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POLAND: NATIONAL REPORT
KEY DECISION FACTORS

National report on end-users decision making factors on H&C systems

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POLAND NATIONAL REPORT

1. OBJECTIVE

The objective of this report is to identify end-users decision making factors for heating and cooling (H&C) systems in Poland. This will be the first step to build an understanding about decision process when deciding on a heating and cooling system and to provide tools that can facilitate stakeholders at European and national level to provide better and transparent information to consumers.

The surveys allow identifying the key purchasing criteria (KPC). They will also provide information on *"Willingness to pay"*, including environmental and social parameters. The surveys have been addressed the heating and cooling sector as a whole and not only the renewable solutions. The surveys have been executed in three different sectors: residential, non-residential and industry in order to have a deep view of the whole sector.

2. SURVEYS IN POLAND

To achieve this objective a national survey has been carried out by Piotr Chrzanowski and Marcin Karolak whose are experts from The Polish National Energy Conservation Agency (KAPE) and Link PR which ones of Polish PR companies.

The execution time of this activity, excluding the subcontracting launching period, was three months.

The number of queries in Poland by sector and the related representativeness were the following:

SECTOR	NUMBER OF QUERIES	POPULATION SIZE	CONFIDENCE LEVEL	SAMPLE ERROR
Residential	960	12 518	96,85%	3,15%
Non-residential	150	74 000	100%	8,00%
Industry	100	1 400 000	90%	10,00%

3. SURVEY ON RESIDENTIAL SECTOR

The flow diagram in the execution of the survey is shown in Figure 1 and Figure 2.
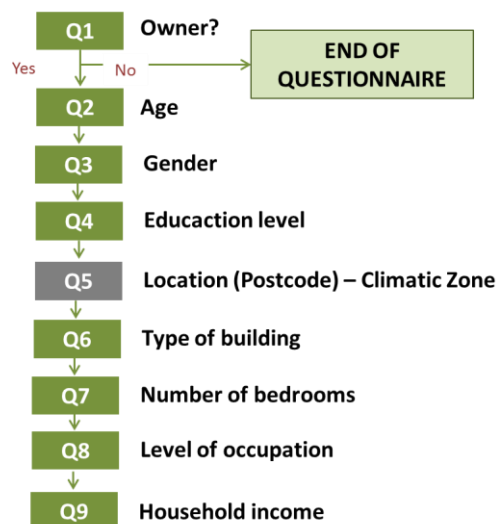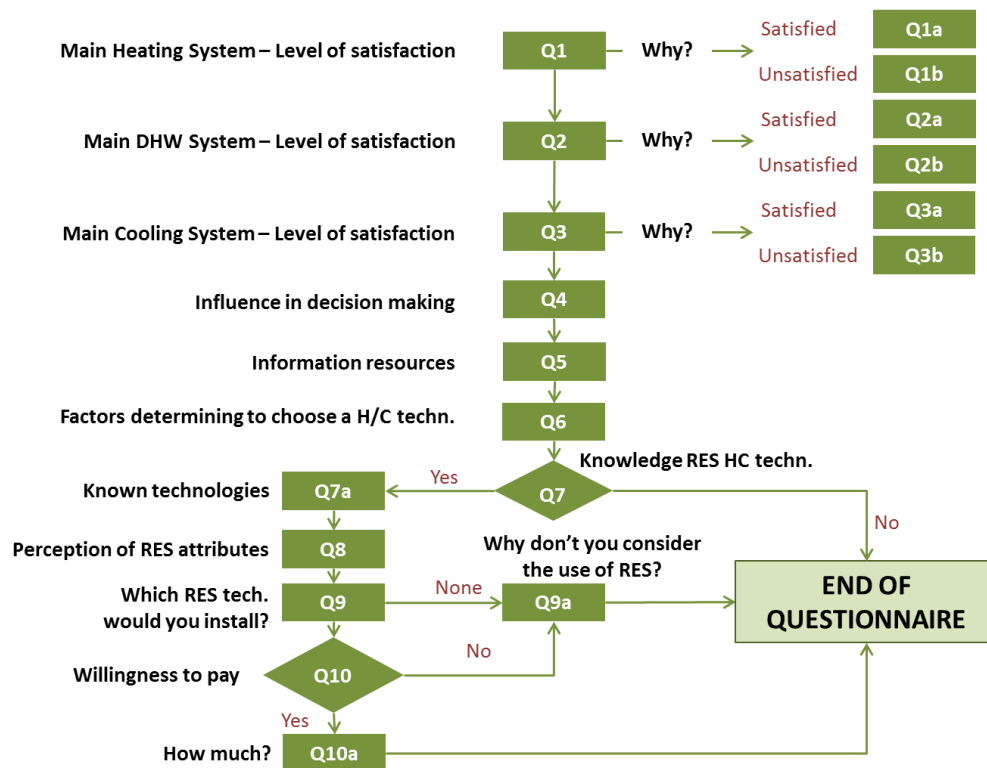

Figure 1 Characterization of the sample

Figure 2 Flow diagram to follow in questionnaires – residential sector.

3.1 MAIN CHARACTERISTICS OF THE SAMPLE

In Poland, 960 interviews were executed in the residential sector. The main characteristics of the sample are depicted in Figure 3. The sample is balanced comparing with the total data of the country.

RANGE OF AGE   GENDER   LEVEL OF EDUCATION   LOCATION

TYPE OF BUILDING   NUMBER OF ROOMS   OCCUPATION   INCOME
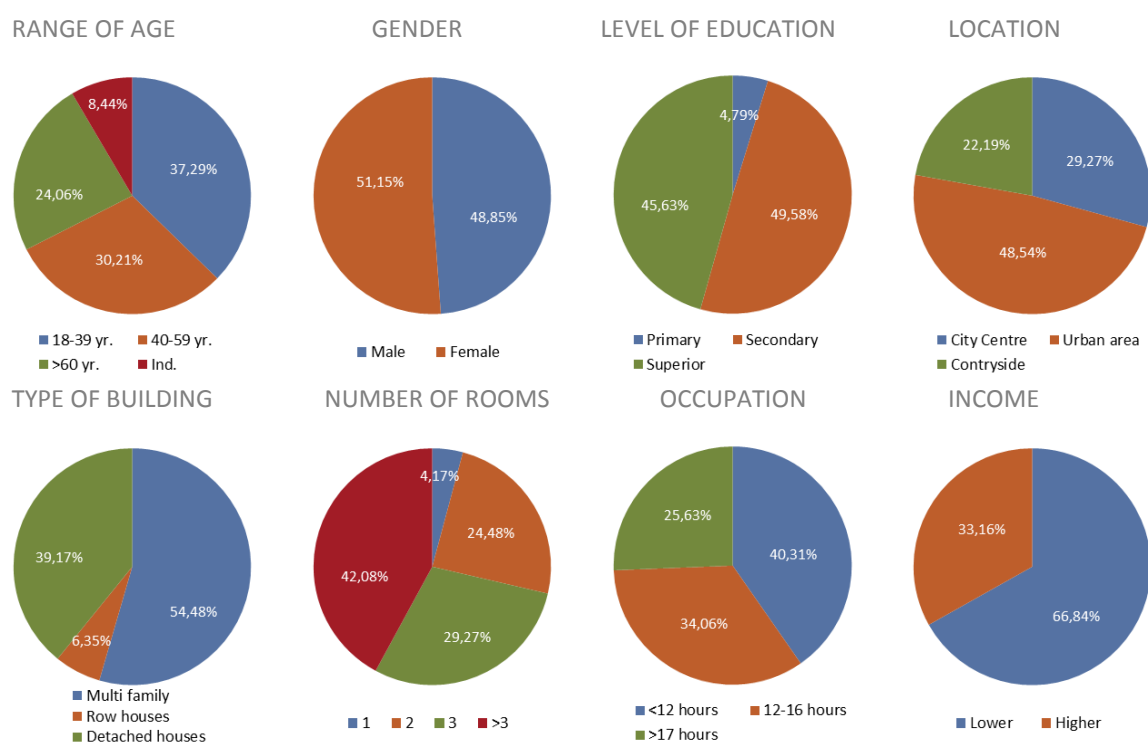
Figure 3 Characterization of the sample

3.2 CURRENT HEATING AND COOLING SYSTEMS

The main heating systems used in Poland are non-renewable district heating, mainly driven by coal (47%) and coal boilers (24%). The contribution of natural gas is around 17%. The contribution of the rest of sources is very low. There are some biomass installations (4%), but the development of the rest of renewables is practically inexistent. In general, there are more centralized systems than individual ones (55% centralized systems and 45% individual systems). Only three respondents declare not to use any heating system.

Figure 4 Distribution of heating systems in Poland

The satisfaction with the heating system is very high and it is not really dependant on the characteristic of the sample, such as age, education, etc. (Satisfied – 84%; No answer – 5%; Dissatisfied: 11%).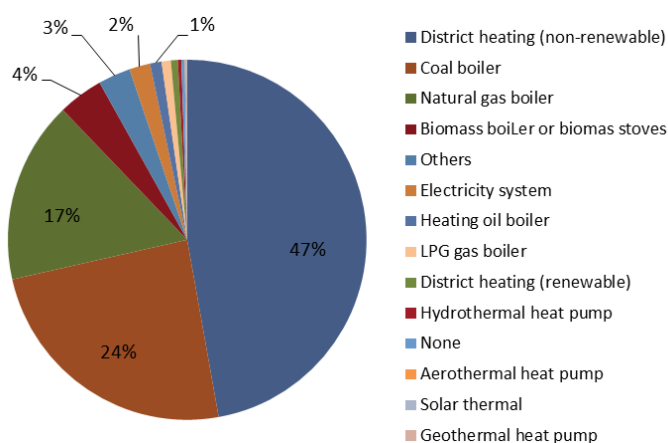 Those who use oil, biomass, district heating systems (renewable and non-renewable) and heat pumps are more satisfied than the average, while those who use electric systems are more dissatisfied than the average. Users of centralized systems are more satisfied than those of individual systems. For those respondents satisfied with its heating system the main reason of satisfaction is the good levels of comfort (53%) and the ease of use, reliability and safety (24%). On the other hand, the main reason of dissatisfaction is the frequent or expensive maintenance (30%) and price of fuel (28%). Regarding the type of fuel, those who use natural gas are less satisfied than the rest of the users.
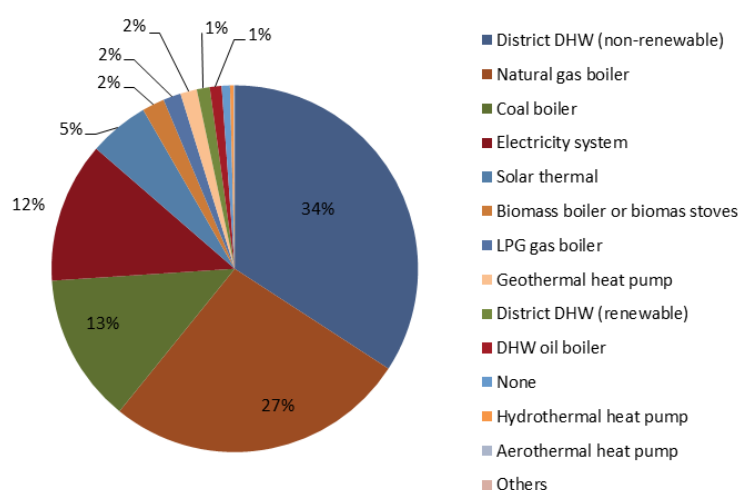
Regarding the Domestic Hot Water systems (DHW), the main used systems are non-renewable district heating, using mainly coal (34%), following by natural gas boilers (27%). Also for DHW, the contribution of renewable energy is very low, only there are a few solar installations and biomass boilers for this purpose (2% in both cases). Seven respondents declare not to use any DHW systems in Poland.

*Figure 5 Distribution of DHW systems in Poland*

The level of satisfaction is high (Satisfied – 83%; No answer – 3%; Dissatisfied: 14%) and the main reasons for those who are satisfied are the good levels of comfort (60%) and the ease of use, reliability and safety (23%). The general characteristics of the sample (age, gender, etc.) are not really influential. However, the dissatisfaction is higher in those users of natural gas and electric systems. In this case, the satisfaction is higher in users of individual systems.

The vast majority of the dwellings in Poland don't have any cooling system (97%). The existing cooling systems are mainly electricity air conditioning systems (38% of them are centralized systems). In general the satisfaction with these systems is very high (Satisfied – 92%; No answer – 4%; Dissatisfied: 4%) because of the high levels of comfort (65%) and the price of equipment (17%) and fuel (22%).

The main reason to use the current system in dwellings for heating and DHW is because they already existed in the dwelling (66%). This is the most repeated answer for those who have non-RES DH. The other reasons given by respondents are the access and fuel costs (15% – 14% in the case of DHW systems) mainly for those who use coal, NG and biomass; and the price of equipment (12%) mainly for coal users. Legal obligation is not a predominant reason to the installation of heating systems in

Poland. In cooling systems, the main reasons for the acquisition of the current technology is the existence of it in the dwelling (36%), the price of equipment (24%) and the access and costs of fuel (24%).

3.3 INFORMATION RESOURCES

Figure 6 Figure 1 Information resources in Poland
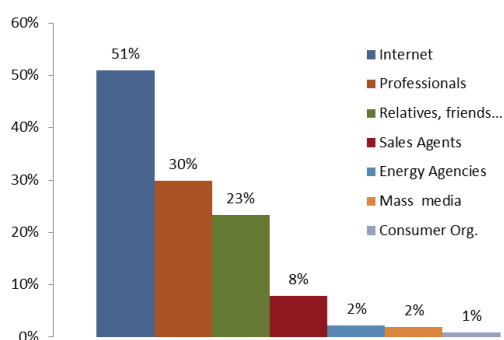
Regarding the sources to search for information about R&H equipment, the main source is the Internet; with a share of 51% (the share is even higher in the age sector of 18-40 years and lower for people over 60). Also professionals and relatives and friends have an important weight (30% and 23%, respectively).

In relative terms, men consult consumer organizations and energy agencies more than women. Professionals are more consulted for people over 60 years-old than for young people. The opinion of relatives and friends has a high importance for those with secondary education and those who live in rural areas.

3.4 KEY PURCHASING CRITERIA

According to the survey the key purchasing criteria (KPC) for H&C systems in Poland are:
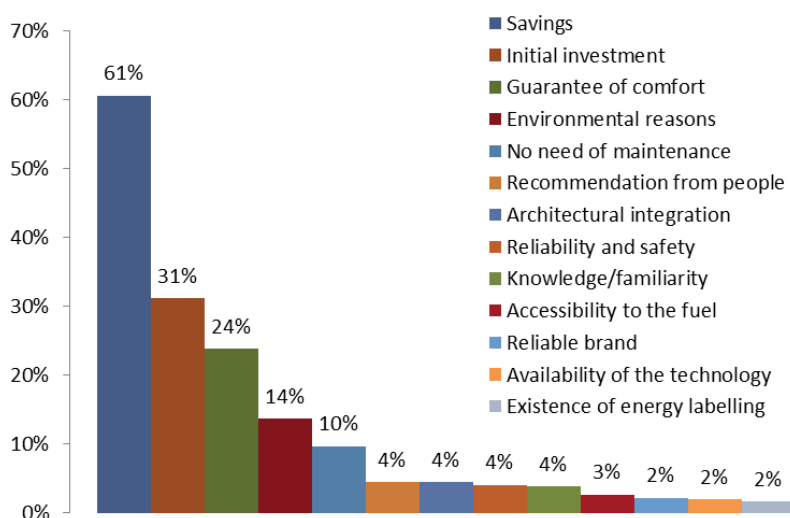
Figure 7 Figure 1 Key purchasing criteria in Poland

Economic reasons are the main important criteria to choose H&C systems: Savings (61%) and initial investment (31%) obtain the higher share of the answers. After them, the technical reasons (guarantee of comfort – 24% – and no need of maintenance – 10%) are also relevant. Environmental

reasons (14%) are not very significant for Polish owners. The other factors are not very important for the survey respondents.

The following tables show the Key Purchasing Factors considering the demographical criteria analysed. In general, initial investment and the no necessity of maintenance are more important for men and the comfort and the environmental reasons for women. Savings are more important for people under 40 years, while the environmental reasons concern more to people over 60 years. Regarding the level of education, it is remarkable the importance of savings for those with primary education (higher than average). On the other hand, this group consider the initial investment less important than the average.

KEY DECISION FACTOR	Answers	%	Gender		Age				Level Education			Location of the building		
			Male	Female	18-40	41-60	>60	Ind.	Prim. Edu	Sec Edu	Sup Edu	City Centre	Urban Area	Rural Area
Savings along the life expectancy	582	61%	60%	61%	70%	59%	48%	59%	57%	60%	62%	58%	60%	65%
Initial investment	299	31%	33%	30%	30%	35%	24%	43%	11%	32%	33%	28%	34%	29%
Guarantee of comfort	229	24%	23%	25%	24%	28%	18%	26%	13%	22%	26%	22%	25%	25%
Environmental reasons	131	14%	13%	14%	9%	18%	13%	21%	13%	13%	15%	12%	15%	13%
No need of maintenance	93	10%	12%	8%	11%	10%	6%	9%	7%	9%	11%	7%	12%	8%
Recommendation from others	43	4%	5%	4%	6%	5%	2%	4%	2%	4%	5%	5%	5%	3%
Architectural integration	43	4%	3%	6%	4%	6%	3%	4%	0%	4%	6%	6%	3%	5%
Reliability and safety	39	4%	4%	4%	4%	5%	3%	2%	2%	3%	5%	6%	3%	3%
Familiarity with the technology	37	4%	4%	4%	4%	4%	2%	6%	0%	4%	4%	5%	3%	4%
Accessibility to the fuel	26	3%	3%	3%	3%	3%	1%	4%	0%	2%	3%	1%	3%	3%
Reliable brand/manufacturer	21	2%	2%	2%	2%	4%	0%	2%	0%	2%	3%	2%	3%	1%
Availability	19	2%	2%	2%	2%	3%	0%	2%	0%	2%	2%	2%	2%	2%
Existence of energy labelling	16	2%	1%	2%	2%	2%	0%	2%	0%	1%	2%	1%	2%	2%

KEY DECISION FACTOR	Answers	%	Type of building			Nº Bedrooms				Level occupation			Income average	
			Apartment	Row house	Detached	1	2	3	>3	<12h	12-16h	>17h	Higher	Lower
Savings along the life expectancy	582	61%	61%	59%	60%	45%	66%	59%	60%	61%	62%	58%	60%	61%
Initial investment	299	31%	32%	39%	28%	38%	29%	30%	32%	33%	34%	24%	32%	31%
Guarantee of comfort	229	24%	23%	20%	25%	20%	21%	22%	27%	24%	24%	22%	28%	22%
Environmental reasons	131	14%	13%	23%	14%	15%	13%	12%	15%	17%	12%	11%	12%	15%
No need of maintenance	93	10%	10%	2%	10%	8%	8%	14%	8%	12%	9%	6%	11%	9%
Recommendation from others	43	4%	5%	5%	4%	10%	4%	5%	3%	5%	5%	2%	4%	5%
Architectural integration	43	4%	5%	3%	5%	0%	6%	6%	3%	7%	3%	2%	7%	3%
Reliability and safety	39	4%	6%	0%	3%	8%	5%	5%	2%	6%	3%	2%	3%	5%
Familiarity with the technology	37	4%	4%	5%	4%	10%	3%	4%	4%	5%	2%	4%	3%	4%
Accessibility to the fuel	26	3%	2%	0%	4%	3%	2%	3%	3%	4%	2%	2%	3%	3%
Reliable brand/manufacturer	21	2%	2%	2%	2%	0%	3%	3%	1%	4%	2%	0%	2%	2%
Availability	19	2%	2%	0%	2%	0%	2%	3%	2%	3%	2%	1%	2%	2%
Existence of energy labelling	16	2%	2%	2%	2%	0%	1%	3%	1%	3%	1%	1%	1%	2%

3.5 AWARENESS ABOUT RES

The 74% of the survey respondents have heard about the use of RES in heating and cooling systems. The following tables show the knowledge about RES, considering the characteristics of the sample. The deviation of each characteristic compared with the distribution of the number of answers is shown:

	Answers	%	Gender		Age				Level Education			Location of the building		
			Male	Female	18-40	41-60	>60	Ind.	Prim. Edu	Sec Edu	Sup Edu	City Centre	Urban Area	Rural Area
YES	706	74%	81%	66%	72%	80%	68%	74%	52%	71%	79%	69%	74%	77%
NO	254	26%	19%	34%	28%	20%	32%	26%	48%	29%	21%	31%	26%	23%

	Answers	%	Type of building			Nº Bedrooms				Level occupation			Income average	
			Apartment	Row house	Detached house	1	2	3	>3	<12h	12-16h	>17h	Higher	Lower
YES	706	74%	69%	80%	79%	65%	65%	69%	82%	73%	80%	67%	79%	71%
NO	254	26%	31%	20%	21%	35%	35%	31%	18%	27%	20%	33%	21%	29%

The known technologies for those who have heard about RES (74%) of the survey respondents are represented in the following tables:

TECHNOLOGY	HEATING/DHW	COOLING
Biomass	55%	35%
Solar Thermal	97%	54%
Heat Pump (Renewable)	61%	37%
Geothermal	63%	39%
District Heating (Renewable)	49%	32%

3.6 PERCEPTION OF RES ATTRIBUTES

The perception of RES attributes by those survey respondents who have heard about RES (74%) is shown in the following table:

ATTRIBUTE	RENEWABLES	%	NON-RENEWABLES	%
Higher initial investment	610	86%	96	14%
Higher operation costs (maintenance and fuel)	278	39%	428	61%
Higher savings along the life expectancy of equipment	610	86%	96	14%
More eco-friendly	666	94%	40	6%
Higher working reliance	406	58%	300	42%
Higher visual impact and/or need of space to install/store fuel	417	59%	289	41%
Safer	610	86%	96	14%
More specialized installers	604	86%	102	14%

The respondents consider that renewable technologies have higher investments, lower operation costs and higher savings along the life expectancy. According to the survey, renewable energies are safer and more eco-friendly than fossil fuel technologies. Besides, the respondents consider that the installers are more specialized. About the reliance, the survey shows that the perception is almost equal for renewable and non-renewable technologies.

It is not appreciated a clear influence of the general characteristic of the sample (gender, age, etc.) on the answer. It is remarkable that the cost of maintenance are considered higher in RES than the average for people over 60 years-old and people who live in rural areas.

3.7 ADEQUACY OF RES

In the question about the most suitable renewable energy technology to incorporate in their houses, 36% of the respondents who know about RES do not consider any renewable energy technology for heating and DHW systems in their dwellings. Female and those who live in the city centre and in apartments are more reluctant to install RES than the rest. Regarding the incorporation of RES in cooling systems, 61% do not consider any, in this case, females, people over 60 years-old and those who live in the city centre or in apartments are also more reluctant.
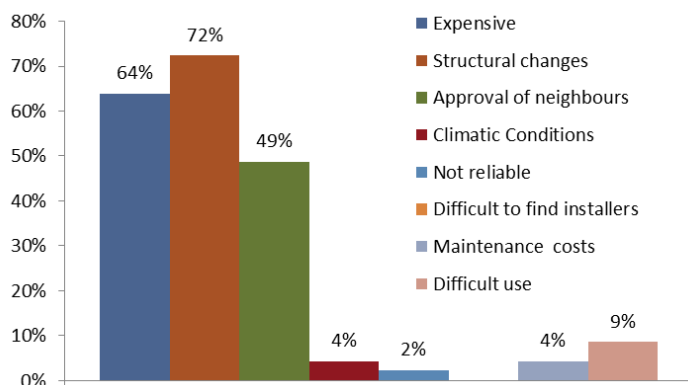
Figure 8 Reason for the rejection of RES in heating and DHW systems in Poland

The main reasons for the rejection of the use of RES for heating or DHW systems are: the structural changes needed in the dwelling (72%) and the initial investment (64%). Figure 8 shows the share of the rest of the reasons.

The lack of installers is not a reason for the rejection of RES in Polish respondents.

Figure 9 Reason for the rejection of RES in cooling systems in Poland
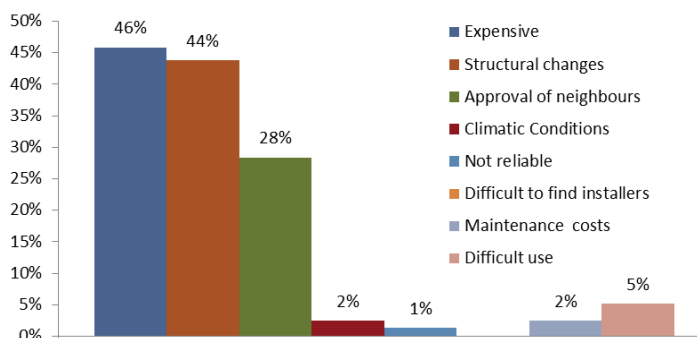
The main reasons for the rejection of the use of RES for cooling systems are: the initial investment (46%) and also the structural changes needed in the dwelling (44%). Figure 9 shows the distribution of the rest of the reasons.

The lack of installers is not a reason for RES rejection in Polish respondents.

The 64% of the respondents who know about RES consider the installation of some RES technologies for heating or DWH systems. According to the results the favourite technology is solar (49%). Figure 10 depicted the considered technologies for heating and DHW systems in Poland. The preference of solar thermal energy follows a distribution similar to the average. In the case of biomass and geothermal energy, it is preferred by people from rural areas.

The 41% of the respondents consider the installation of some RES technologies for cooling systems. Solar thermal systems are the preferred systems for polish respondents (27%). RES are preferred majority by male
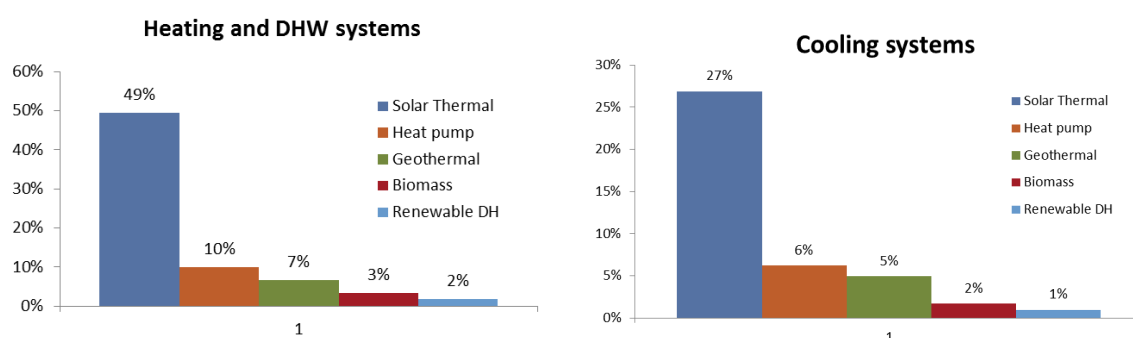

Figure 10 Considered RES technologies for heating and DHW and cooling systems.

3.8 WILLINGNESS TO PAY MORE

To the question: "Are you willing to pay more for a RES system?" 75% the respondents will be willing to pay more money, 10% won't and 15% did not answer to the question. In general, men are more willing to pay than women. The willingness to pay is not really dependant on the general features, actually the willingness to pay follows almost the same distribution that the sample.

The majority of those, whose answer to the previous questions was "YES", were willing to pay, as it is shown in Figure 11.
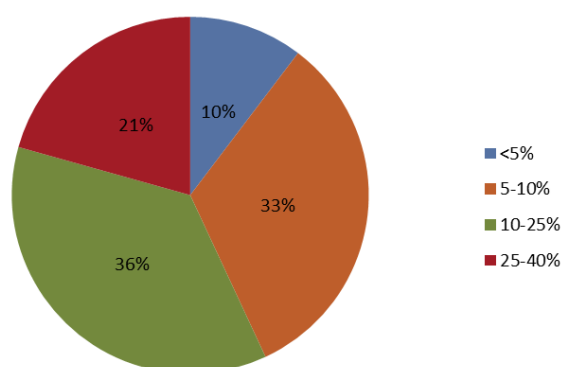

Figure 11Willingness to pay for RES technologies.

4. SURVEY ON NON RESIDENTIAL SECTOR

The flow diagram in the execution of the survey is shown in Figure 12 and Figure 13.

Figure 12 Characterization of the sample

Figure 13 Flow diagram to follow in questionnaires – non - residential sector.

4.1 MAIN CHARACTERISTICS OF THE SAMPLE

In Poland, 150 interviews were executed in the non - residential sector. The main characteristics of the sample are depicted in Figure 1. There was 3% buildings which have swimming pool inside. Any of the building have ESCO managing. Energy audit was performed in 54% of the buildings.
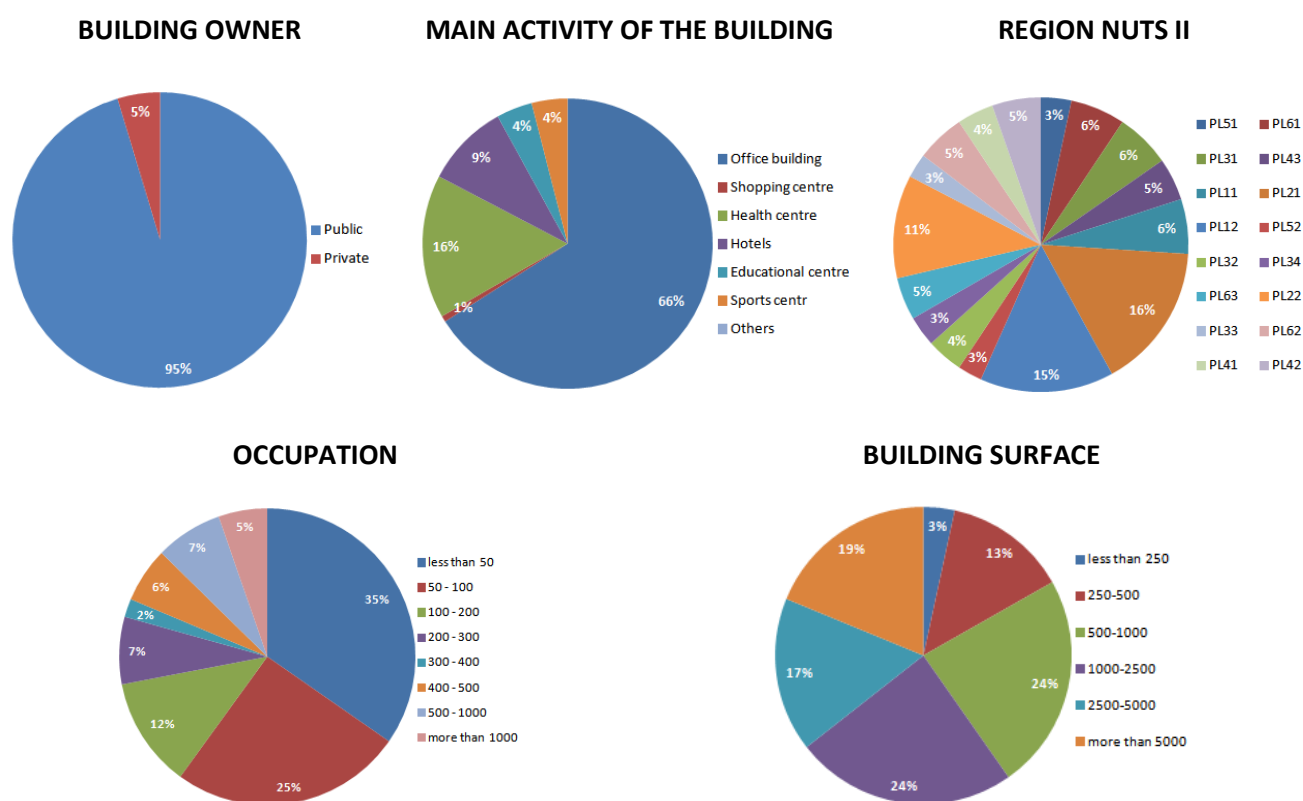
BUILDING OWNER

MAIN ACTIVITY OF THE BUILDING

REGION NUTS II

OCCUPATION

BUILDING SURFACE

Figure 14 Characterization of the sample
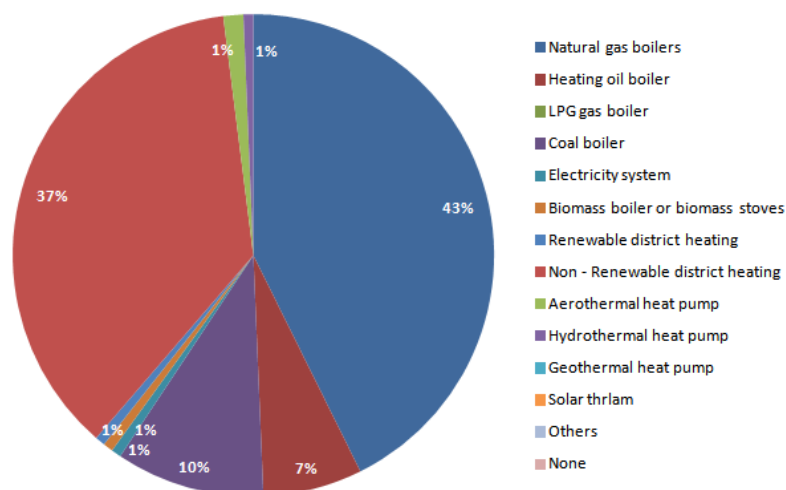
4.2 CURRENT HEATING AND COOLING SYSTEMS

Figure 15 Distribution of heating systems in Poland in non residential sector

The main heating systems used in Poland are non-renewable district heating, mainly driven by natural gas boilers (43%) and non renewable district heating (37%). Only 10% of respondents uses coal boilers. The contribution of RES technologies is particularly low. There are one biomass and two heat pump installations and the rest of renewable is practically inexistent. In general, most of the systems are centralized (99%).

Most of respondents have high level of satisfaction (85%). The reasons of that are: high level of comfort, easy to use and safe and low cost of fuels to produce energy. On the other hand the main reason of dissatisfaction is fact, that technologies based on natural gas can be unsafe.

Regarding the Domestic Hot Water systems (DHW), the main used systems are non-renewable district heating, The most popular technologies are electricity systems (40%), natural gas boilers (24%) and non renewable district heating. (22%). The contribution of renewable energy to produce
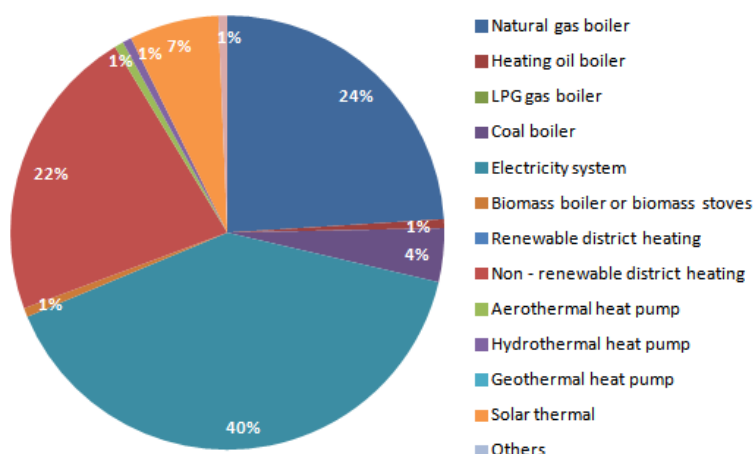

Figure 16 Distribution of DHW systems in Poland

DHW is low but the most popular are solar thermal installations (7%). One respondent declare not to use any DHW systems in Poland. Most of installation are centralized (63%).

Most of respondents are satisfied (85%) about their installation. The main reason is providing good level of comfort. Dissatisfied users of DHW installation signalized that equipment is expensive and require frequent or expensive maintenance.

The existing cooling systems are electricity air conditioning systems (59%). The rest of respondents do not have installation of cooling. In general existing systems are decentralized (70%) electricity air conditioning (59%) and respondents ale satisfied about this installation (85%).Uses of it provide good level of comfort and equipment is easy to use.

4.3 INFORMATION RESOURCES

Regarding the sources to search for information about R&H equipment, the main source is professional (79%), the internet (65%) and energy agencies or other public organization (49%).
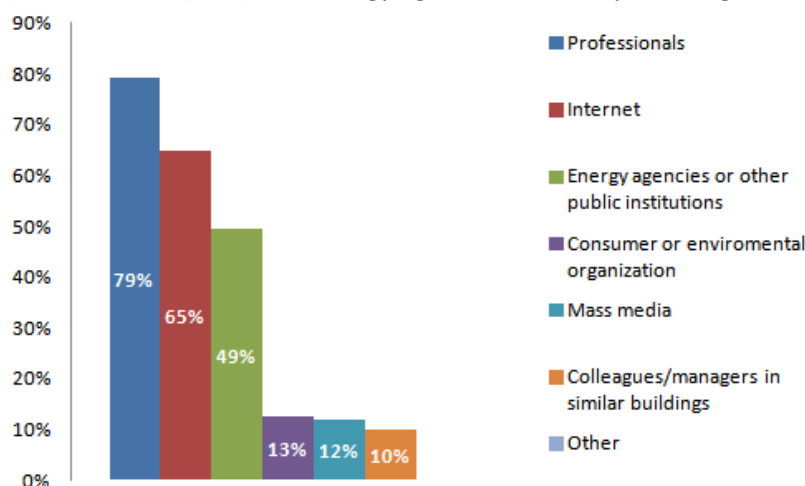

Figure 17 Information resources in Poland

4.4 KEY PURCHASING CRITERIA

According to the survey the key purchasing criteria (KPC) for H&C systems in Poland are:
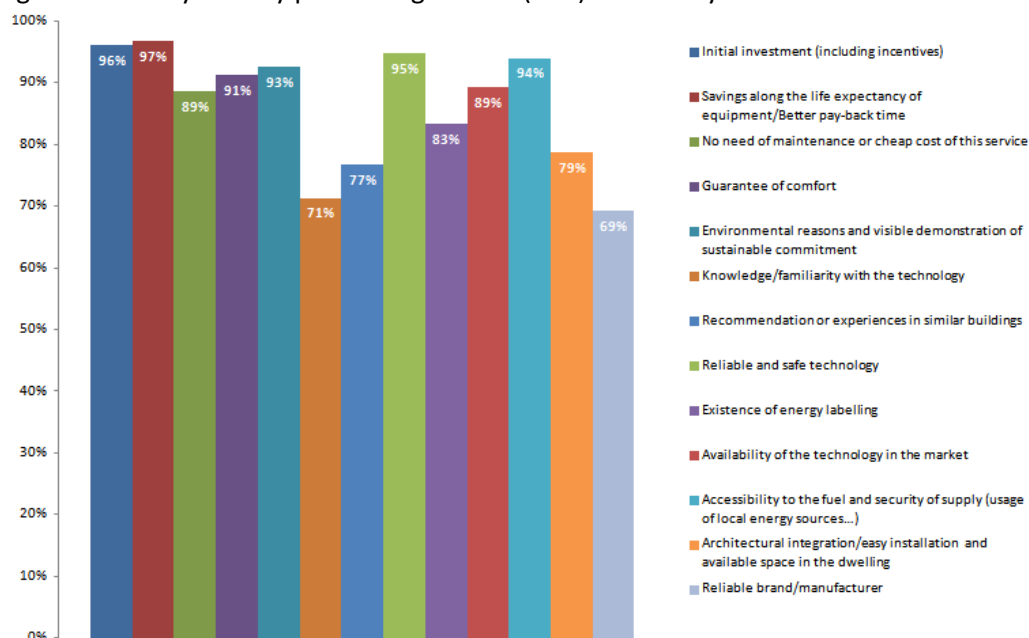

Figure 18 Key purchasing criteria in Poland

Economic reasons are the main important criteria to choose H&C systems: Savings (97%) and initial investment (96%) obtain the higher share of the answers. After them, the technical reasons

(guarantee of comfort – 91% , reliable and safe technology - 95% and security of supply - 94%) are also relevant. The research shows increasing environmental awareness - 93% of respondents choose this answer as very important.

The following tables show the Key Purchasing Factors considering the data of the survey respondents including owner of the building, main activity in the building, region, occupation and surface. In general initial investment and costs of maintenance are important at both the public and private buildings. Public sector pay attention to environmental reasons when private sector to availability of technology and fuels in the market. Less often respondents choose answer: familiarity with the technology and reliable brand.

KEY DECISION FACTOR	%	Building owner		Main activity of the building						Swimming pool	
		Public	Private	Office	Shopping centre	Health centre	Hotels	Educational centre	Sports centre	yes	no
Saving	97,3%	97,2%	100,0%	95,9%	100,0%	100,0%	100,0%	100,0%	100,0%	100%	97,2%
Initial investment	96,6%	96,5%	100,0%	95,9%	100,0%	100,0%	100,0%	83,3%	100,0%	100%	96,6%
Reliable and safe technology	95,3%	95,1%	100,0%	93,9%	100,0%	100,0%	92,9%	100,0%	100,0%	100%	95,2%
Accessibility to the fuel and security of supply	94,6%	94,4%	100,0%	93,9%	100,0%	100,0%	85,7%	100,0%	100,0%	100%	94,5%
Environmental reasons	93,3%	93,7%	85,7%	92,9%	100,0%	95,8%	85,7%	100,0%	100,0%	100%	93,1%
Guarantee of comfort	91,9%	92,3%	85,7%	88,8%	100,0%	100,0%	100,0%	100,0%	83,3%	100%	91,7%
Availability of the technology in the market	89,9%	89,4%	100,0%	88,8%	100,0%	100,0%	78,6%	100,0%	83,3%	100%	89,7%
No need of maintenance or cheap cost of this service	89,3%	90,1%	71,4%	85,7%	0,0%	95,8%	100,0%	100,0%	100,0%	75%	89,7%
Existence of energy labelling	83,9%	83,8%	85,7%	80,6%	100,0%	95,8%	85,7%	83,3%	83,3%	75%	84,1%
Architectural integration	79,2%	80,3%	57,1%	74,5%	0,0%	100,0%	85,7%	83,3%	66,7%	100%	78,6%
Recommendation or experiences in similar buildings	77,2%	77,5%	71,4%	78,6%	100,0%	75,0%	71,4%	66,7%	83,3%	50%	77,9%
Knowledge/familiarity with the technology	71,8%	71,8%	71,4%	64,3%	0,0%	100,0%	78,6%	66,7%	83,3%	100%	71,0%
Reliable brand/manufacturer	69,8%	69,7%	71,4%	62,2%	100,0%	95,8%	78,6%	50,0%	83,3%	75%	69,7%

KEY DECISION FACTOR	Occupation								Surface					
	Less than 50	50 – 99	100 – 199	200 – 299	300 – 399	400 – 499	500 – 1000	More than 1000	Less than 250	250 – 499	500 – 999	1000- 2499	2500 – 5000	More than 5000
Saving	100,0%	100,0%	92,0%	84,6%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	97,1%	94,4%	96,0%	100,0%
Initial investment	100,0%	94,3%	96,0%	92,3%	100,0%	100,0%	100,0%	87,5%	100,0%	95,0%	94,3%	100,0%	96,0%	96,4%
Reliable and safe technology	92,5%	97,1%	96,0%	92,3%	85,7%	100,0%	100,0%	100,0%	100,0%	95,0%	91,4%	91,7%	100,0%	100,0%
Accessibility to the fuel and security of supply	95,0%	91,4%	92,0%	100,0%	100,0%	75,0%	100,0%	100,0%	100,0%	90,0%	94,3%	91,7%	96,0%	100,0%
Environmental reasons	90,0%	91,4%	96,0%	92,3%	85,7%	100,0%	100,0%	100,0%	100,0%	100,0%	88,6%	91,7%	92,0%	96,4%
Guarantee of comfort	92,5%	91,4%	92,0%	92,3%	85,7%	100,0%	88,2%	100,0%	100,0%	95,0%	85,7%	97,2%	88,0%	92,9%
Availability of the technology in the market	82,5%	91,4%	92,0%	100,0%	100,0%	75,0%	88,2%	100,0%	100,0%	85,0%	85,7%	91,7%	92,0%	92,9%
No need of maintenance or cheap cost of this service	90,0%	88,6%	80,0%	100,0%	100,0%	100,0%	88,2%	87,5%	80,0%	95,0%	85,7%	86,1%	88,0%	96,4%
Existence of energy labelling	77,5%	88,6%	76,0%	92,3%	85,7%	50,0%	100,0%	87,5%	60,0%	80,0%	77,1%	83,3%	88,0%	96,4%
Architectural integration	80,0%	80,0%	84,0%	61,5%	57,1%	75,0%	94,1%	75,0%	60,0%	80,0%	77,1%	77,8%	92,0%	75,0%
Recommendation or experiences in similar buildings	75,0%	85,7%	76,0%	61,5%	71,4%	75,0%	76,5%	87,5%	80,0%	90,0%	77,1%	75,0%	76,0%	71,4%
Knowledge/familiarity with the technology	77,5%	65,7%	68,0%	69,2%	71,4%	50,0%	88,2%	62,5%	80,0%	65,0%	71,4%	61,1%	76,0%	85,7%
Reliable brand/manufacturer	77,5%	65,7%	72,0%	46,2%	57,1%	50,0%	76,5%	87,5%	40,0%	75,0%	74,3%	58,3%	52,0%	96,4%

4.5 AWARENESS ABOUT RES

The answer of the question *"have you ever heard about use of renewable energy heating/cooling/DHW technologies on building?"* was always YES. Figure 19 shows the most popular technologies for heating and DHW are solar installation and heat pump, and heat pump in the cooling sector.
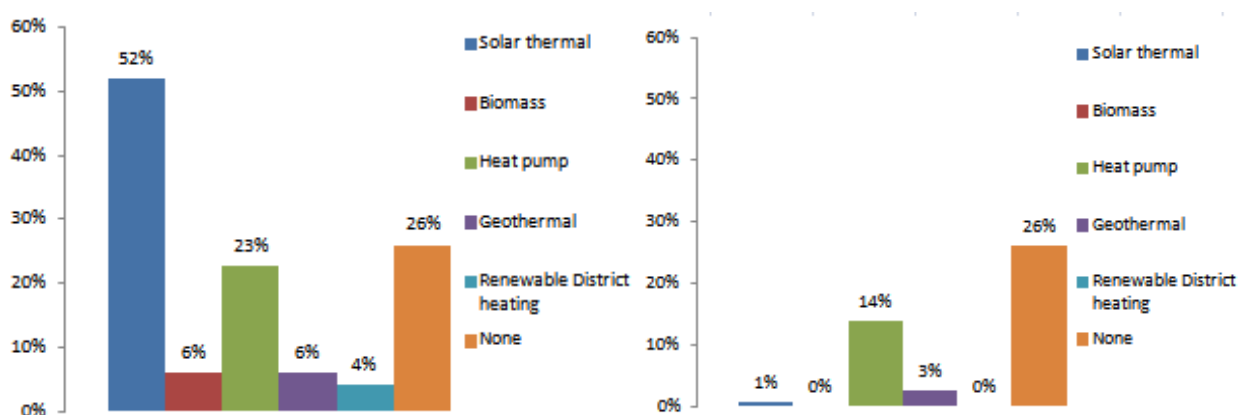

*Figure 19 The known respondents of the heating/DHW/cooling technologies*

4.6 PERCEPTION OF RES ATTRIBUTES

The perception of RES attributes by survey respondents is shown in the following table:

ATTRIBUTE	RENEWABLES	%	NON-RENEWABLES	%
Higher initial investment	145	97%	5	3%
Higher operation costs (maintenance and fuel)	43	29%	107	71%
Higher savings along the life expectancy of equipment	141	94%	9	6%
More eco-friendly	148	99%	2	1%
Higher working reliance	64	43%	86	57%
Higher visual impact and/or need of space to install/store fuel	110	73%	40	27%
Safer	125	83%	25	17%
More specialized installers	134	89%	16	11%

The respondents consider that renewable technologies have higher investments, lower operation costs and higher savings along the life expectancy. According to the survey, renewable energies are safer and more eco-friendly than fossil fuel technologies. Besides, the respondents consider that the installers are more specialized. About the reliance, the survey shows that the perception is almost equal for renewable and non-renewable technologies.

4.7 ADEQUACY OF RES
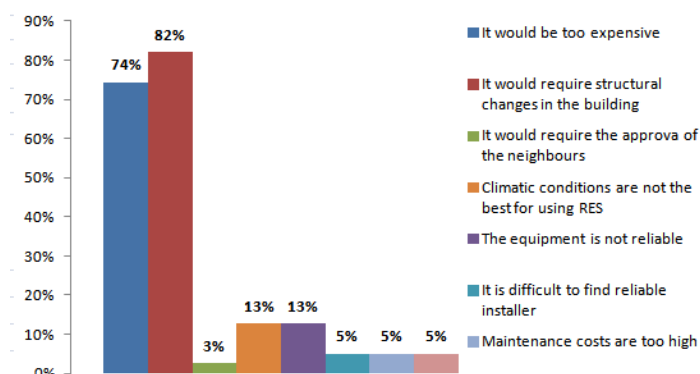
The main reasons for the rejection of the use of RES for heating or DHW systems are: the structural changes needed in the building (74%) and the initial investment (64%). Figure 20 shows the share of the rest of the reasons.

The lack of installers is not a reason for the rejection of RES in Polish respondents.

Figure 20Reason for the rejection of RES in cooling systems in Poland

Results of the question 8: "*Have you ever heard about the use of renewable energy heating/cooling/DHW technologies in buildings?*" favourite technology is solar (52%) and heat pump (23%) for heating and DHW systems. As the most popular RES installation for cooling is heat pump (14%).
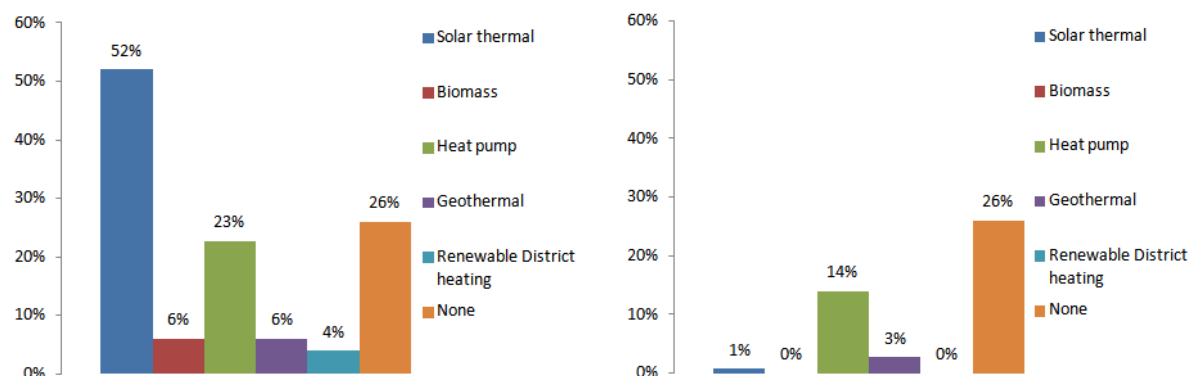

Figure 21 Considered RES technologies for heating and DHW and cooling systems

4.8 WILLINGNESS TO PAY MORE

To the question: "Are you willing to pay more for a RES system?" 74% the respondents will and 26% won't pay more money for RES installation.

The majority of those, whose answer to the previous questions was "YES", were willing to pay, as it is shown in Figure 22.
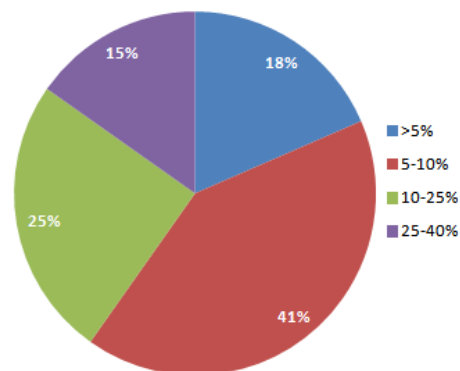

Figure 22 Willingness to pay for RES technologies.

5. SURVEY ON INDUSTRIAL SECTOR

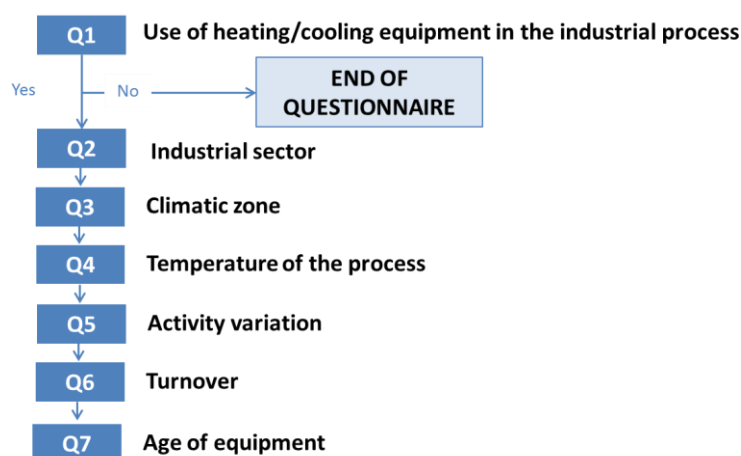The flow diagram in the execution of the survey is shown in Figure 12 and Figure 13.
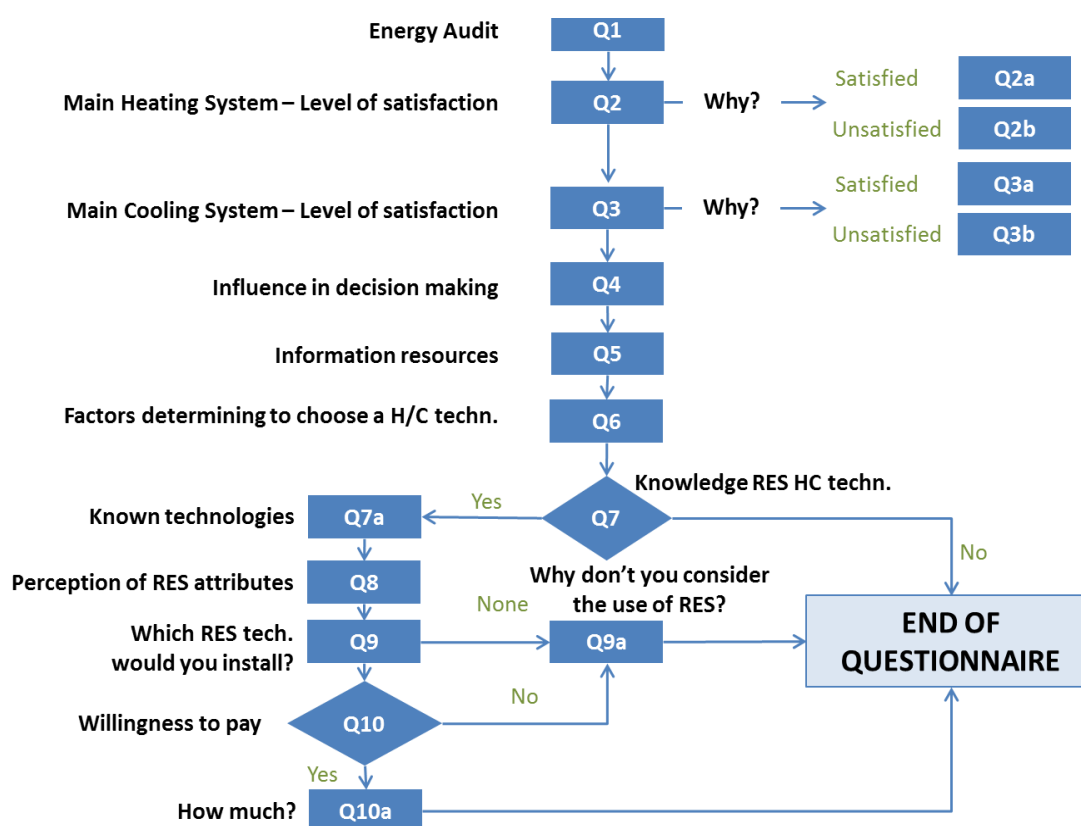

Figure 23 Characterization of the sample

Figure 24 Flow diagram to follow in questionnaires – industrial sector

5.1 MAIN CHARACTERISTICS OF THE SAMPLE

In Poland, 100 interviews were executed in the industrial sector. The main characteristics of the sample are depicted in Figure 1. The sample is balanced comparing with the total data of the country.
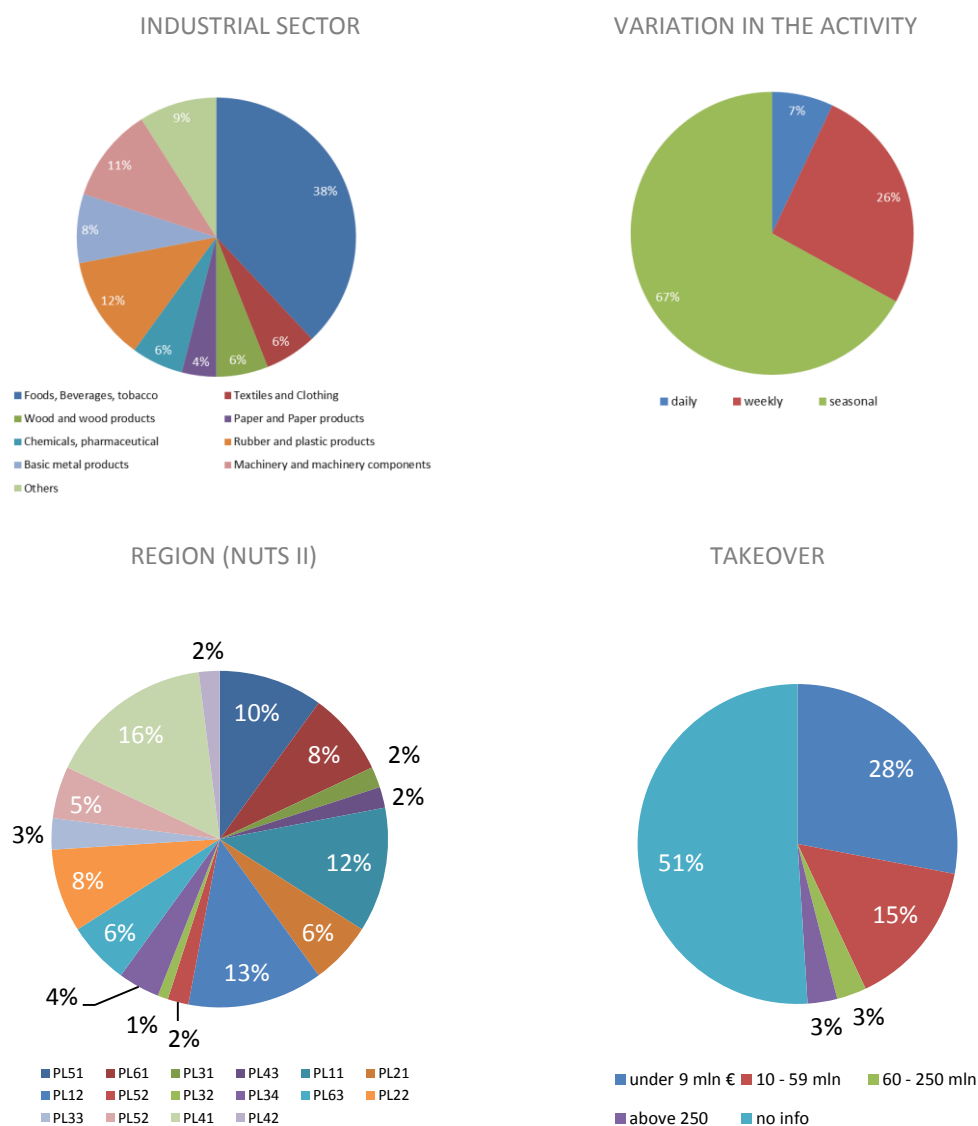
INDUSTRIAL SECTOR

VARIATION IN THE ACTIVITY

REGION (NUTS II)

TAKEOVER

Figure 25 Characterization of the sample

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5.2 CURRENT HEATING AND COOLING SYSTEMS

Coal boiler

Natural gas boiler

LPG gas boiler

Heating oil boiler

Electricity system/Joule system (including oil radiators)

Aerothermal Heat pump (electrical or Gas driven)

Hydrothermal Heat pump (electrical or Gas driven)

Geothermal Heat pump (electrical or Gas driven)

Solar Thermal

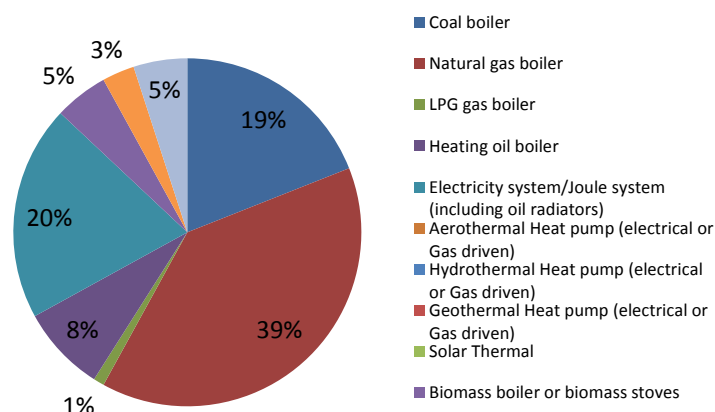Biomass boiler or biomass stoves

Figure 26 Distribution of heating systems in Poland

The main heating systems used in industrial process in Poland are non-renewable heating, mainly driven by natural gas (39%) and electricity system (20%). The contribution of coal is around 19% and contribution of oil 8%. Significant proportion of using natural gas is related with basic advantage of this fuel which is the high combustion control level. There are also some biomass installations used in industrial process(5%), mostly in wood sector. About 80% manufactures from this sector use biomass heating in industrial process. The contribution of the rest of sources is low or very low.
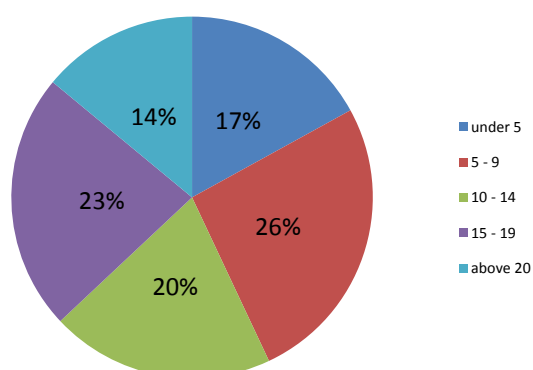

under 5

5 - 9

10 - 14

15 - 19

above 20

Age of heating systems can be described as good. 63% heating systems in Poland are younger than 15 years. 26% of all system used in industrial process have between 5 and 9 years, 23% between 15 and 19 and 20% between 10 and 14 years. The greatest percentage of most recent systems is in sector paper and wood.
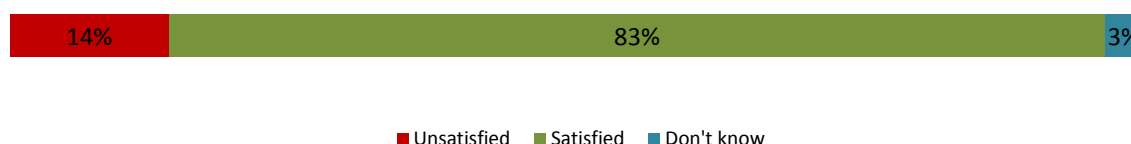
Figure 27 Distribution of age of heating systems in Poland (years)

■ Unsatisfied ■ Satisfied ■ Don't know

Figure 28 Distribution of level of satisfaction of cooling system in Poland
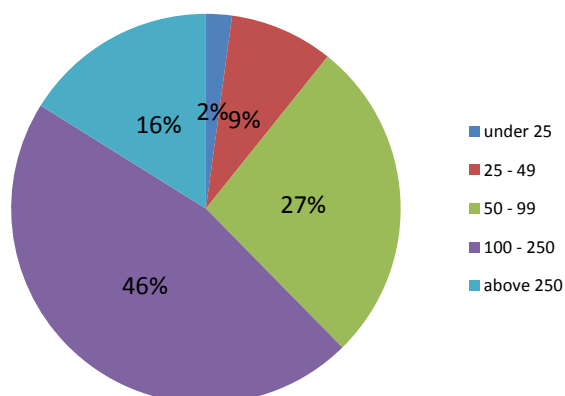
Figure 29 Distribution of heating temperature in production process in Poland

About 42% of industries in Poland don't use cooling system in industrial process. The existing cooling systems are mainly electrical cooling units. Cooling systems used in industrial process are mostly 5 – 14 years old.
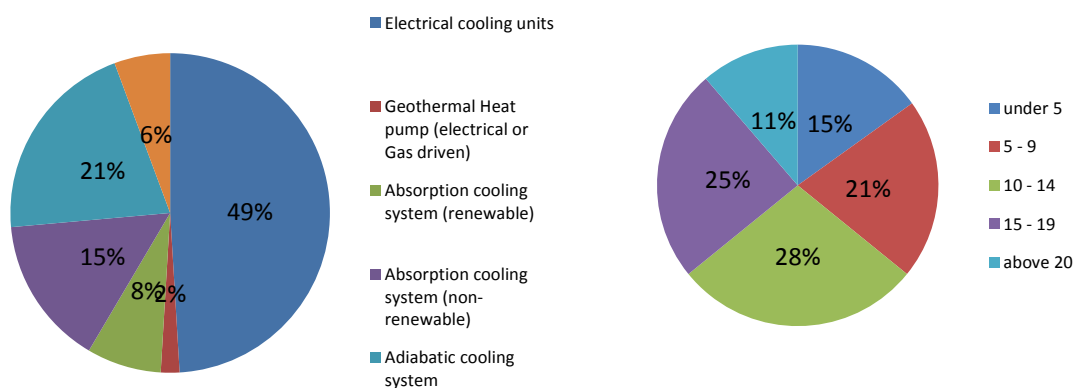

Figure 30 Distribution of cooling systems in Poland   *Figure 31Distribution of age of cooling system in Poland*
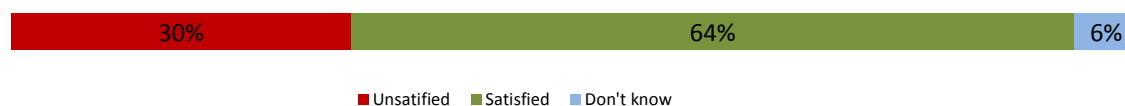

Figure 32 Distribution of level of satisfaction of cooling systems in Poland
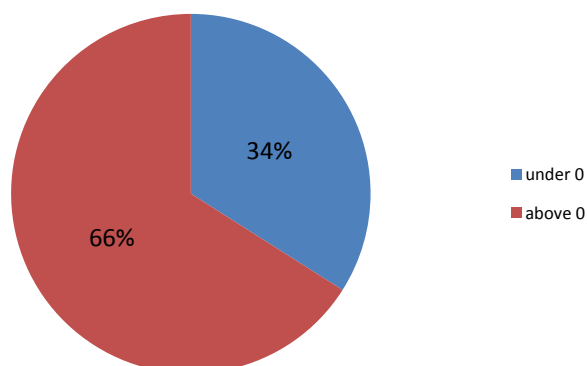
Figure 33 Distribution of cooling temperature in industrial process in Poland

5.3 INFORMATION RESOURCES
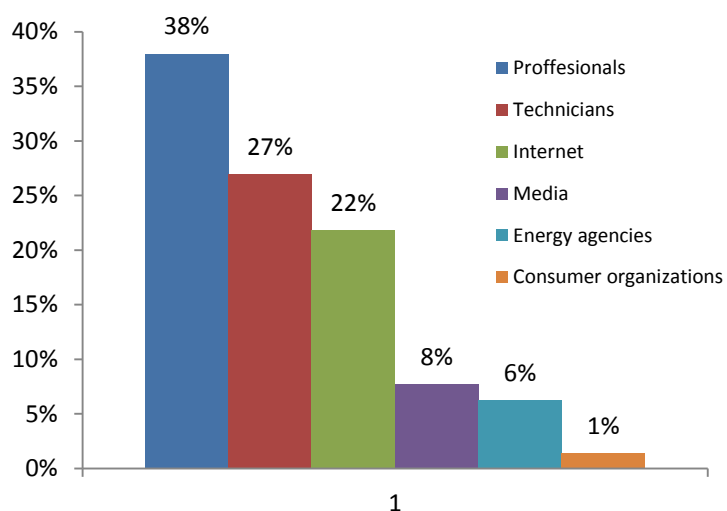
Figure 34 Information resources in Poland

Regarding the sources to search for information about R&H equipment, the main source are professionals; with a share of 38%. Also technicians and Internet have an important weight (27% and 22%, respectively). Technicians are pointed the most by the persons representing food sector, rubber and plastic products. There are not significant correlations between information resources and turnover of industrial undertaking.

5.4 KEY PURCHASING CRITERIA

According to the survey the key purchasing criteria (KPC) for H&C systems in Poland are:
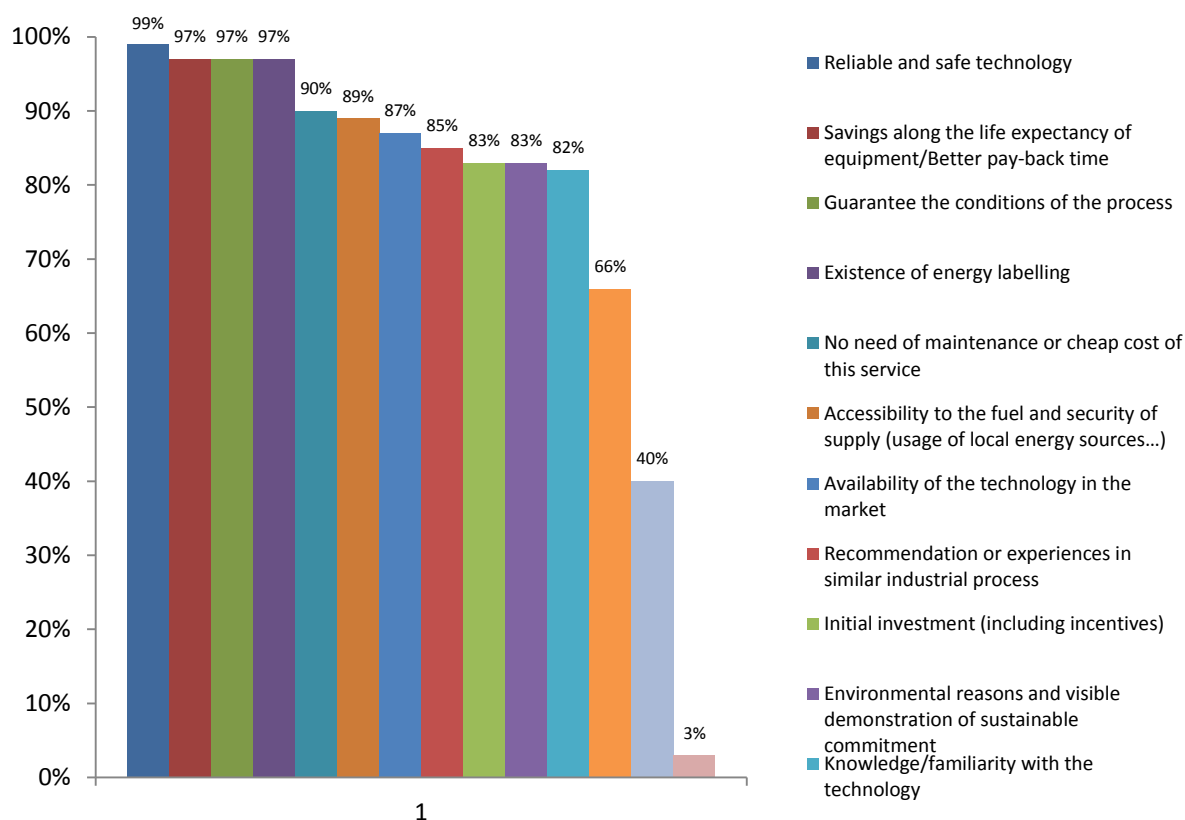

Legend:
- Reliable and safe technology
- Savings along the life expectancy of equipment/Better pay-back time
- Guarantee the conditions of the process
- Existence of energy labelling
- No need of maintenance or cheap cost of this service
- Accessibility to the fuel and security of supply (usage of local energy sources…)
- Availability of the technology in the market
- Recommendation or experiences in similar industrial process
- Initial investment (including incentives)
- Environmental reasons and visible demonstration of sustainable commitment
- Knowledge/familiarity with the technology

Figure 35 Key purchasing criteria in Poland

Considering the purchase of H&C, polish industrials recognised valid wide range of important criteria. However, in their opinion, any decision at purchasing process must go hand in hand with the main objective – production process. Factors like environmental reasons are important for them but only with secondary importance (which was often underlined by respondents at survey).

The following tables show the Key Purchasing Factors considering the criteria of analysed sample. Identified key purchasing criteria are above all related with nature of production process. For example industrials with daily variation in the activity much less pointing as important key purchasing criteria – architectural integration

KEY DECISION FACTOR	%	Sector								
		Foods & Beverages	Textiles	Wood	Paper	Chemicals,	Rubber & plastic	Metal	Machinery	Others
Reliable and safety	99%	97,4%	100%	100%	100%	100%	100%	100%	100%	100%
Savings	97%	100,00%	83%	100%	75%	100%	92%	100%	100%	100%
Guarantee the conditions of the process	97%	97,4%	83%	100%	100%	100%	92%	100%	100%	100%
Existence of energy labelling	97%	97,4%	100%	100%	100%	83%	92%	100%	100%	100%
No need of maintenance	90%	89,50%	83%	100%	100%	83%	92%	88%	82%	100%
Accessibility to the fuel	89%	89,5%	100%	83%	75%	100%	92%	88%	91%	78%
Experiences in similar industrial process	85%	84,2%	100%	100%	75%	67%	100%	63%	73%	100%
Initial investment	83%	92,1%	100%	67%	25%	83%	83%	88%	73%	78%
Environmental reasons	83%	86,8%	100%	67%	75%	67%	83%	100%	64%	89%
Familiarity with the technology	82%	76,3%	100%	83%	75%	83%	83%	88%	82%	89%
Reliable brand/manufacturer	66%	76,3%	50%	83%	100%	50%	50%	75%	55%	44%
Architectural integration	40%	36,84%	33%	50%	25%	50%	50%	50%	36%	33%

KEY DECISION FACTOR	%	Variation in the activity			Turnover (€/year)				
		Daily	Weekly	Seasonal	under 9	10 - 59	60 - 250	above 250	no info
Reliable and safety	99%	100%	100%	99%	100%	100%	100%	100%	98%
Savings	97%	100%	100%	96%	96%	100%	100%	100%	96%
Guarantee the conditions of the process	97%	100%	92%	99%	100%	100%	100%	100%	94%
Existence of energy labelling	97%	100%	96%	97%	93%	100%	100%	100%	98%
No need of maintenance	90%	86%	88%	91%	89%	80%	33%	100%	96%
Accessibility to the fuel	89%	100%	92%	87%	89%	93%	33%	67%	92%
Experiences in similar industrial process	85%	71%	92%	87%	86%	73%	33%	100%	94%
Initial investment	83%	86%	85%	85%	75%	87%	67%	100%	90%
Environmental reasons	83%	71%	88%	82%	82%	93%	100%	100%	78%
Familiarity with the technology	82%	71%	85%	84%	79%	80%	67%	100%	86%
Reliable brand/manufacturer	66%	71%	92%	79%	86%	60%	33%	67%	90%
Architectural integration	40%	43%	69%	67%	64%	87%	33%	100%	61%

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5.5 AWARENESS ABOUT RES

The 71% of the survey respondents have heard about the use of RES in heating and cooling systems in industrial process. The following tables show the knowledge about RES, considering the characteristics of the sample. The deviation of each characteristic compared with the distribution of the number of answers is shown:

	Answers	%	Sector								
			A	B	C	D	E	F	G	H	I
YES	71	71%	83%	83%	75%	83%	75%	50%	64%	67%	71%
NO	29	29%	17%	17%	25%	17%	25%	50%	36%	33%	29%

Description: A - Processed and Refined Foods and Beverages and tobacco B - Textiles and Clothing C - Wood and wood products D - Paper and Paper products E - Chemicals, pharmaceutical and related products F - Rubber and plastic products G - Basic metal products and fabricated metal products H - Machinery and machinery components I - Others

	Answers	%	Variation in the activity			Turnover (€/year)				
			daily	weekly	seasonal	under 9	10 - 59	60 - 250	above 250	no info
YES	99	99%	57%	73%	72%	68%	67%	33%	100%	71%
NO	97	97%	43%	27%	28%	32%	33%	56%	0%	29%

The known technologies for those who have heard about RES i (74%) of the survey respondents are represented in the following tables:

| TECHNOLOGY	Heating/DWH	cooling
Solar Thermal	97%	4%
Heat Pump (Renewable)	94%	20%
Geothermal	94%	6%
Biomass	92%	4%
District Heating (Renewable)	55%	7%

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5.6 PERCEPTION OF RES ATTRIBUTES

The perception of RES attributes by those survey respondents who have heard about using RES at industrial process (74%) is shown in the following table:

ATTRIBUTE	RENEWABLES	%	NON-RENEWABLES	%	NO ANSWER	%
Higher initial investment	64	90%	6	9%	1	1%
Higher operation costs (maintenance and fuel)	32	45%	38	54%	1	1%
Higher savings along the life expectancy of equipment	61	86%	9	13%	1	1%
More eco-friendly	68	96%	3	4%	0	0%
Higher working reliance	19	27%	49	69%	3	4%
Higher visual impact and/or need of space to install/store fuel	52	73%	17	24%	2	3%
Safer	53	75%	16	23%	2	3%
More specialized installers	62	87%	7	14%	2	3%

The respondents consider that renewable technologies have higher investments, lower operation costs (at a lesser degree) and higher savings along the life expectancy. According to the survey, renewable energies are safer and more eco-friendly than fossil fuel technologies. Besides, the respondents consider that the installers are more specialized. About the operation cost, the survey shows that the perception is almost equal for renewable and non-renewable technologies.

5.7 ADEQUACY OF RES
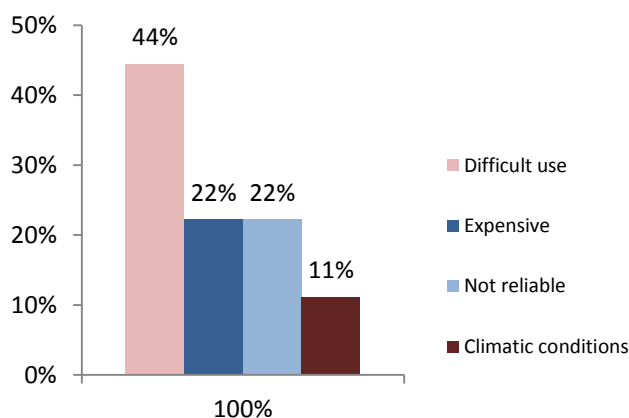
The main reasons for the rejection of the use of RES for heating or DHW systems are: the difficult use in production process (44%), high costs (22%) and not reliable (22%).

Figure 36 Reason for the rejection of RES in heating and DHW systems in Poland

The 66% of the respondents who know about RES consider the installation of some RES technologies for heating or DWH systems. According to the results the favourite technology is solar (20%), heat pump (18%), Biomass (17%), Geothermal (17%).

The 76% of the respondents consider the installation of some RES technologies for cooling systems. Adsorcion cooling systems are the preferred systems for polish respondents (27%).
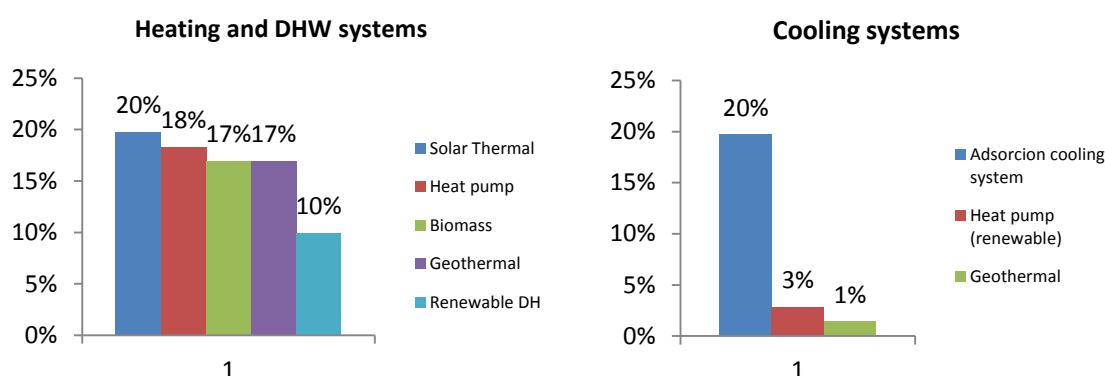

Figure 37 Considered RES technologies for heating and cooling systems.

5.8 WILLINGNESS TO PAY MORE

To the question: "Are you willing to pay more for a RES system?"29% the respondents will be willing to pay more money, 27% won't and 44% did not answer to the question mainly because in their opinion decision like this should be based on economic analysis.

The majority of those, whose answer to the previous questions was "YES", were willing to pay, as it is shown in Figure 11.
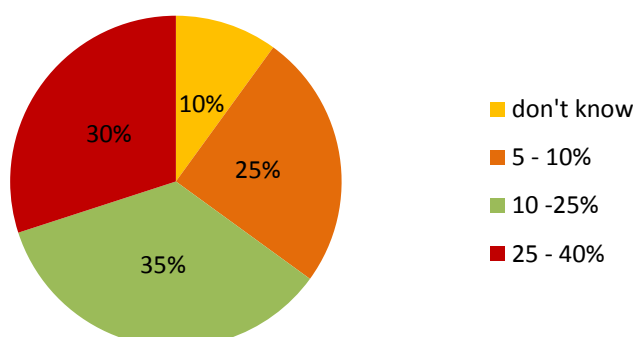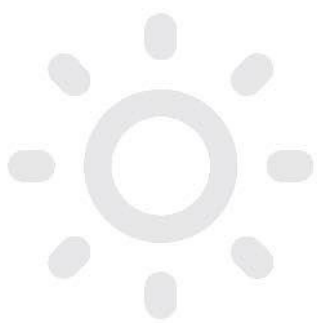

Figure 38 Willingness to pay for RES technologies.