	2.05%
TOTAL	4	8.20%

**Table 8 : Q4 - Do you agree that continuous monitoring of HVAC components is helpful in reducing overall energy consumption in buildings?**

Answer	(N)	(%) to all respondents (N=48)
Yes	47	97.90 %
No	1	2.10 %
TOTAL	48	100%
No. skips	9	

**Table 9 : Q5 - Can/could your current HVAC products provide energy and other performance data over the internet for use by your customers?**

Answer	(N)	(%) to all respondents (N=46)
Yes	34	73.90 %
No	12	26.10 %
TOTAL	46	100%
No. skips	11	

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**Table 10 : Q6 - Please tick all the parameters you can or could provide:**

<b>Answer</b>	<b>(N)</b>	<b>(%) to all respondents (N=31)</b>
Energy Use in kWh	26	83.87%
Power Demand in W	15	48.39%
Air Temperatures in °C	25	80.65%
Fluid Temperatures in °C	21	67.74%
Flow rates in l/s or m3/s	24	77.42%
Flow velocity in m/s	11	35.48%
Pressure drops in Pa	21	67.74%
Enthalpy in kJ/kg	6	19.35%
VOC's in ppm	2	6.45%
CO2 in ppm	8	25.81%
RH in %	13	41.94%
<b>TOTAL</b>	<b>31</b>	<b>100.00%</b>
No. Skips	26	

**Table 11 : Q7 - Do you have plans to provide such information?**

<b>Answer</b>	<b>(N)</b>	<b>(%) to all respondents (N=11)</b>
Yes	5	45.55 %
No	6	54.55 %
<b>TOTAL</b>	<b>11</b>	<b>100%</b>
No. skips	46	

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**Table 12 : Q8 - For which products/components can/could you provide energy and other performance data over the internet for use by your customers?**

<b>Answer</b>	<b>Total (N)</b>	<b>(%) to all respondents (N=34)</b>
Boilers	1	2.90%
Chillers	10	29.40%
All in one systems	3	8.80%
Fans	2	5.90%
Pumps	0	0.00%
Air Filters	3	8.80%
Air Handling Units	17	50.00%
Chilled Beams	3	8.80%
Fan Coils	4	11.80%
Underfloor Heating	1	2.90%
Air-to-air, water-to-air Air conditioners (cooling only and reversible)	6	17.60%
Air-to-water, water-to-water Chillers (cooling only, reversible)	7	20.60%
Air-to-water, water-to-water Heat-pumps (heating only, reversible)	10	29.40%
Energy recovery component (plate, rotary, ...)	2	5.90%
Heat exchangers for refrigeration	3	8.80%
Condensing units	1	2.90%
Rooftops	7	20.60%
Variable refrigerant Flow systems	2	5.90%
<b>TOTAL</b>	<b>34</b>	<b>100%</b>
No. skips	23	

**Table 13 : Q8 – Comments**

<b>Other responses</b>	<b>(N)</b>
Precision Air Conditioning	1
Cooling towers, adiabatic and hybrid coolers	1
open and closed circuit cooling towers and evaporative condensers	1
<b>TOTAL</b>	<b>3</b>

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**Table 14 : Q9 - In your view, what are the main barriers preventing HVAC manufacturers from integrating online monitoring within their products? Please tick all that apply:**

Answer	Total (N)	(%) to all respondents (N=37)
Additional Investment cost for the customer	24	64.90%
Additional maintenance cost for the customer	13	35.10%
Technology availability	9	24.30%
Lack of interest from customers	12	32.40%
Lack of use for the data	10	27.00%
Potential threat for future activities	0	0.00%
Cost to manufacturer Makes products uncompetitive on price	25	67.60%
Lack of manufacturing knowledge	5	13.50%
Lack of coherent standards for these systems	16	43.20%
Other: <please specify>	5	13.50%
TOTAL	37	100 %
No. skips	20	

**Table 15 : Q9 – Other Barriers listed:**

Other responses	(N)	(%) to all respondents (N=37)
IT projects development, time and complexity	1	2.7%
Security of data	1	2.7%
The most important figures cannot be measured correctly on site, especially temperature efficiency of plate heat exchangers and rotary wheels (very unhomogenous temperatur profile)	1	2.7%

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Some customers prefer to handle directly these information about their application and not share them.	1	2.7%
The units are all Tailormade	1	2.7%
TOTAL	2	13.50%

**Table 16 : Q10 - In your view, what are (would be) the main advantages of HVAC product/component manufacturers integrating online monitoring systems within their products?**

Answer	Total (N)	(%) to all respondents (N=37)
Additional value for the customer	28	75.70%
Better market prospects for the Manufacturer	14	37.80%
Ability to comply with forthcoming legislation aimed at nearly Zero Energy Buildings	28	75.70%
Other (please specify)	2	5.40%
TOTAL	37	100 %
No. skips	20	

**Table 17 : Q10 – Other advantages listed:**

Other responses	(N)	(%) to all respondents (N=107)
none	1	2.7%
Nothing because of Technology	1	2.7%
TOTAL	2	5.4%

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**Table 18 : Q11 - Do you know about the iSERV project?**

Answer	(N)	(%) to all respondents (N=37)
Yes	6	16.20 %
No	31	83.80 %
TOTAL	37	100%
No. skips	20	

**Table 19 : Q12 - How did you hear about the iSERV project? Please tick the main introduction route:**

Answer	(N)	(%) to all respondents (N=6)
REHVA – iSERV Technical Seminar	1	16.7 %
from a presentation	1	16.7 %
from a newspaper, technical paper	2	33.3 %
from the internet	3	50.0 %
from personal discussions with an iSERV partner	1	16.7 %
from another source: <please tell us the source>	1	16.7 %
TOTAL	6	100%
No. skips	51	

**Table 20 : Q12 – Other Answers**

Other responses	(N)	(%) to all respondents (N=107)
EuroventCertita Certification	1	16.7%
TOTAL	1	16.7%

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**Table 21 : Q13 - Do you consider projects like iSERV to be helpful for your company?**

Answer	(N)	(%) to all respondents (N=6)
Yes	6	100.00 %
No	0	0.00 %
TOTAL	6	100%
No. skips	51	

**Table 22 : Q14 - What are the immediate benefits you see from iSERV? Please tick all that apply:**

Answer	(N)	(%) to all respondents (N=6)
Obtain information, comparison and analysis of the in-use energy consumption of my systems and components	6	100.0 %
Obtain information that can drive systematic improvements in my products.	4	66.7 %
Adds value to my products.	4	66.7 %
Other: <please describe>	0	0.0 %
TOTAL	6	100%
No. skips	51	

**Table 23 : Q15 - The project is achieving significant energy savings in systems across Europe but the process used requires greater access to data at the HVAC component level to have the maximum impact. Would you be happy to comply with a standard covering data requirements from HVAC components to allow your products to participate in an iSERV-type process? Please choose one option:**

Answer	(N)	(%) to all respondents (N=5)
Yes	1	20.00 %
No	0	0.00 %

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Maybe	4	80.00 %
TOTAL	5	100%
No. skips	52	

**Table 24 : Q16 - Please give reasons in box below:**

<b>Other responses</b>
Depends on the final data agreed on and on the numbers of competitors participating.
Yes in theory, but would depend on the final data standard agreed on
Depends on the final data standard agreed
May generated business opportunities for companies open to move forward in this market.
It would have to be completely clear that all extra costs would be imposed fairly across competing technologies, for example water-cooled chiller systems vs. air-cooled chiller systems.

**Table 25 : Q17 - In addition to the building related data that iSERV collects, which performance-related continuous data parameters would you like to see recorded according to such a standard? Please tick all that apply:**

<b>Answer</b>	<b>(N)</b>	<b>(%) to all respondents (N=5)</b>
Whole building energy consumption	4	80.0 %
HVAC component energy consumption	5	100.0 %
Water consumption	3	60.0 %
Indoor Air Quality parameters	3	60.0 %
Comfort related parameters	4	80.0 %
Outdoor climate conditions	5	100.0 %
Other (please specify)	0	0.0 %
TOTAL	5	100%

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No. skips	52	
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**Table 26 : Q18 - What data collection frequency could you provide for such a scheme? Please choose one option:**

Answer	(N)	(%) to all respondents (N=5)
15' or less data	0	0.0 %
30' data	1	20.0 %
Hourly data	2	40.0 %
Daily data	1	20.0 %
Monthly data	0	0.0 %
None of the above	1	20.0 %
TOTAL	5	100%
No. skips	52	

**Table 27 : Q19 - Are there any other any other outputs you would like to see from the iSERV system to enable HVAC system energy improvements to take place? Please describe each one briefly:**

Other responses
-
No

**Table 28 : Q20 - As an HVAC product/component manufacturer, would you be interested in participating in a follow-up project to iSERV?**

Answer	(N)	(%) to all respondents (N=5)
Yes	4	80.00 %
No	1	20.00 %

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TOTAL	5	100%
No. skips	52	

**Table 29 : Q21 - Will you be using or planning to use any of the iSERVcmb project results in improving your corporate image? Please choose one option and provide a comment if possible:**

Answer	(N)	(%) to all respondents (N=5)
Yes	0	0.00 %
No	0	0.00 %
Maybe	5	100.00 %
TOTAL	5	100%
No. skips	52	

**Table 30 : Q22 - Contact Page. Please complete if you wish us to keep you in touch with the project.**

Answer	(N)	(%) to all respondents (N=5)
Yes	4	80.00 %
No	1	20.00 %
TOTAL	5	100%
No. skips	52	

**Table 31 : Q24 - Are there any other any other outputs you would like to see from the iSERV system to enable HVAC system energy improvements to take place? Please describe each one briefly:**

<b>Other responses</b>
We are interested and oriented to 'a better world' by 'better efficiency' of any equipment
Where it's possible to find information about iSERV project?

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