PORTUGAL: NATIONAL REPORT KEY DECISSION FACTORS

CONTENTS

PORTUGAL 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 Portugal. 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 permit identify the key purchasing criteria (KPC). They 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 PORTUGAL

To achieve this objective a national survey has been carried out by Equação Lógica® (Portuguese Market Research & Insights Company founded in 2010, comprises a team that began its professional career at Millward Brown in 1998, and serves as the preferred supplier as well as commercial agent for its tools and solutions in Portugal. Specializing in ad-hoc solutions, create solutions tailor-made to the needs of clients and of each project, using methodologies and innovative analyses. Is a member of APODEMO Portuguese Association of Market Research Companies) in Portugal under the coordination of Portuguese National Energy Agency (ADENE).

The execution time of this activity, excluding the subcontracting launching period, was around two months (fieldwork: 23rd April to 22nd May 2015).

Three targets:

. **Residential** - owners, of both genders, with 18 and more years old, living in buildings in the last five years or pretend to do so in the next five years, in mainland Portugal;

. **Nonresidential** - companies, public or private, such as offices, stores/shops, health centers, hotels, educational centers, sports centers, etc. existing in mainland Portugal;

. **Industry** - companies in the industrial area using heating / cooling equipment in the industrial process, various business sectors, such as processed and refined foods, beverages and tobacco, textiles and clothing, wood and wood products and paper, chemicals, pharmaceuticals, rubber and plastic products, metal and base metal products, machinery and machinery components, etc., exist in mainland Portugal.

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

SECTOR	NUMBER OF QUERIES	POPULATION SIZE	CONFIDENCE LEVEL	SAMPLE ERROR
Residential	900	5.620 M	95%	3,27%
Non-residential	250	225 M	95%	6,20%
Industry	100	50.780	95%	9,80%

Source: INE National Statistical Institute

3. SURVEY ON RESIDENTIAL SECTOR

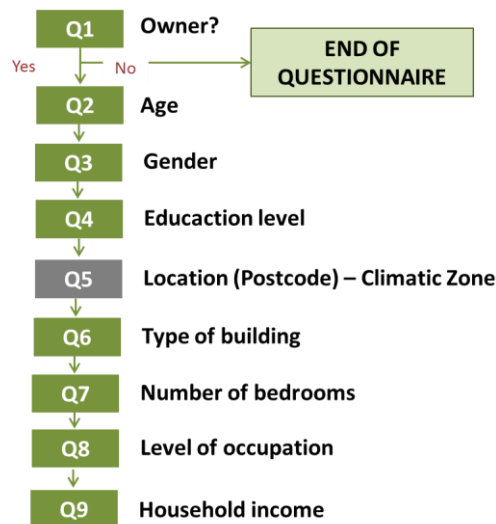The flow diagram in the execution of the survey is shown in Figure 1 and 2.
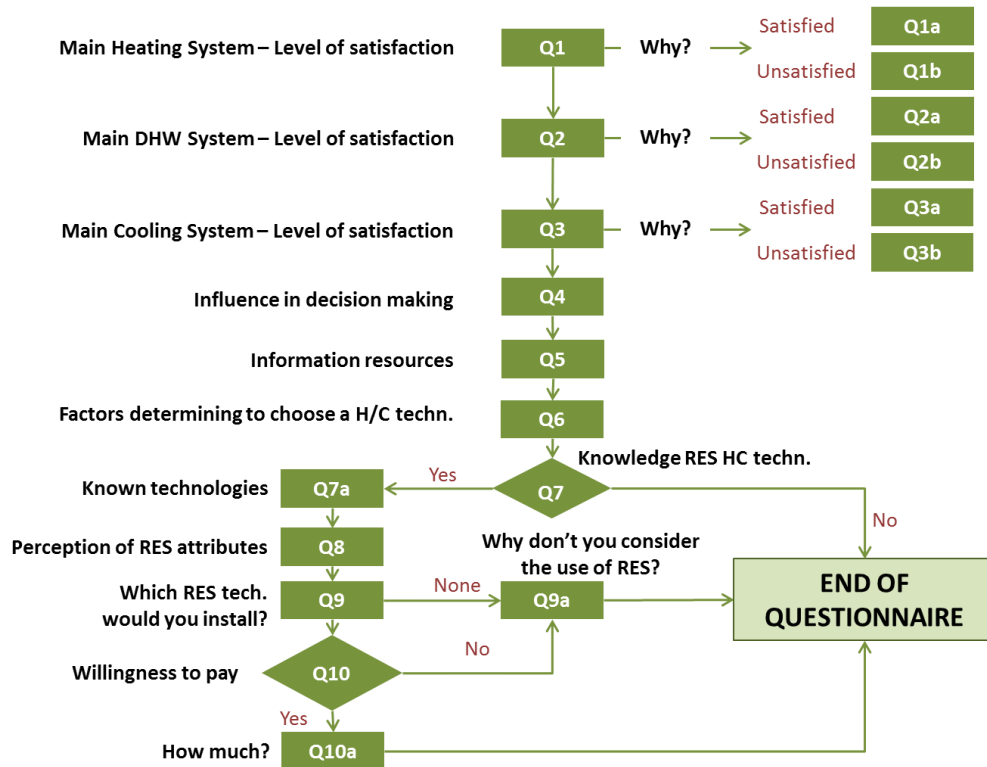

Figure 1 *Characterization of the sample*

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

3.1. MAIN CHARACTERISTICS OF THE SAMPLE

In Portugal, 900 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.
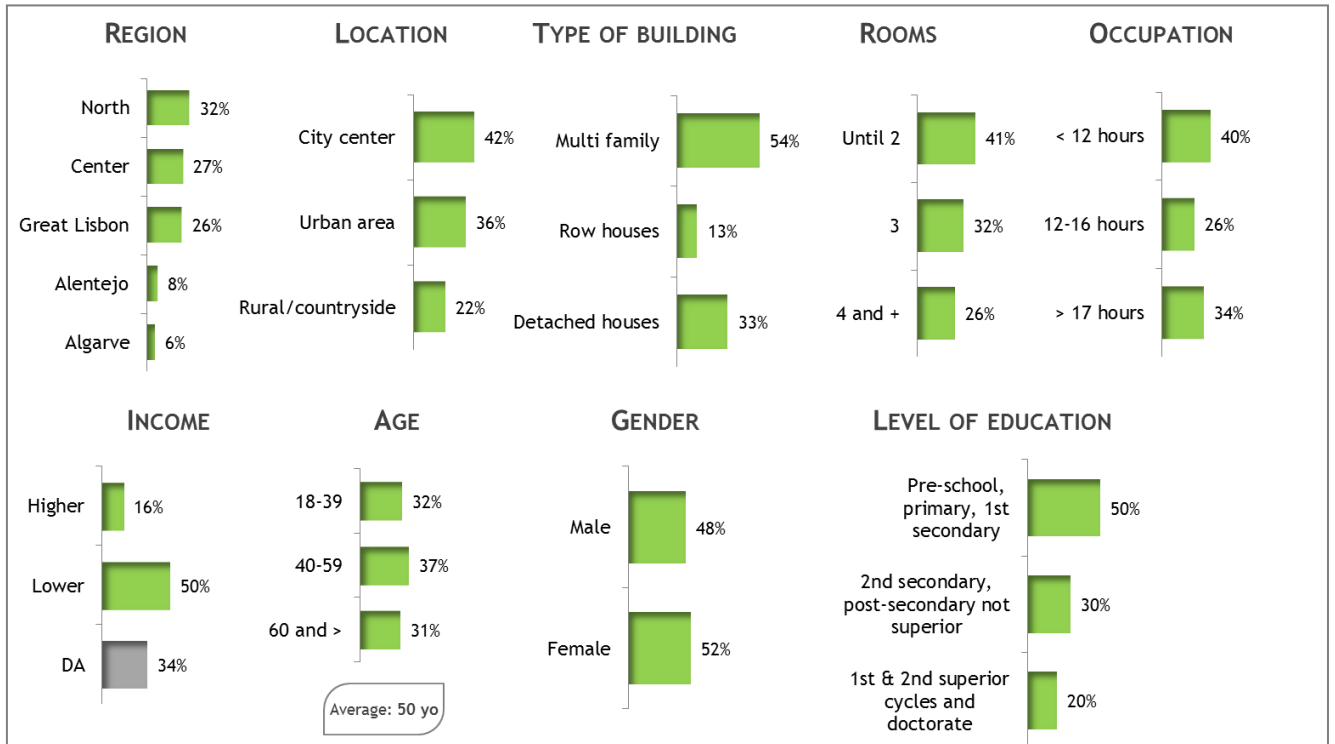
REGION		LOCATION		TYPE OF building		ROOMS		OCCUPATION	
North	32%	City center	42%	Multi family	54%	Until 2	41%	< 12 hours	40%
Center	27%	Urban area	36%	Row houses	13%	3	32%	12-16 hours	26%
Great Lisbon	26%	Rural/countryside	22%	Detached houses	33%	4 and +	26%	> 17 hours	34%
Alentejo	8%								
Algarve	6%								

INCOME		AGE		GENDER		LEVEL OF EDUCATION	
Higher	16%	18-39	32%	Male	48%	Pre-school, primary, 1st secondary	50%
Lower	50%	40-59	37%	Female	52%	2nd secondary, post-secondary not superior	30%
DA	34%	60 and >	31%			1st & 2nd superior cycles and doctorate	20%
		Average: 50 yo					

Figure 3 *Characterization of the sample*

3.2 CURRENT HEATING, COOLING AND DOMESTIC HOT WATER SYSTEMS

Regarding the **Heating** systems, 57% of Portuguese households have it; the main heating system used in Portugal is "electricity/ joule" (25%).
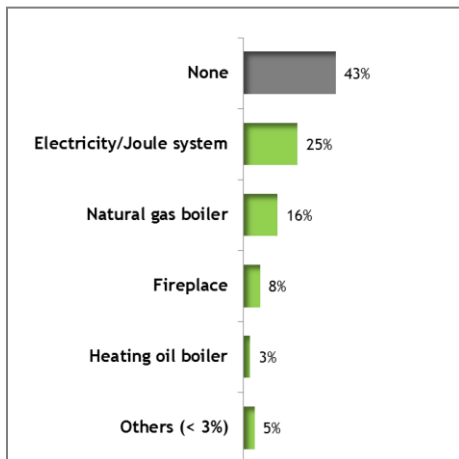

Figure 4 *Distribution of heating systems in Portugal*

- 51% of the systems are "individual" and 49% are "centralized", more individual in detached houses (62%) and more centralized in row houses (65%),

- In region Centre more "electricity" (33%) and less "none" (29%), in Lisbon more "none" (51%),

- In city centre, more "none" (50%) and in rural/countryside more "electricity" (32%) and less "none" (31%),

- In apartments, more "none" (52%), in detached houses less "none" (31%) and houses with 4 or more bedrooms less "none" (31%).

The **satisfaction** with the heating system is very high without differences between socio-demographic groups (Satisfied: 84% and Dissatisfied: 16%). All the households with fireplace are satisfied those who use natural gas boiler are more satisfied while those who use electric systems are less satisfied.

For those respondents satisfied with its heating system the main reason of satisfaction is "easy to use, reliable and safe of equipment" (37%), this reason is more significant in "electricity" (59%), "good levels of comfort" is more important in natural gas boiler (39%), "fuel/source of energy is cheap" is more important in fireplace (39%).

On the other hand, the main reason of dissatisfaction is "fuel/source of energy is expensive" (64%), more significant in "electricity" (80%).

Regarding the **Domestic Hot Water** systems (DHW), 88% of Portuguese households have it; the main domestic water system used in Portugal is "boiler / esquentador" (38%).
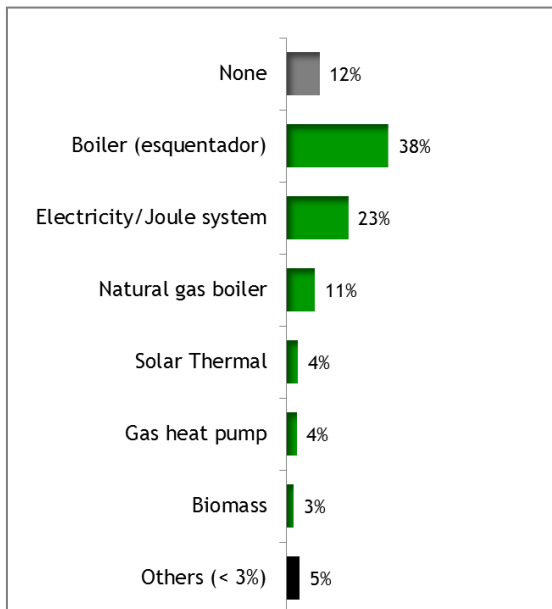

Figure 5 *Distribution of DHW systems in Portugal*

- The households in Alentejo and Lisbon use less "boiler" (26% and 31%),
- 55% of the systems are "centralized" and 45% are "individual"
  - More centralized in Centre (66%), Algarve (71%) and Rural (69%),
  - More individual in North (56%), at city center (54%) and houses with 2 bedrooms (52%),

The level of **satisfaction** is very high (Satisfied: 88% and Dissatisfied: 12%). The main reasons for those who are satisfied are "easy to use, reliable and safe of equipment" (43%) and "Fuel/source of energy is cheap" (36%).

On the other hand, the main reasons of dissatisfaction are "the equipment is/was very expensive" (33%), "it requires a lot of space for storage" (25%), "fuel/source of energy is expensive" (22%) and "it provides low levels of comfort" (22%).

Regarding the **Cooling** systems, only 20% of Portuguese households have it; there are two main systems used, "electro air conditioning" (12%) and "fans/blowers" (7%).
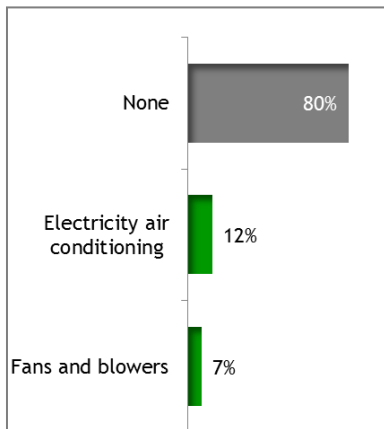

Figure 6 *Distribution of Cooling systems in Portugal*

- 89% is individual (87% air conditioning and 98% fans/blowers) and 11% is centralized,
- In Centre more "none" (86%).

In general the **satisfaction** with these systems is very high (Satisfied: 84% and Dissatisfied: 16%) because "the equipment is easy to use, reliable and safe (63%).

On the other hand, the main reason of dissatisfaction is "it requires a lot of space for storage" (35%).

The main reason to use the current system in residential for:

✓ **Heating** is "a cheap option" (27%), "familiarity" and "don´t know any other technology" is less important in fireplace (9% and 7%);

✓ **DHW** system are "a cheap option" (22%), "familiarity" (22%) and "at house when bought" (21%),

✓ **Cooling** is "a cheap option" (29%).

3.3. INFORMATION RESOURCES

Regarding the sources to search for information about R&H equipment in Portugal, the main sources are the "Stores and Agent sales" (46%), "Professionals" (installers, manufacturers, architects, engineers) (37%) and with less but even important "Family, friends or colleagues" (24%). There were no significant differences between segments.
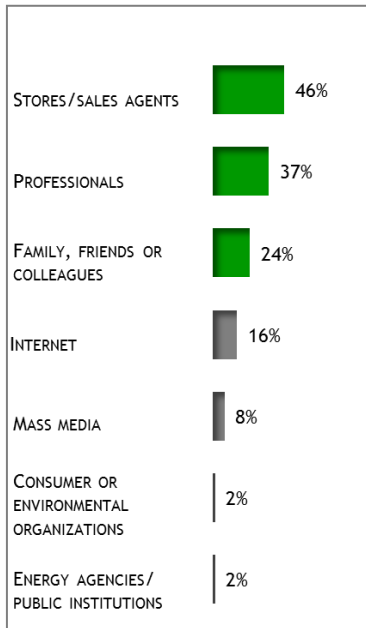

Figure 7 *Information resources in Portugal*

3.4. KEY PURCHASING CRITERIA

According to the survey the key purchasing criteria (KPC) for H&C systems in Portugal are:
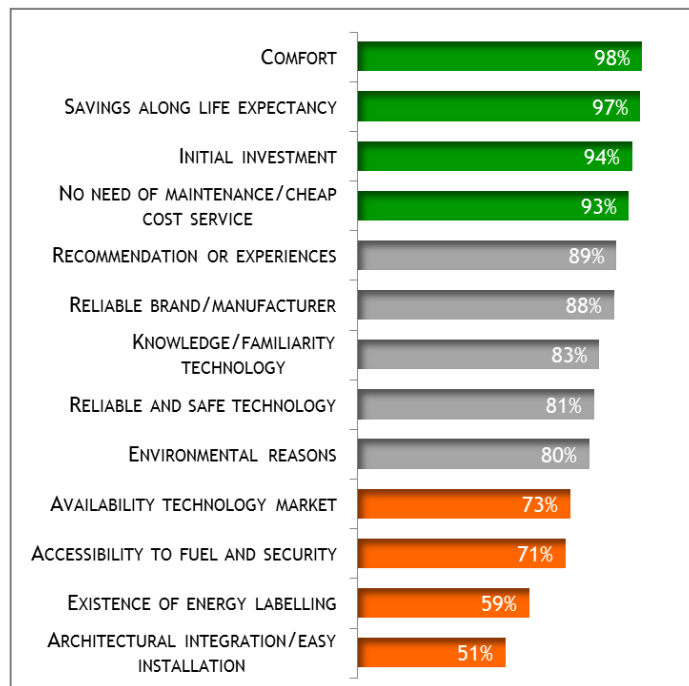
Figure 8 *Key purchasing criteria in Portugal*

All the criteria have high level of importance.

The **most** important are "comfort" (98%), and about economic reasons like "savings along life expectancy" (97%), "initial investment" (94%) and "cheap cost service" (93%);

The **least** important are "architectural integration/easy installation" (51%), "energy labelling" (59%), "accessibility to fuel and security" (71%) and "availability technology in the market" (73%).

We observe many differences by variables:

- o "Familiarity with technology" more at 60+yo (88%) and in Algarve (91%) vs. 83%,

- o "Reliable brand" more 18-39 years old (92%) and in North (92%), less in Centre (82%) and in Algarve (74%), less in rural (82%) vs. 88%

- o "Reliable and safe technology" more in North (86%) vs. 81%

- o "Environmental" less in Algarve (67%) vs. 80%

- o "Availability technology market" more 18-39 years old (81%) and less 60 + years old, more in North (80%) and less in Algarve (58%) vs. 73%,

- o "Existence of energy labelling" more in North (67%) vs. 59%,

- o "Architectural integration" more in North (58%) vs. 51%.

3.5. KNOWLEDGE ABOUT RES

The 64% of the survey respondents have heard about the use of RES in heating and cooling systems, more awareness in Centre (72%).

The known technologies for those who have heard about RES (64%) of the survey respondents are represented in the following tables:

TECHNOLOGY	HEATING/DHW	COOLING
Solar Thermal	90%	15%
Biomass	34%	4%
Geothermal	23%	6%
Heat Pump (Renewable)	23%	5%
District Heating (Renewable)	7%	6%

None: 76%

3.6 PERCEPTION OF RES ATTRIBUTES

The perception of RES attributes by those survey respondents who have heard about RES (64%) is shown in the following table:

ATTRIBUTE	RENEWABLES	%	NON-RENEWABLES	%
Higher initial investment	526	92%	47	8%
Higher operation costs (maintenance and fuel)	357	62%	216	38%
Higher savings along the life expectancy of equipment	491	86%	82	14%
More eco friendly	547	96%	26	5%
Higher working reliance	447	78%	126	22%
Higher visual impact and/or need of space to install/store fuel	418	73%	155	27%
Safer	485	85%	88	15%
More specialized installers	437	76%	136	24%

- All the attributes are more associated to renewable vs. non-renewable energy ,

- The **most** attribute associated to renewable energy is "more eco-friendly" (96%),

- The **least** attribute associated to renewable energy is "Higher operation costs" (62%),

- "Higher initial investment" at renewable energy more at Algarve (97%),

- "Higher visual impact and/or need of space to install/store fuel" at renewable energy more at Algarve (90%),

- "Safer" at renewable energy more associated at Algarve (97%) and North (92%),

- "More specialized installers" at renewable energy more associated at apartments (83%) and less at detached houses (68%).

3.7. ADEQUACY OF RES

In the question about the most suitable renewable energy technology to incorporate in their houses, 28% of the respondents do not consider any renewable energy technology for heating and DHW systems in their dwellings and 45% of the respondents do not consider any renewable energy technology for cooling systems in their dwellings – 10% do not consider both.
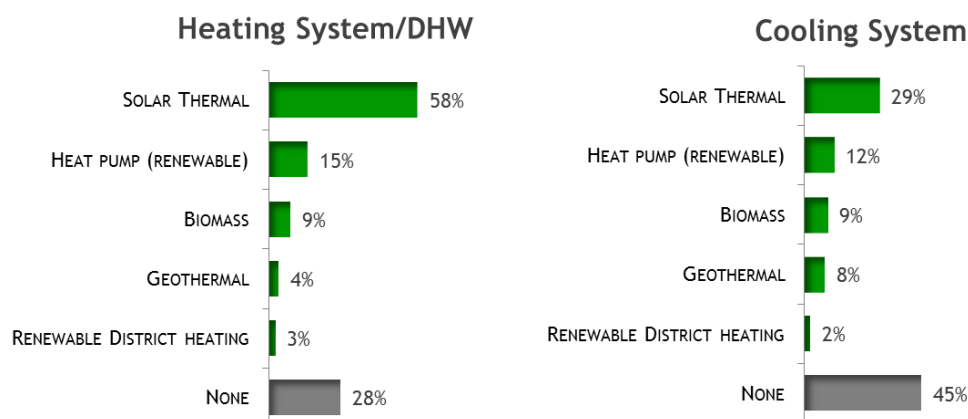
- ✓ "Solar thermal" is the favourite energy technology to heating and DHW systems (58%),
  - ✓ However, 28% consider that "none" is suitable - more at oldest (37%) and female (35%) and less male (21%) and at Alentejo (17%),
- ✓ Biomass and Heat pump less at oldest (5% and 11% respectively)
- ✓ Heat pump less at households with occupation more than 17 hours daily (11%)

- ✓ "Solar thermal" is the favourite energy technology to cooling system (29%)
- ✓ However, 45% consider that "none" is suitable - more at Centre (53%) and at detached houses (53%) and less at Lisbon (37%) and at row houses (35%)
- ✓ Heat pump less at Centre (5%) and at households with occupation between 12 and 16 hours daily (6%) and more at Lisbon (21%)

The rejection is higher in some groups: "60 + years old" (16%), "female" (12%), "Centre" (14%), "urban area" (12%), "detached houses" (15%), "3 or more bedrooms" (10%) and level of occupation more than 17 hours daily (13%).

The main reasons for the **rejection** of the use of RES for heating or DHW systems is the idea "being expensive" (62%). The lack of installers is not a reason for the rejection of RES in Portuguese respondents.
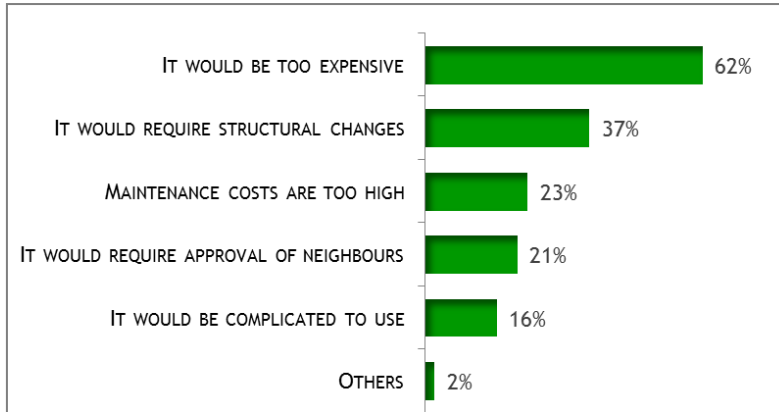

Figure 9 *Reason for the rejection of RES in heating and DHW systems in Portugal*

To the question: "Are you willing to pay more for a RES system?" only 24% the respondents will be willing to pay more money, 54% won't and 22% did not answer to the question. Is in the North that there is a lower willingness to invest (16%), with more indecision (30%).

The majority of those, whose answer to the previous questions was "YES", were willing to pay, less than 5%.
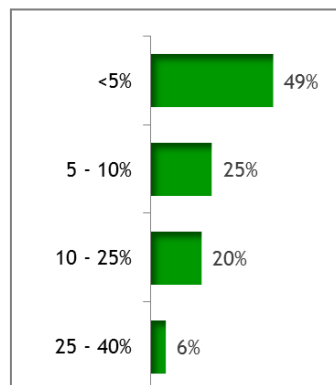
Figure 10   *Willingness to pay for RES technologies.*

4. SURVEY ON NON-RESIDENTIAL SECTOR

The flow diagram in the execution of the survey is shown in Figure 11 and 12.
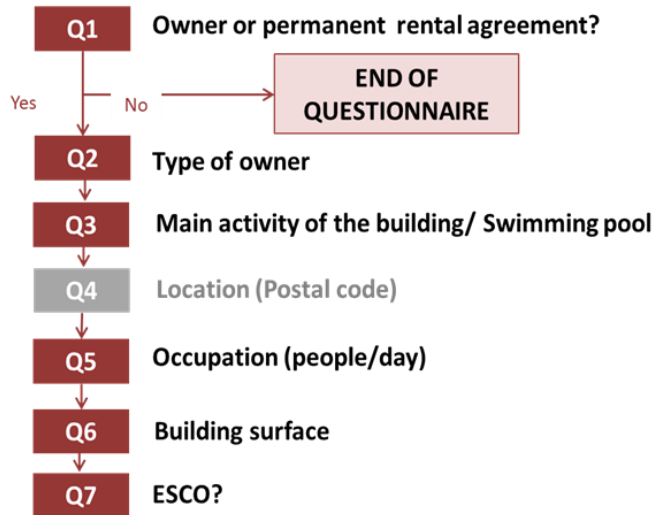
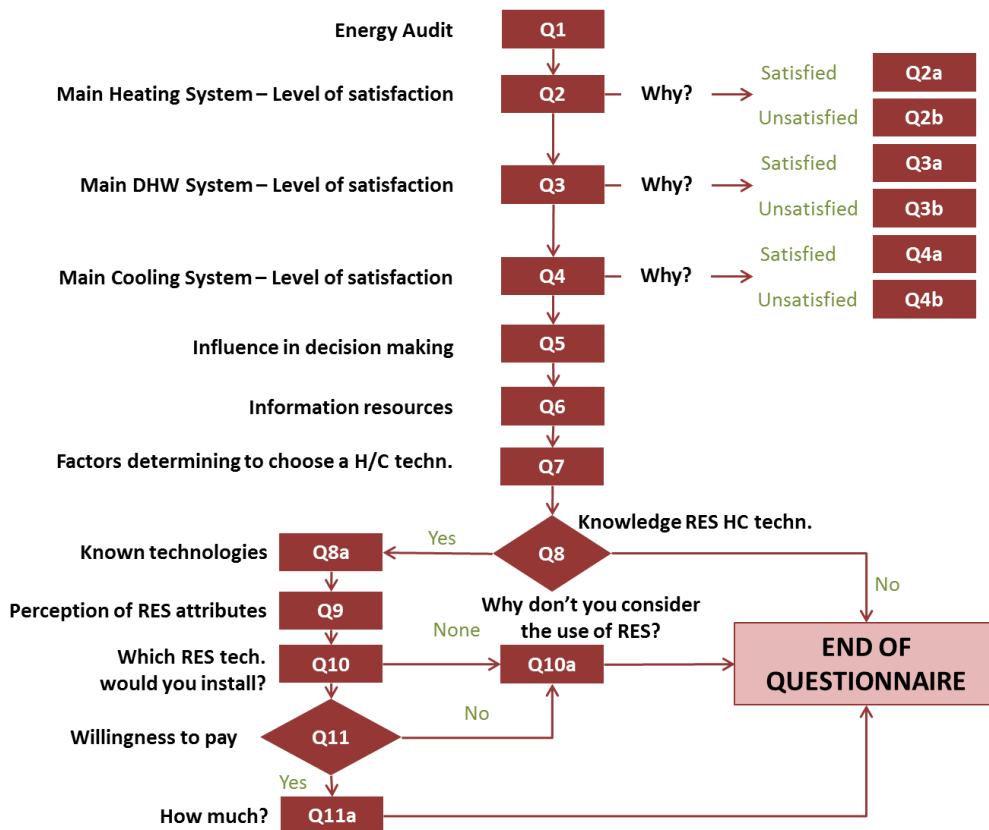

Figure 11   *Characterization of the sample*

Figure 12   *Flow diagram to follow in questionnaires – non-residential sector*

4.1. MAIN CHARACTERISTICS OF THE SAMPLE

In Portugal, 250 interviews were executed in the non-residential sector. The main characteristics of the sample are depicted in Figure 13. The sample is balanced comparing with the total data of the country.
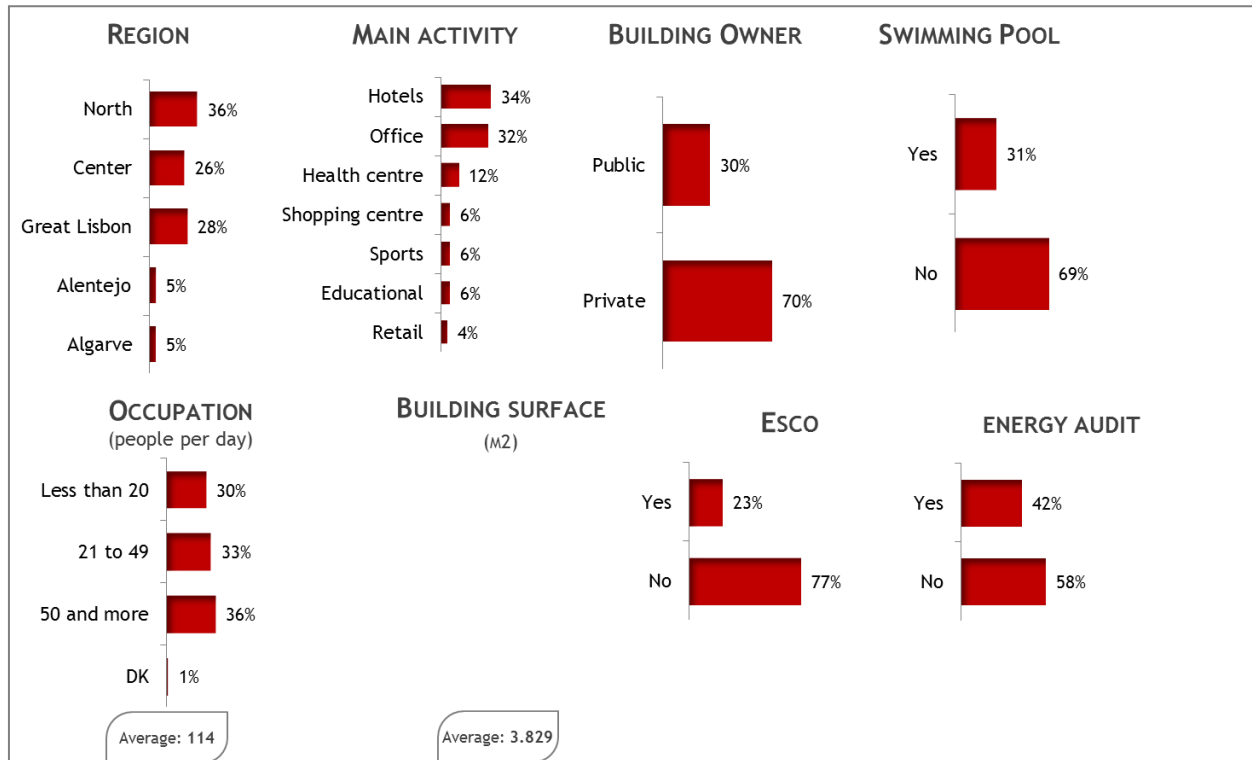

Figure 13   *Characterization of the sample*

4.2. CURRENT HEATING, COOLING AND DOMESTIC HOT WATER SYSTEMS

Regarding the **Heating** systems, almost of non-residential buildings have it; the main heating system used in Portugal is "electricity/ joule" (76%).
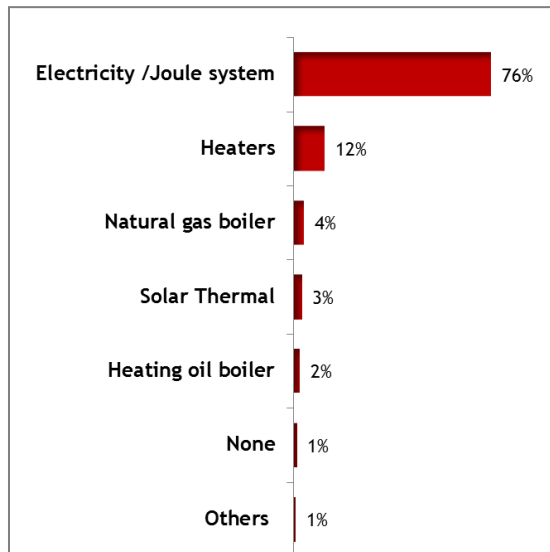
| Figure 14 | *Distribution of heating systems in Portugal* |

- 60% of the systems are "individual" and 39% are "centralized",
- More "heaters" at office buildings (23%).

The satisfaction with the heating system is very high without differences between socio-demographic groups (Satisfied: 87% and Dissatisfied: 13%), without differences by system.

For those respondents satisfied with its heating system the main reason of satisfaction is "provides good levels of comfort" (62%).

On the other hand, the main reasons of dissatisfaction are "requires a lot of space to storage" (29%), "requires frequent or expensive maintenance" (26%), "fuel/source of energy is expensive" (23%) and "provides low levels of comfort" (23%).

Regarding the **Domestic Hot Water** systems (DHW), 71% of Portuguese non-residential buildings have it; the main domestic water system used in Portugal is "natural gas boiler" (32%).
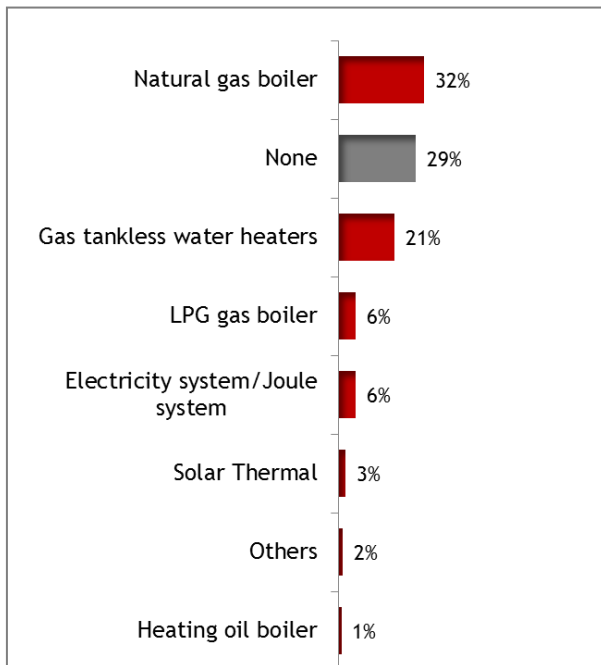

Figure 15   *Distribution of DHW systems in Portugal*

- All the hotels and sport centres have the system,

- 49% of the systems are "individual" and 22% are "centralized",

- More "natural gas boiler" at hotels (52%) and less at office building (20%),

- Emphasis on the lack of system in public buildings and office buildings (44% and 56% don´t have it).

The level of **satisfaction** is very high (Satisfied: 85% and Dissatisfied: 15%), more satisfied with gas tankless water heaters (98%). The main reason for those who are satisfied is "the equipment is/was very cheap" (57%).

On the other hand, the main reasons of dissatisfaction are "fuel/source of energy is expensive" and "it requires a lot of space for storage" (39% for both).

Regarding the **Cooling** systems, 83% of Portuguese non-residential have it; the leading system is "electro air conditioning" (69%).
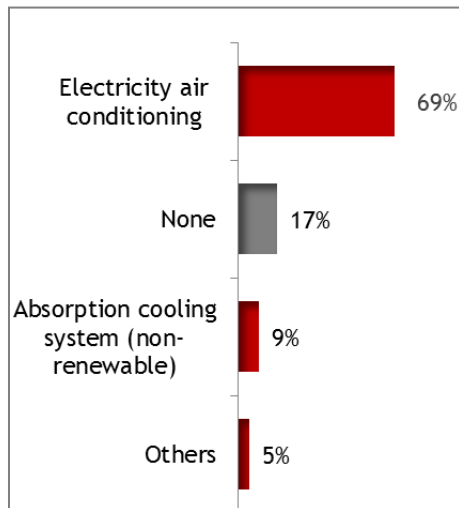

Figure 16   *Distribution of Cooling systems in Portugal*

- 54% is individual (76% in public and office buildings), and 46% is centralized (60% in hotels),
- In public and office buildings more "none" (29% and 31%), all hotels have cooling system (more absorption than the total – 20%).

In general the **satisfaction** with these systems is very high (Satisfied: 89% and Dissatisfied: 11%) because "it provides good levels of comfort" (50%). In the electricity other important reason for this satisfaction is "does not require frequent or expensive maintenance" (35%).

On the other hand, the main reasons of dissatisfaction are "it is unfriendly with environment" (41%) and "the equipment is/was very expensive" (36%).

The main reason to use the current system in non-residential for:

✓ **Heating** has been chosen by higher instances (other than the person responsible in the company/institution for energy issues in the building) (34%) but the "price" appears as second factor in that decision (25%),

✓ **DHW** are "satisfaction of needs" (23%) and "a cheap option" (21%), without differences by system,

✓ **Cooling** is by "familiarity" (23%).

4.3. INFORMATION RESOURCES

Regarding the sources to search for information about R&H equipment in Portugal, the main source is the "Professionals" (installers, manufacturers, architects and engineers) (67%).
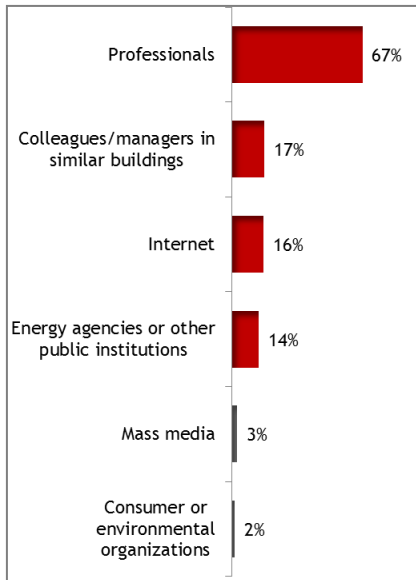

Figure 17   *Information resources in Portugal*

4.4. KEY PURCHASING CRITERIA

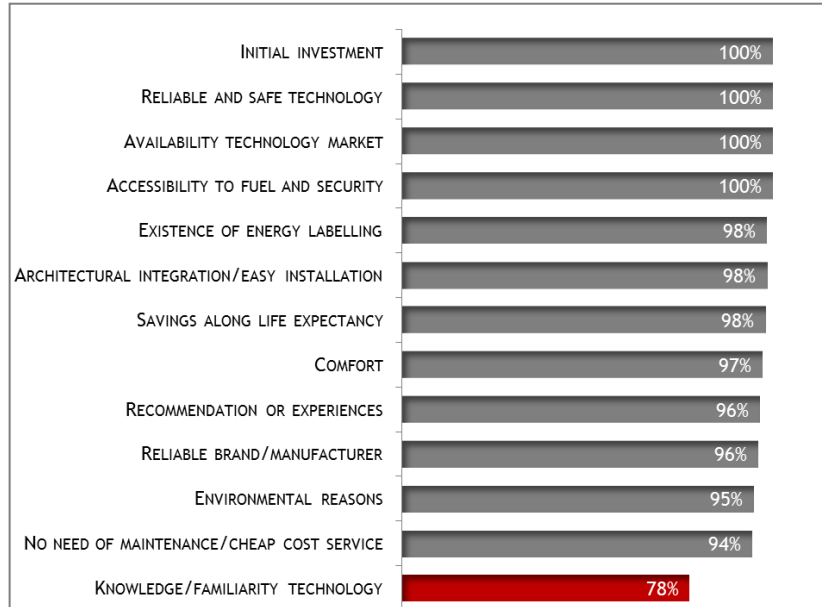According to the survey the key purchasing criteria (KPC) for H&C systems in Portugal are:

Figure 18   *Key purchasing criteria in Portugal*

Everything is important at non-residential target, only "familiarity" is below 80%.

4.5 KNOWLEDGE ABOUT RES

All the respondents of the survey have heard about the use of RES in heating and cooling systems.

The known technologies for the survey respondents are represented in the following tables:

TECHNOLOGY	HEATING/DHW	COOLING
Solar Thermal	100%	80%
Biomass	55%	5%
Geothermal	37%	4%
Heat Pump (Renewable)	36%	23%
District Heating (Renewable)	5%	1%

## 4.6. PERCEPTION OF RES ATTRIBUTES

The perception of RES attributes by those survey respondents who have heard about RES (100%) is shown in the following table:

ATTRIBUTE	RENEWABLES	%	NON-RENEWABLES	%
Higher initial investment	245	98%	5	2%
Higher operation costs (maintenance and fuel)	107	43%	143	57%
Higher savings along the life expectancy of equipment	232	93%	18	7%
More eco friendly	246	98%	4	2%
Higher working reliance	234	94%	16	6%
Higher visual impact and/or need of space to install/store fuel	131	52%	119	48%
Safer	239	96%	11	4%
More specialized installers	239	96%	11	4%

- Almost attributes are more associated to renewable vs. non-renewable energy,

- Only "higher initial investment" is more associated to non-renewable energy (57%),

- "Higher visual impact and/or need of space to install/store fuel" it is almost equal between the two types of energy.

4.7 ADEQUACY OF RES

In the question about the most suitable renewable energy technology to incorporate in their offices, 32% of the respondents do not consider any renewable energy technology for heating and DHW systems and 42% of the respondents do not consider any renewable energy technology for cooling systems – 20% do not consider both.
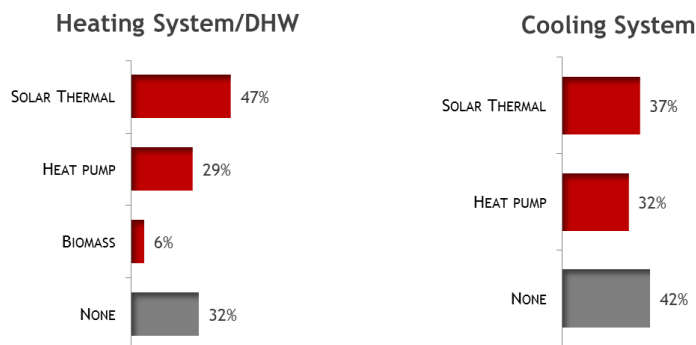
- ✓ "Solar thermal" is the favourite energy technology to heating and DHW systems (47%)
- ✓ However, 32% consider that "none" is suitable
    - ✓ More at public and office building (45% & 59%)
    - ✓ Less at health centres (17%) and Hotels (6%)
- ✓ Solar Thermal more at health centres and hotels (67% both) and less at office building (29%)
- ✓ Heat pump less at office building (14%)

- ✓ "Solar thermal" is the favourite energy technology to cooling system (37%) but with a value close "Heat pump" (32%)
- ✓ However, 42% consider that "none" is suitable
- ✓ Without differences by segments

The rejection is lower in hotels (4%) and higher in office buildings (35%).

The main reasons for the rejection of the use of RES for heating or DHW systems is the idea "being expensive" (60%). The lack of installers is not a reason for the rejection of RES in Portuguese respondents.
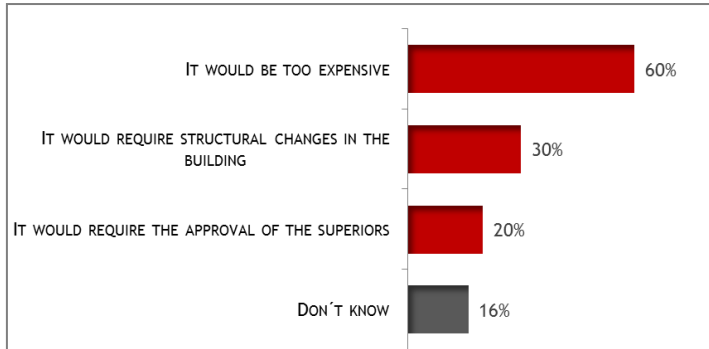

Figure 19   *Reason for the rejection of RES in heating and DHW systems in Portugal*

To the question: "Are you willing to pay more for a RES system?" only 18% the respondents will be willing to pay more money, 32% won't and 50% did not answer to the question.

Among non-residential target that show available to do an initial investment, the value is in near 70% below 5%.
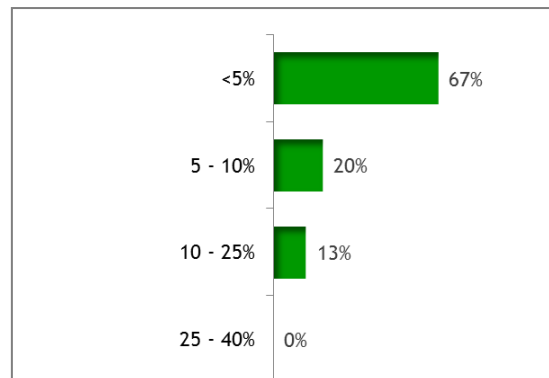
Figure 20   *Willingness to pay for RES technologies.*

5. SURVEY ON INDUSTRIAL SECTOR

The flow diagram in the execution of the survey is shown in Figure 21 and 22.
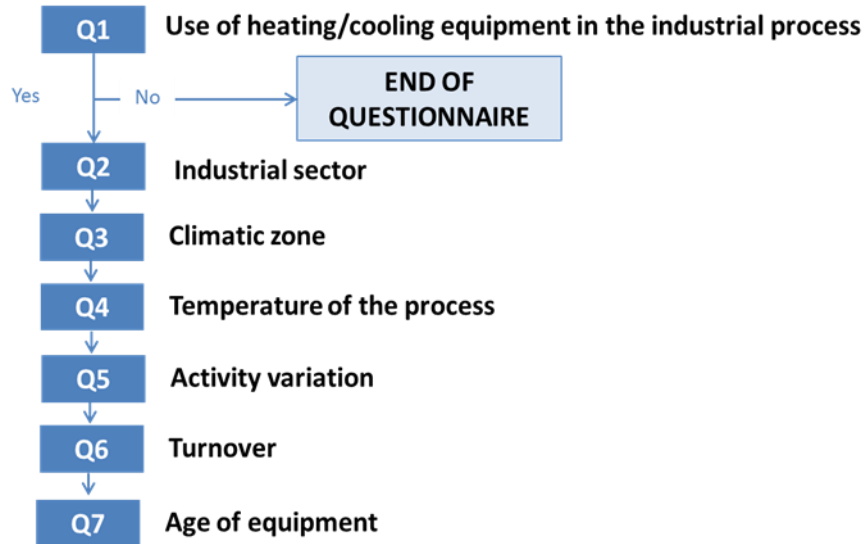

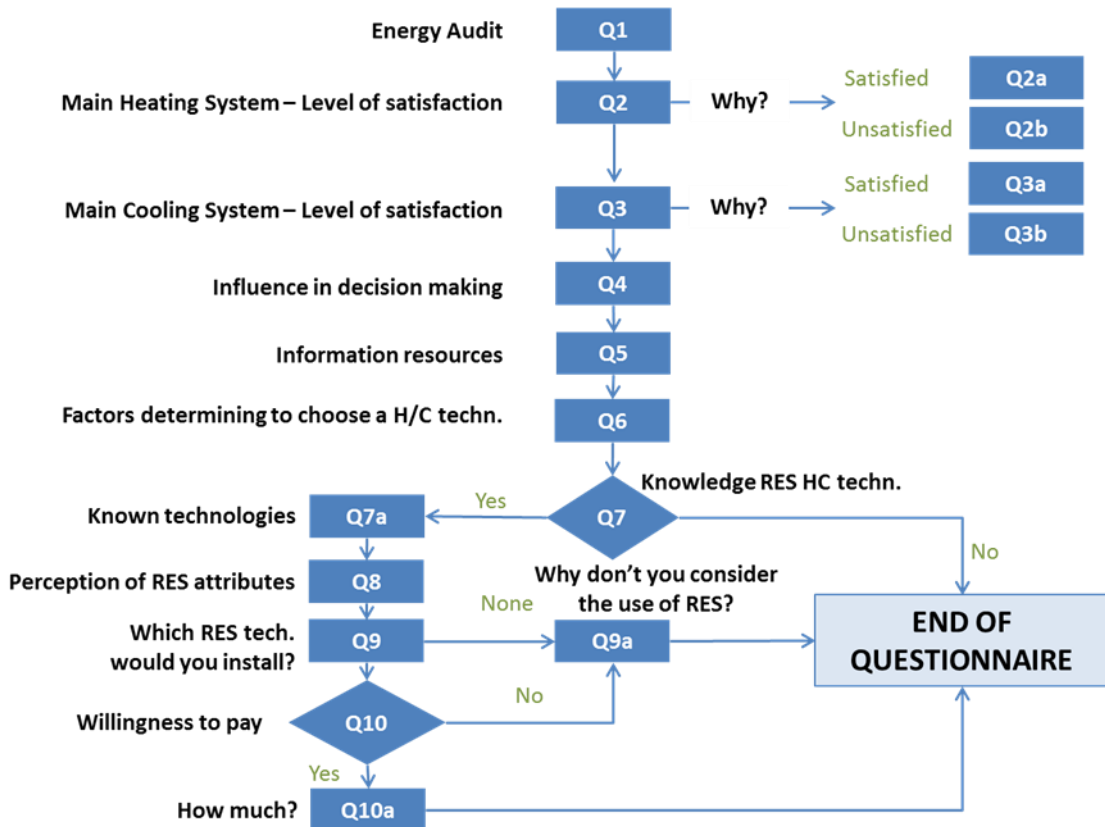Figure 21   *Characterization of the sample*

Figure 22   *Flow diagram to follow in questionnaires – industrial sector*

5.1. MAIN CHARACTERISTICS OF THE SAMPLE

In Portugal, 100 interviews were executed in the industrial sector. The main characteristics of the sample are depicted in Figure 23. The sample is balanced comparing with the total data of the country.
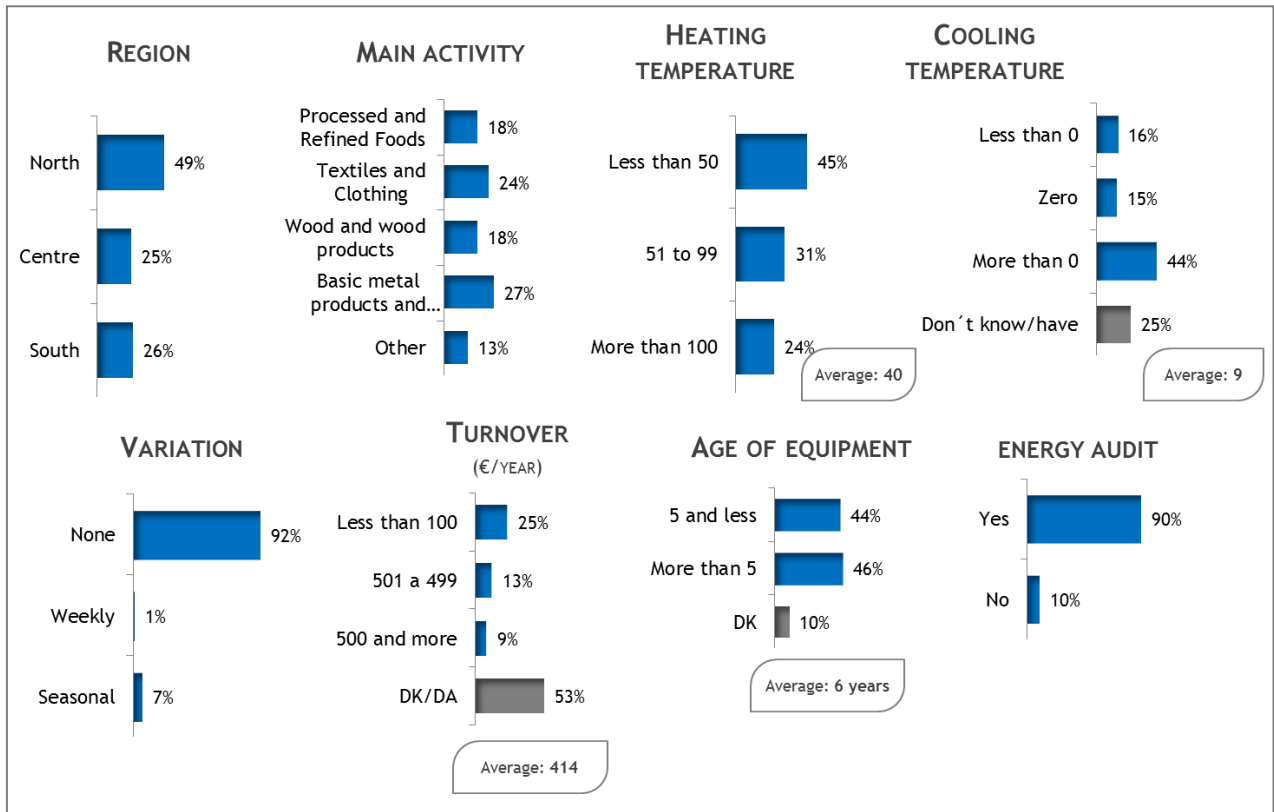

Figure 23   *Characterization of the sample*

5.2. CURRENT HEATING, COOLING AND DOMESTIC HOT WATER SYSTEMS

Regarding the **Heating** systems, the main heating system used in Portugal is "electricity/ joule" (38%).
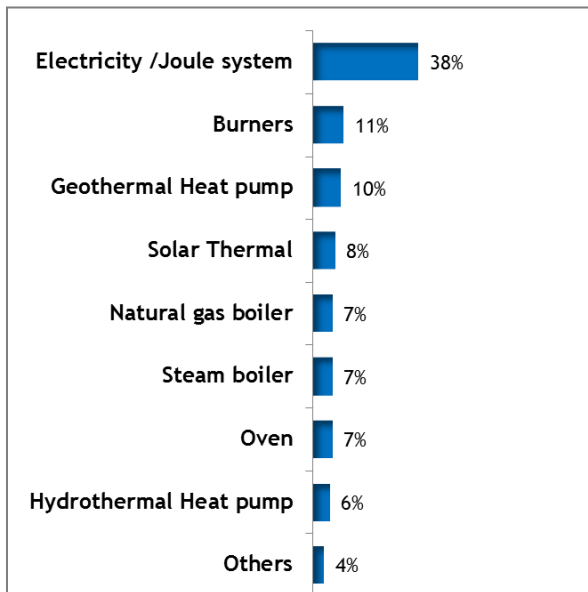

Figure 24   *Distribution of heating systems in Portugal*

The satisfaction with the heating system is very high (Satisfied: 95% and Dissatisfied: 5%).

For those respondents satisfied with its heating system the main reasons of satisfaction are "provides good levels of comfort" (31%), "the equipment is easy to use, reliable and safe" (31%) and "the equipment was/is very cheap" (30%).

Regarding the **Domestic Hot Water** systems (DHW), 90% of Portuguese industry have it; the main domestic water systems used in Portugal are "natural gas boiler" (21%), "electricity" (17%) and "aero thermal heat pump" (17%).
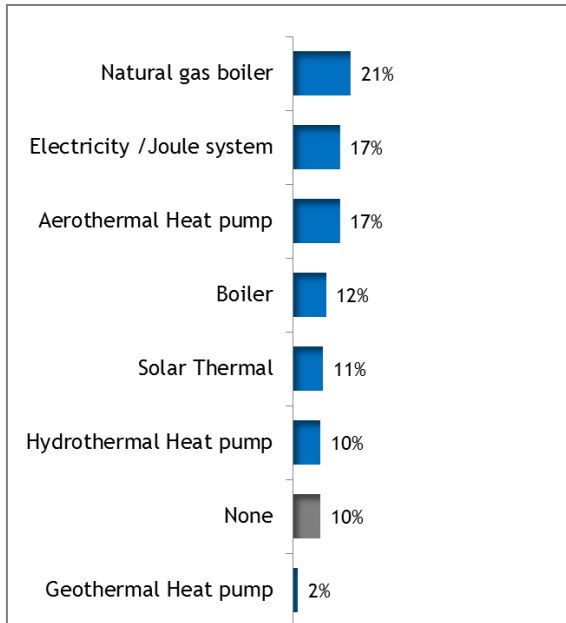

Figure 25   *Distribution of DHW systems in Portugal*

The level of **satisfaction** is very high (Satisfied: 91% and Dissatisfied: 9%).

The main reasons for those who are satisfied are "friendly with the environment" (36%) and "provides goods levels of comfort" (33%).

Regarding the **Cooling** systems, 87% of Portuguese industry has it; the leading system is "absorption renewable" (43%).
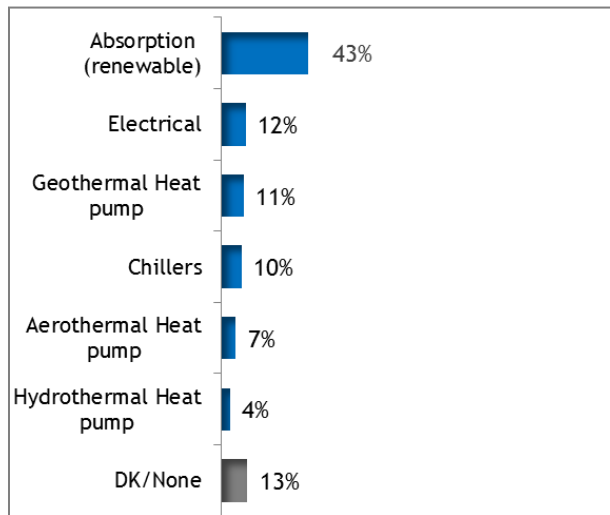

Figure 26   *Distribution of Cooling systems in Portugal*

In general the **satisfaction** with these systems is very high (Satisfied: 81% and Dissatisfied: 20%) because "the equipment is easy to use, reliable and safe" (39%), "the equipment was/is very cheap" (37%) and "it is friendly of environment" (37%).

On the other hand, the main reason of dissatisfaction is "it is unfriendly with environment" (60%).

There is a big distribution for many reasons to use the current systems in industry; a lot with same value but the "decision has been taken by higher instances" is corporative.

5.3. INFORMATION RESOURCES

Regarding the sources to search for information about R&H equipment in Portugal, the main source is the "Professionals" (installers, manufacturers, architects and engineers) (58%).
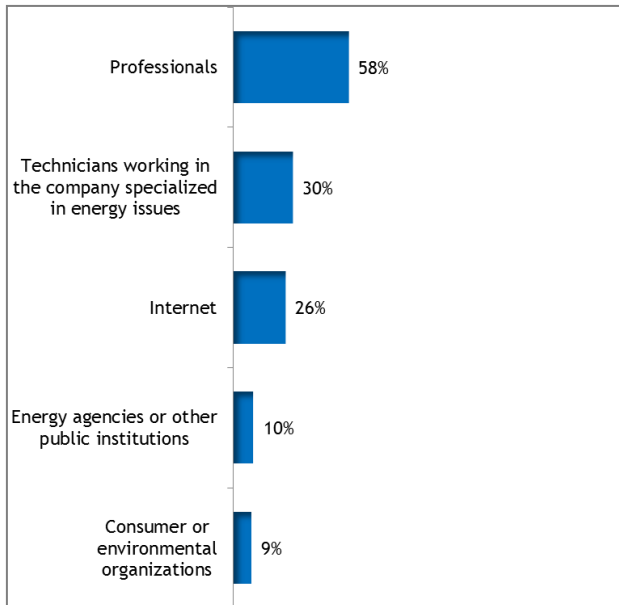

Figure 27   *Information resources in Portugal*

5.4. KEY PURCHASING CRITERIA

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

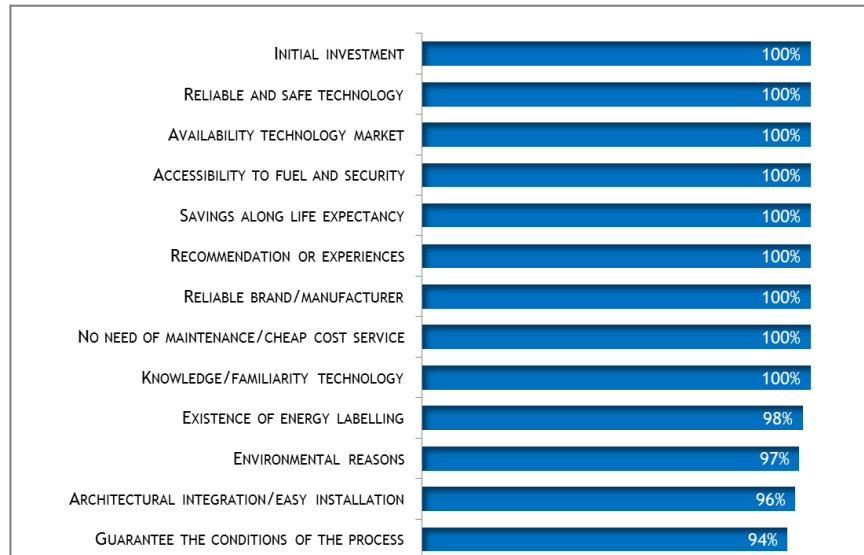|	
INITIAL INVESTMENT	100%
RELIABLE AND SAFE TECHNOLOGY	100%
AVAILABILITY TECHNOLOGY MARKET	100%
ACCESSIBILITY TO FUEL AND SECURITY	100%
SAVINGS ALONG LIFE EXPECTANCY	100%
RECOMMENDATION OR EXPERIENCES	100%
RELIABLE BRAND/MANUFACTURER	100%
NO NEED OF MAINTENANCE/CHEAP COST SERVICE	100%
KNOWLEDGE/FAMILIARITY TECHNOLOGY	100%
EXISTENCE OF ENERGY LABELLING	98%
ENVIRONMENTAL REASONS	97%
ARCHITECTURAL INTEGRATION/EASY INSTALLATION	96%
GUARANTEE THE CONDITIONS OF THE PROCESS	94%

Figure 28   *Key purchasing criteria in Portugal*

Everything is important at industrial target, with many attributes with 100% of references - no one is below 90%.

5.5 KNOWLEDGE ABOUT RES

All the respondents of the survey have heard about the use of RES in heating and cooling systems.

The known technologies for the survey respondents are represented in the following tables:

TECHNOLOGY	HEATING/DHW	COOLING
Solar Thermal	100%	---
Biomass	46%	34%
Geothermal	62%	46%
Heat Pump (Renewable)	100%	44%
District Heating (Renewable)	35%	45%

5.6. PERCEPTION OF RES ATTRIBUTES

The perception of RES attributes by those survey respondents who have heard about RES (100%) is shown in the following table:

ATTRIBUTE	RENEWABLES	%	NON-RENEWABLES	%
Higher initial investment		93%		7%
Higher operation costs (maintenance and fuel)		96%		4%
Higher savings along the life expectancy of equipment		96%		4%
More eco friendly		95%		5%
Higher working reliance		95%		5%
Higher visual impact and/or need of space to install/store fuel		77%		23%
Safer		96%		4%
More specialized installers		97%		3%

Note: basis is 100

- Almost attributes are more associated to renewable vs. non-renewable energy,

- "Higher visual impact and/or need of space to install/store fuel" it is where non-renewable has the higher value (23%)

5.7 ADEQUACY OF RES

In the question about the most suitable renewable energy technology to incorporate in their industries, 27% of the respondents do not consider any renewable energy technology for heating and DHW systems and 42% of the respondents do not consider any renewable energy technology for cooling systems – 27% do not consider both.
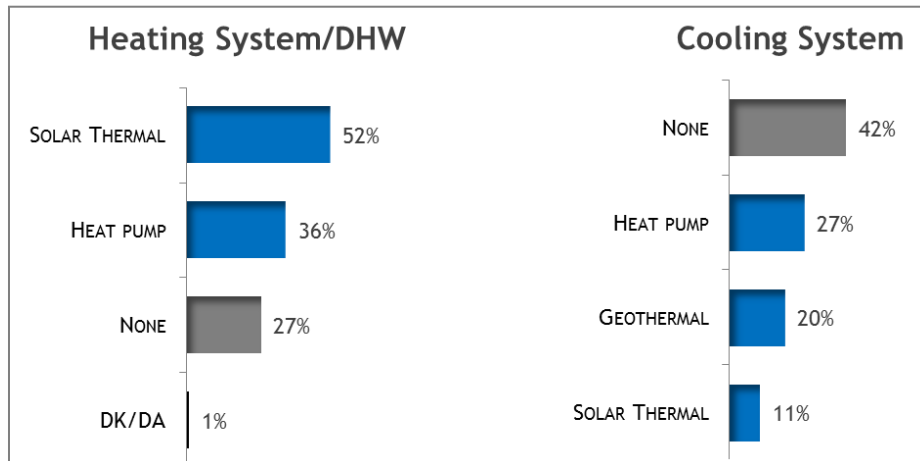
- ✓ "Solar thermal" is the favourite energy technology to heating and DHW systems (52%)
- ✓ However, 27% consider that "none" is suitable

- ✓ 42% consider that "none" is suitable
- ✓ "Heat pump" is the favourite energy technology to cooling system (27%) but with a value close "Geothermal" (20%)

The main reasons for the rejection of the use of RES for heating or DHW systems is the idea "being expensive" (74%). The lack of installers is not a reason for the rejection of RES in Portuguese respondents.
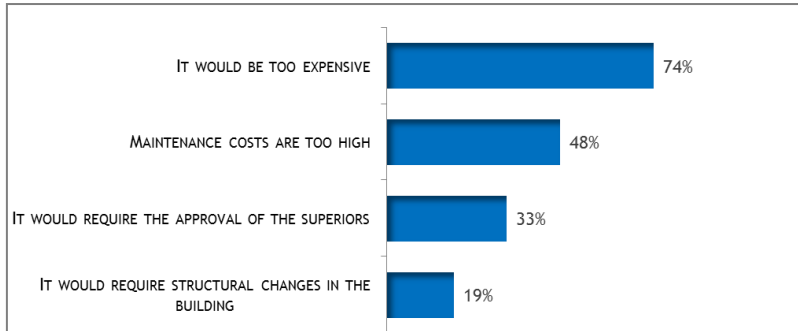

Figure 29   *Reason for the rejection of RES in heating and DHW systems in Portugal*

To the question: "Are you willing to pay more for a RES system?" 54% the respondents will be willing to pay more money, 12% won't and 34% did not answer to the question.

Among industrial target that show available to do an initial investment, almost 80% only willing to pay "below 5%".
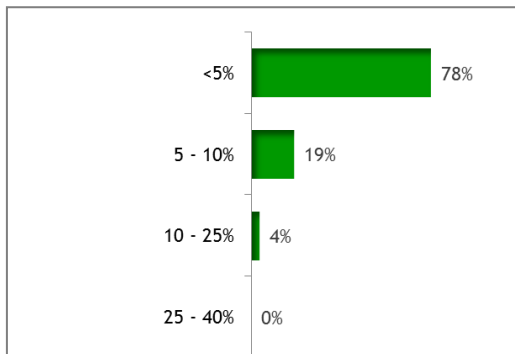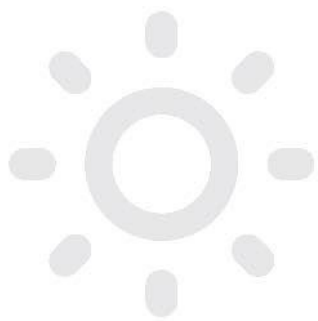

Figure 30   *Willingness to pay for RES technologies.*