



Increasing the Market Implementation of Solar Air-Conditioning Systems for Small and Medium Applications in Residential and Commercial Buildings

Questionnaire

National market analysis for SAC

A project funded under the Intelligent Energy Europe (IEE) programme

Contract No. EIE/06/034/SI2.446612



Part A: Information on respondents

This part of the questionnaire is designed to identify the institutions and experts contributing to the research project. The questionnaire may be filled in by the experts or by giving interviews to the responsible contact person.

1. Responsible contact person

Organisation name:	SOLAIR partner
Contact person:	
Name:	
Address:	
Phone:	
Fax:	
E-mail :	
Internet:	

2. Other experts contributing information to this questionnaire

Description of the expert who is responsible for answers given. Please indicate also which parts of the questionnaire are covered by this expert (not all interviewees need to be questioned on all parts).

Organisation name:	
Type of organisation (e.g. industry association)	
Contact person (interviewee):	

Parts of the questionnaire answered by respondent (please tick the boxes by double click):

Part B Part C Part D Part E Part F

Organisation name:	
Type of organisation (e.g. industry association)	
Contact person (interviewee):	

Parts of the questionnaire answered by respondent (please tick the boxes by double click):

Part B Part C Part D Part E Part F

Organisation name:	
Type of organisation (e.g. industry association)	
Contact person (interviewee):	

Parts of the questionnaire answered by respondent (please tick the boxes by double click):

Part B Part C Part D Part E Part F

Part B: Structure of the national housing sector

This part of the questionnaire is designed to give an overview on the national residential sector to quantify the market potential of SAC in this sector.

1. Information on the existing building stock (max 1 page)

Please describe with text and graphs the national building stock regarding

- 1. the number of dwellings and its structure (apartments, single family houses, multi family houses.) within the building stock*
- 2. the year of construction of the building stock (if available: share per construction year)*
- 3. share of privately owned and rented dwellings*

2. Information on used heating systems in residential sector (max 1 page)

Please describe with texts and graphs the energy consumption and common heating systems in the national residential sector.

Relevant questions within this chapter are:

- 1. What is the share between district, centralised and decentralised (each dwelling) space heating systems?*
- 2. Which are common ways of hot water supply - via central systems or decentralized (electricity, gas or other)? Please quantify the share of centralized and decentralized hot water supply systems.*
- 3. Which energy sources are used? Shares?*
- 4. Typical energy consumption and load profiles for heating (kWh/a energy consumption or m³/a fuel consumption)*
- 5. Average daily DHW consumption per occupant.*

3. Information on used cooling systems in residential sector (max 1 page)

Please describe with texts and graphs the energy consumption and common cooling systems in the national housing sector.

Relevant questions within this chapter are:

- 1. What kind of systems are usually adopted in the residential sector?*
- 2. Which energy resources are used?*
- 3. Typical energy consumption and load profiles for cooling (kWh/a energy consumption or m³/a fuel consumption)*

4. Information on refurbishment and new construction activities in the residential sector

Please indicate in figures (and/or graphs) the overall refurbishment and new construction activities in the national residential market. Eventually give comments / explanations on it with regard to SOLAIR.

	Houses stock	Refurbishment in total	equivalent in % of existing stock	New constructions	equivalent in % of stock
Year					
2004					
2005					
2006					

Source(s) of information:

Comments / explanations:

5. Information on actors in the residential sector

What are important associations or organisations in the national residential sector? Have these actors been involved in solar thermal campaigns or programmes in the past?

6. Solar cooling systems in residential sector (max 1 page)

Please give a brief overview on existing solar cooling systems in the residential sector.

*Please also indicate the actual market size and peculiarities of the national **solar thermal** market in general.*

Part C: Information on national structure of the commercial sector

Like Part B. This part of the questionnaire is designed to give an overview on the national commercial sector to understand the starting point / basis for SOLAIR activities within this sector.

1. Information on the existing commercial building stock (max 1 page)

Please describe with text and graphs the national commercial building stock regarding size and structure of commercial activities (m²). Interesting targets are mainly hotels, homes of elderly, sport centres, wine cellars, office buildings.

2. Information on used heating systems in commercial sector (max 1 page)

Please describe with texts and graphs the energy consumption and common heating systems in the national commercial sector.

Relevant questions within this chapter are:

- 1. What is the share between district, centralised and decentralised space heating systems?*
- 2. Which are common ways of hot water supply - via central systems or decentralized (electricity, gas or other)? Please quantify the share of centralized and decentralized hot water supply systems.*
- 3. Which energy sources are used?*
- 4. Typical energy consumption and load profiles for heating (kWh/a energy consumption or m³/a fuel consumption).*
- 5. Average daily hot water consumption per m² (for commercial buildings using large amounts of hot water).*

3. Information on used cooling systems in commercial sector

Please describe with texts and graphs the energy consumption and common cooling systems in the national commercial sector.

Relevant questions within this chapter are:

- 1. What kind of systems are usually adopted in the commercial sector?*
- 2. Which energy resources are used?*
- 3. Typical energy consumption and load profiles for cooling (kWh/a energy consumption or m³/a fuel consumption)*

4. Information on refurbishment and new construction activities

Please indicate in figures (and/or graphs) the overall refurbishment and new construction activities in the national commercial sector. Eventually give comments / explanations on it with regard to SOLAIR.

	Building inventory	Refurbishments in total	equivalent in %	New constructions	equivalent in %
Year					
2004					
2005					
2006					

Source(s) of information:

Comments / explanations:

5. Information on actors in the commercial sector

Which are important associations or organisations in the national commercial sector? Have these associations been involved in solar thermal campaigns or programmes in the past?

6. Solar cooling systems in commercial sector (max 1 page)

Please give a brief overview on existing solar cooling systems in the commercial sector.

Part D: Information on the economic framework for SAC

This part of the questionnaire is needed to assess the actual impact of the policy framework in the national SAC sector.

1. Energy prices

Please provide an overview on the development of the national energy prices in your country. If necessary, please specify the composition of prices (e.g. basic fixed rate/working rate or excl./incl. VAT etc).

Residential sector

	Unit	Natural gas	Heating oil	Power	Biomass
1990	Euro/kWh				
1995	Euro/kWh				
2000	Euro/kWh				
2005	Euro/kWh				
2006	Euro/kWh				
2007	Euro/kWh				

Commercial sector

	Unit	Natural gas	Heating oil	Power	Biomass
1990	Euro/kWh				
1995	Euro/kWh				
2000	Euro/kWh				
2005	Euro/kWh				
2006	Euro/kWh				
2007	Euro/kWh				

Comments / explanations:

In case tariffs depend on consumption, please specify the price for each consumption band.

If this information is not available, please refer to an average consumption according to following reference examples:

Residential:

<i>description</i>	<i>number of inhabitants</i>	<i>yearly thermal consumption [kWh_{th}]</i>	<i>yearly electricity consumption [kWh_e]</i>
<i>single family house</i>	<i>4</i>	<i>22.000</i>	<i>3.000</i>

Commercial

<i>description</i>	<i>heated area [m²]</i>	<i>yearly thermal consumption [MWh_{th}]</i>	<i>yearly electricity consumption [MWh_e]</i>
<i>small commercial building (office)</i>	<i>500</i>	<i>120</i>	<i>12</i>
<i>medium commercial building (office)</i>	<i>2.000</i>	<i>500</i>	<i>50</i>
<i>medium commercial building (supermarket)</i>	<i>1.500</i>	<i>150</i>	<i>350</i>

2. National air conditioning market

*Please provide data about the kW yearly installed and/or the number of plants **per power range***

3. Capital market terms in the residential and in the commercial sector (max 1 page)

Please indicate in figures/graphs important capital market terms for both sectors, like

1. *Interest rates for real estate investments*
2. *Expected pay back times for refurbishment investments*
3. *Common equity rates in the residential and in the commercial sector*
4. *etc.*

4. Conditions for refurbishment by residential sector (max 1 page)

Please describe with texts and graphs the conditions for refurbishment by residential sector by answering the questions:

- 1. How are heating costs allocated between Tenants/Owners?*
- 2. What are the mechanisms used to shift the investment costs from the investor/owner to the users/tenants of a building?*
- 3. What are legal restrictions for rent increases?*
- 4. How are the tenants right to refuse higher rents due to refurbishment?*
- 5. Can the rent be dependant on the energy-efficiency of the flat?*
- 6. Other investment barriers due to regulations on social housing?*

5. National incentive systems for SAC installations in the residential and commercial sector (max 1 page)

Here the most important programmes on the national and regional level are identified, that are designed to promote investments in SAC installations or directly affecting the development of the SAC market.

6. National incentive systems for installation of other technical solutions competing with SAC (max 1 page)

Here the most important programmes on the national and regional level are identified, that are designed to promote investments in installations competing with SAC.

Part E: Information on national legislative framework for SAC

This part of the questionnaire is designed to give an overview on the relevant legislative framework for the promotion of the national SAC market and its impact on it: overall goals and strategy, as well as programmes to achieve these goals.

1. Building sector regulations relevant for the SAC market

Here the most important legislation on the national (or regional) level is identified, that is designed to regulate the construction of new buildings and the refurbishment of existing buildings. Obviously only regulations are relevant that immediately promote or prevent the installation of SAC installations (e.g. national building codes and standards for new and/or existing buildings or Solar building obligations).

Important data are, for example:

Which energetic requirements are existing for new buildings and refurbishment?

Are solar ordinances active and in praxis working?

Are SAC systems currently included in calculations?

Which anti legionella regulation is available?

Which regulation is actually available concerning the use of surface water (for recooling of SAC appliances).

2. Market conditions (max 1 page)

Please explain how heating and cooling costs are allocated between tenants and owners.

Can rent be dependent on energy efficiency of the flat?

3. Certification for solar equipment

Please describe the current status of certification at national level: is certification for solar equipment required?

Specify for which components : Collectors ? Sorption machines ?

4. Financing of refurbishment activities (max 1 page)

Describe the mechanism used to shift the investment costs from the investor/owner to the user/tenant of a building.

How are investments usually financed in case of multi ownership?

5. EU – EPBD (max 1 page)

What is the current status of EPBD implementation at national level?

Will solar systems profit directly from the foreseen implementation?

6. Overview: national energy policy framework (max 1 page)

Please indicate the most relevant political goals and targets for the solar thermal and cooling sector, as well as national programs of activities for solar thermal.

Self evaluation of the filled-in questionnaire

		data available	estimated data	not filled in
Part B	1. Information on the existing building stock			
	2. Information on used heating systems in residential sector			
	3. Information on used cooling systems in residential sector			
	4. Information on refurbishment and new construction activities in the residential sector			
	5. Information on actors in the residential sector			
	6. Solar cooling systems in residential sector			
Part C	1. Information on the existing commercial building stock			
	2. Information on used heating systems in commercial sector			
	3. Information on used cooling systems in commercial sector			
	4. Information on refurbishment and new construction activities			
	5. Information on actors in the commercial sector			
	6. Solar cooling systems in commercial sector			
Part D	1. Energy prices			
	2. National air conditioning market			
	3. Capital market terms in the residential and in the commercial sector			
	4. Conditions for refurbishment by residential sector			
	5. National incentive systems for SAC installations in the residential and commercial sector			
	6. National incentive systems for installation of other technical solutions competing with SAC			
Part E	1. Building sector regulations relevant for the SAC market			
	2. Market conditions			
	3. Certification for solar equipment			
	4. Financing of refurbishment activities			
	5. EU – EPBD			
	6. Overview: national energy policy framework			

Example of country summary sheets for the market

AUSTRIA

THE BUILDING STOCK

Main figures for the residential stock

Total stock: 1,800,000 buildings (3,200,000 flats)

60 % of the flats: multi-family houses

40 % of the flats: single and double-family houses

Between 2000 and 2002, the growth of the residential buildings has been of 40,000÷50,000 unit/year, quite small with respect to the total stock.

Construction period	1-2 flats per building	3-10 flats per building	More than 10 flats per building	Total
Living area (m ²)				
1945-1960	17,290,736	8,085,171	7,948,202	33,324,110
1961-1970	21,980,857	9,565,045	13,367,405	44,913,308
1971-1980	26,804,568	9,676,739	15,310,476	51,791,783
Total	66,076,161	27,326,956	36,626,084	130,029,201

"Useable living area" [m²] for main residences in Austria (source: Zentrum für Bauen und Umwelt, Schuster et al).

	Number of buildings
Office	32,177
Hotel	35,846
Building for retail or wholesales	33,024
Building for traffic or communication	3951
Buildings for vehicle workshops, industry or storage	71,693
Building for culture, leisure, education	15,524
Other buildings	90,039
TOTAL (2001)	282,257

Non residential building stock in Austria (source: Statistik Austria 2007)

HEATING, COOLING AND SOLAR THERMAL

Heating the buildings

Wood is one of the main heating sources for residential buildings.

Central systems (64 %) and district heating solutions (18 %) are predominant.

Average consumptions are: 128.3 kWh/m² year for space heating, 1,274 kWh/person year for domestic hot water and 108.7 kWh/person year for cooking.

COMMERCIAL SECTOR: *There is a chapter written on heat demand in office buildings within the Hight Combi project. However, this report on "market analysis" is not yet finished*

Energy sources	Apartments (principal residence, total)	Type of heating				
		Single burners	Gas converter	Electricity heating (fix connected)	Central heating (or equivalent)	District heating*
Wood, wood chips, pellets, wood briquettes	590,119	214,212	-	-	375,908	-
Coal, koks, briquettes	63,934	22,955	-	-	40,979	-
Heating oil, liquid gas	876,304	89,861	-	-	786,444	-
Electricity	254,550	40,137	-	175,148	39,265	-
Natural gas	955,098	-	69,515	-	885,583	-
Solar, Heat pump	26,830	1,346	-	-	25,484	-
District heating	662,883	-	-	-	49,322	613,561
Total	3,429,719	368,511	69,515	175,148	2.202,984	613,561

* Central heater with unknown heat source is defined as district heating

Results from the micro census 2004: energy sources and heating system (source: Statistik Austria 2007)

Cooling the buildings

Energy consumption for cooling: 365 GWh

Residential buildings do not use cooling systems and also the new building regulation will not consider cooling application or loads in this sector.

50 % of the cooling devices are currently operating in offices and other work places, 7 % in hospitals and 13 % in hotels, restaurants and bars. 70 % of the chilled surface in use water as cold distribution fluid.

Heating demand for office buildings: 30÷40 kWh/m²a

Cooling loads for office buildings: 60÷80 kWh/m²a (due to internal heat loads and passive solar gain)

More than 40,000,000 m² of conditioned area for commercial buildings are expected in 2020.

Solar thermal in Austria

One of the highest market per capita worldwide

65 % of the installed solar thermal plants are used for DHW and 35 % for space heating

35 % of the installed systems are in existing buildings and 65 % in new buildings.

There are three solar cooling plants operating in the commercial sector, for a wine storage (100 m²), and two office building (40 m² and 77 m²), and just one in the residential sector.

LEGISLATION FRAMEWORK & INCENTIVES

Legislation

Austria target is to reach a 45 % share of renewable energy in the final consumption within 2020. Thanks to the implementation of the EPBD, buildings constructed after the beginning of 2006 must carry an “energy performance certification” from 2008. Buildings rented, bought or constructed before 2006, are obliged to get the certificate within the beginning of 2009. Also, the cooling demand in a non-residential building is taken under consideration in the “agreement on the demand of energy efficiency” for new and refurbished buildings.

Incentives

A national based incentive for solar thermal systems is currently operating, also including solar cooling. Furthermore, a subsidy scheme is available for demonstration and pilot plants for industrial and commercial applications.

In addition, several Federal States have favourable subsidy schemes for solar thermal (in the range of 25 % of the investment cost), which in many cases are cumulable with the national incentives.

Further incentives for solar thermal systems at municipal level give average subsidies of about 10 % of the investment cost.

The investment costs for solar thermal also reduce the income tax of private persons.

The federal state of Styria offers incentives for energy efficient new buildings only if a solar thermal system is installed.

It is possible to receive funding for a retrofit for house/flat owners as well as for tenants in form of support of bank interest when implementing energy efficiency measures.

Solar cooling should compete, however, with heat pumps for cooling applications, which also could benefit of some incentives, e.g. the Federal State of Styria support building owners in installing heat pumps with COP >4 and subsidies are available in Tirol and Upper Austria from energy utilities.

CONCLUSIONS

Despite an ever growing mature solar thermal market, the focus has been so far mainly on residential system for DHW and space heating. However, subsidy schemes are already including special applications, such as solar cooling. No small cooling devices are needed in Austria, since the cooling demand comes from the commercial sector and not from the residential one.

Quantitative indicators for the cross country analysis

		Austria	France	Germany	Greece	Italy	Portugal	Slovenia	Spain
CLIMATIC DATA (NB. Not included in the questionnaires)	Maximum ambient temperature in °C (June-September)								
	Average ambient temperature in °C (June-September)								
	Average solar radiation in kWh/m2 day (June-September)								
BUILDING STOCK - RESIDENTIAL	No. residential buildings	1.764.455	25.000.000	49.500.000	2.510.759	10.900.000	3.400.000		
	No. Flats	3.203.508	31.300.000	67.000.000		21.500.000	5.519.654	777.772	23.900.00
	Total surface (m2)	130.029.201		3666km2				58.031.187	
	Share of single-family houses	88%	56,60%	22%	84%	63%	87%	68%	50%
	Share of multi-family houses	12%	43,40%	42%	14%	37%	12%	32%	50%
	Share of privately owned flats		56%	31%		90%	79%	92,40%	
	Share of rented flats		44%	69%		10%	21%	7,60%	
	Share of new construction on total dwelling park	8%	1,27%	1%	7,50%	3,50%	1%	1,13%	2,5
Share of refurbishment on total dwelling park		1,35%	2%			0,10%		0,22	
BUILDING STOCK - COMMERCIAL	No. Commercial buildings	282.257		73.500	179930	1.479.203		21150	
	Total surface (m2)		735.000.000	754km2				2.530.000	
	Share of new construction on total commercial park		2,50%	35%	15%	0,50%	16%		
	Share of refurbishment on total commercial park								
HEATING SYSTEM - RESIDENTIAL	Share of centralised heating systems - residential	64%	91,50%	69%		18%	5%	58%	40%
	Share of individual heating systems - residential	13%		17%		81%	95%	22%	60%
	Share of district heating systems - residential	18%		14%		1%		20%	
	Share of natural gas in heating - residential	28%	40,50%	48%		75%	6%	4,50%	33,20%
	Share of oil in heating - residential	26%	18%	31,80%		18,50%	22%	33,50%	14%
	Share of electricity in heating - residential	7%	27,30%	4,10%			35%		31,60%
	Share of coal in heating - residential	1,90%		1,60%				8,80%	3,80%
	Share of biomass in heating - residential	17%	6,10%	1,00%			36%	30%	2,50%
Average consumption for heating - residential (kWh/m2 year)	128,3			131	200	53,5	131	79,5	
HEATING SYSTEM - COMMERCIAL	Share of centralised heating systems - commercial								
	Share of individual heating systems - commercial								
	Share of district heating systems - commercial								
	Share of natural gas in heating - commercial			2%			5%		
	Share of oil in heating - commercial			27,90%			43%		
	Share of electricity in heating - commercial			24,90%			51%		
	Share of coal in heating - commercial			44%					
	Share of biomass in heating - commercial			8,50%			1%		
Average consumption for heating - commercial (kWh/m2 year)		141	138	35					

COOLING SYSTEM - RESIDENTIAL	Share of air-conditioned flats		6%	0,30%				14%		
	Share of cooling loads on total national energy consumption									
	Share of "only cold" units		18%				63,50%	63%		
	Share of reversible units		82%				36,50%	37%		
	Share of centralised cooling systems		14%		5,80%		15%			
	Share of individual cooling systems		68%		94,20%		85%			
	Share of electricity driven cooling systems						100%			
	Share of heat driven cooling systems									
	Average consumption for cooling (kWh/m2 year)			17			45		48	32,6
	COOLING SYSTEM - COMMERCIAL	Share of air-conditioned commercial buildings		19%	35%					
Share of cooling loads on total national energy consumption				22%						
Share of "only cold" units		85%	40%				63,50%			
Share of reversible units		15%	60%				36,50%			
Share of centralised cooling systems			43,50%	35%			26%			
Share of individual cooling systems			44%	65%			74%			
Share of electricity driven cooling systems				86%						
Share of heat driven cooling systems				14%						
Average consumption for cooling (kWh/m2 year)		60 kWh/m2 a	30	184			35		41,8	
ENERGY PRICES - RESIDENTIAL (€/kWh)		Natural gas	0,0398	0,042	0,063	0,0345	6,5	0,077	0,05	0,042
	Oil	0,0608	0,0638	0,057	0,0591	9		0,056		
	Coal									
	Biomass	0,035	0,032	0,031	0,047			0,013		
	Electricity	0,11	0,1325	0,18	0,07	21	0,097	0,106	0,097	
ENERGY PRICES - COMMERCIAL (€/kWh)	Natural gas	0,017	0,03318	0,025	0,028	3,62/2,58/3,62	0,046	0,016	0,03	
	Oil	0,0179	0,029	0,03	0,0591			0,041		
	Coal									
	Biomass		0,032		0,047			0,011		
	Electricity	0,075	0,0442	0,068	0,11	7/8,6/10,4	0,097	0,074	0,097	
SOLAR THERMAL PLANTS	Total market in 2006 (m2)	290.000	300.000	1.500.000			23.000	20.000	930.000	
	Total market in 2005 (m2)	240000	121000	950000	3.050.000				795.000	
	Share of collective or large scale systems on 2006 market	5,60%	7,30%		5%		42%	1%	12,70%	