WP 2: Report about the regional cooling market

1 Introduction

1.1 Intention of the report

Objective, scope of cooling

1.2 Description of region

- Short verbal description of the region
- Map of region (on a scale of 1:200 000)
- Habitants, area, population density
- Employment figures according to branches
- Land use (developed area, agricultural area, area of forestry, space dedicated as public thoroughfares…) → to give an idea of the regional structure

Slovenia is highly dependant on energy imports. Coal and RES are representing the most important part of the domestic energy sources. Like in the EU (European Union) member countries the RES and efficient use of energy are representing the only available instruments for stagnation or decrease in energy imports. The increase of the share of RES (small and large hydro, wood biomass and solar energy) must represent Slovenia's strategic direction.

Taking into account the existing tradition Slovenia has a good start-point and possibility for further development and could join the group of the leading European countries. Together with the programs for efficient use of energy the requirement for the 8% decrease of the CO_2 emissions according the Kyoto protocol will be possible to achieve. Besides the rehabilitation and enlargement of the existing power plants, the construction of the hydro chain on the Sava River the biggest potential lies in the development of modern use of wood biomass and wind energy. A substantial potential exists also for other renewables, but without a serious governmental program of support for RES the potential will remain only theoretical.

The Slovenian strategic goals are appropriate and comparable with the same in the most developed EU countries. They are still achievable up to 2010, but require immediate supporting financial instruments for the investments, taking into account the experiences in the leading EU members.

Population and geography

Area: 20.273 km^2
Lenghth of boarders: 1.382 km
Length of coastline: 46,6 km
Population: 1.964.036 (2002 census)
Population density: 98.3 inh. Per km2
Nationalities: (2002 census)
Slovenian 1.631.363; Italian 2258; Hungarian 6.243; other 127.118
Language: Slovenian, in nationality mixed areas also Italian and Hungarian

Geographical division of Slovenia:
Alps 42.1% of territory
Dinaric Alps 28.2% of territory
Pannonian Plain 21.2% of territory
Mediterranean 8.6% of territory
Climate:
Continental in central Slovenia, Alpine in the north-west, sum-Mediterranean along the cost and its hinterland
Average temperature:
January: -2°C
July: +21°C

Source: Statistical Office of the Republic of Slovenia.

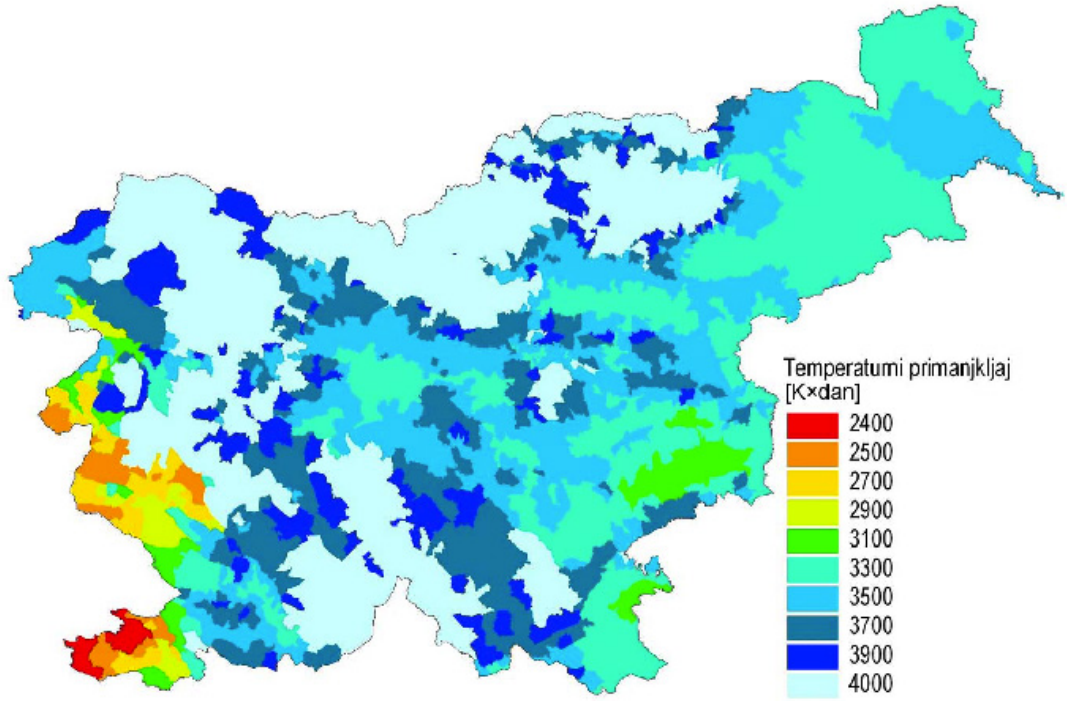

Figure 1: Degree-days (20/12) for Slovenia

Source: Regulation for thermal regulation and energy efficiency in buildings (2002).

	Population
Ljubljana	252.585
Maribor	94.635
Celje	37.476
Kranj	35.019
Velenje	25.966
Koper	23.064
Novo mesto	21.604
Ptuj	18.830
Trbovlje	15.751
Jesenice	13.202
Nova Gorica	12.942
Murska Sobota	12.615
Škofja Loka	12.141
Kamnik	12.128
Domžale	11.527

Table 1: Slovenian towns, September 2003

Slovenia[1] covers 20.273 km2 stretching between Alps, the Adriatic and the Panonian plain. In spite geographically small size, it links different landscapes: Alpine and Mediterranean, Panonian and Dinaric, each with its characteristics and unique features.
Slovenian has a population of 1,96 mio. inhabitants of which 83.1% are Slovenians. The average density of population is less than in the majority of other EU states. The people have mainly settled the river valleys and transport routes, where long ago Slovenian towns began to emerge, whilst the mountainous and forested areas remain unpopulated. Approximately 30% of population lives in town with more than 10.000 inhabitants, whilst the rest live in nearly six thousand smaller towns and villages. The capital, Ljubljana, is the largest city as well as the political, administrative, economic, educational and cultural centre of Slovenia.

	Enumerated persons					
Total	**population of Slovenia**		**temporarily present**		**absent more than one year because of living in foreign country**	
	total	**citizens of RS**	**total**	**citizens of RS**	**total**	**citizens of RS**
1 987 971	**1 964 036**	**1 924 677**	**5 423**	**2 778**	**18 512**	**17 635**

Table 2: Enumerated persons, Slovenian, 2002 Census

Source: Statistical Office of the Republic of Slovenia, Census of Population, Households and Housing 2002

[1] Facts about Slovenia; http://www.uvi.si/eng/slovenia/publications/facts-book/english.pdf

	1991 [1)]			2002		
	total	**men**	**women**	**total**	**men**	**women**
	TOTAL					
TOTAL	**1.913.355**	**923.643**	**989.712**	**1.964.036**	**958.576**	**1.005.460**
	Urban settlements					
TOTAL	**971.502**	**461.826**	**509.676**	**997.772**	**479.356**	**518.416**
	Non-urban settlements					
TOTAL	**941.853**	**461.817**	**480.036**	**966.264**	**479.220**	**487.044**

Table 3: Population by sex and type of settlement, Slovenia, Census 1991 and 2002

Source: Statistical Office of the Republic of Slovenia, Census of population, households and housing 2002.

The largest part of Slovenia's territory is taken up by the Alps, where 47.3% of the population lives. On the southern and eastern margins of the Alps there are high plateaux, covered mainly with forests. The pre Alpine hills and valleys are also a part of Slovenian Alps. The largest among valleys are Ljubljana (930 km^2), 619 inh./km^2 and Celje basins.
Many rivers in Slovenia have karstic sources. In many cases, they emerge as waterfalls on the lower part of slopes or in valleys. Because of its mainly mountainous territory and copious precipitation, Slovenia has more than 300 permanent waterfalls. Sava is the longest river (221 km), which has two sources in Alps and carries the waters from more than half of Slovenia's territory into Danube. The Soca, the longest Slovenian river flowing into the Adriatic (96km in Slovenia) has karstic source in Julian Alps and ranks among world's cleanest rivers.
The southern part of Slovenia belongs to the north-eastern part of Dinaric Alps. There are many karts massifs, all more than 700 meters above sea-level. Among the plateaux, where there are hardly any surface waters, there is a string of *karsts fields*, areas with disappearing rivers and intermittent lakes. The largest rivers are the Kolpa and the Krka river. This 28.1% of Slovenian territory is the most forested part of Slovenia.
The Pannonian Plain in the north-east of the country ins the most fertile land of Slovenia. The main river is Mura, with stagnant pools around it and flood-prone meadows. The special natural features of this part of Slovenia are thermal and mineral waters.

2.2 Political system and economical figures

Slovenia is a democratic republic and social state governed by law. In May 1, 2004 Slovenia became a member of EU. The highest legislative authority is the National Assembly (90 deputies), which has exclusive jurisdiction over the enactment of laws. The National Council represents social, economic, professional and local interests. The National Council performs civil and social supervision of the National Assembly influences its work and the decisions it makes, and has the power of veto on laws proposed by the National Assembly. It has 40 members.
Local self-government is carried out in municipalities and other local communities. The municipality as the basic unit of self-government comprises a settlement or several settlements bound together by the common needs and interests of the residents. The municipal council is a representative body and the most important body of self-management.

The economy:
GDP per capita in 2003: EUR 12.152
Growth in GDP in 2003: 2,3%
Inflation in 2003: 4,6%

Export of goods and services in 2003: EUR 13.9 billion
Import of goods and services in 2003: EUR 13.9 billion
Balance of trade in 2003: EUR – 3million
Unemployment in 2003: 6.7%

Number of business according to sector in 2002:
Trade – 27.184
Manufacturing – 20.169
Community, social and personal activities – 29.082
Real estate – 20.507
Construction – 13.563
Transport, storage and communications – 9.929
Agriculture – 1.906

Sector according to added value in 2002 (in % of GDP):
Manufacturing (car, chemical and pharmaceuticals) – 23.3%
Real estate – 13%
Retail, wholesale – 10.3%
Transport, storage and communication – 6.4%
Public administration, compulsory social insurance – 5,8%
Construction – 4.9%
Education – 5%
Health and social security – 4.6%
Financial services – 4,7%

Source: Statistical Office of the Republic of Slovenia

1.3 Approach

The results of the energy consumption study are based on a top-down and a bottom-up approach. Depending on the available data either the bottom-up approach (interviews) or the top-down approach is more emphasised. See in the following the objectives of the several chapters. Methods to answer the questions are given in the chapters themselves.
Chapter two: repartition of surface by building types and evolution
Chapter three: electricity consumption, influence of cooling on the load curves and energy consumption/m²
Chapter four: evaluation of the situation, technologies and context by interviewing the actors
Chapter five: description of technologies used and evaluation of the stakes
Chapter six: transcription of EPDB in Slovenia and future projections
Chapter seven: discussion
Chapter eight: identification of regional actors

2 Building types

2.1 Current stock

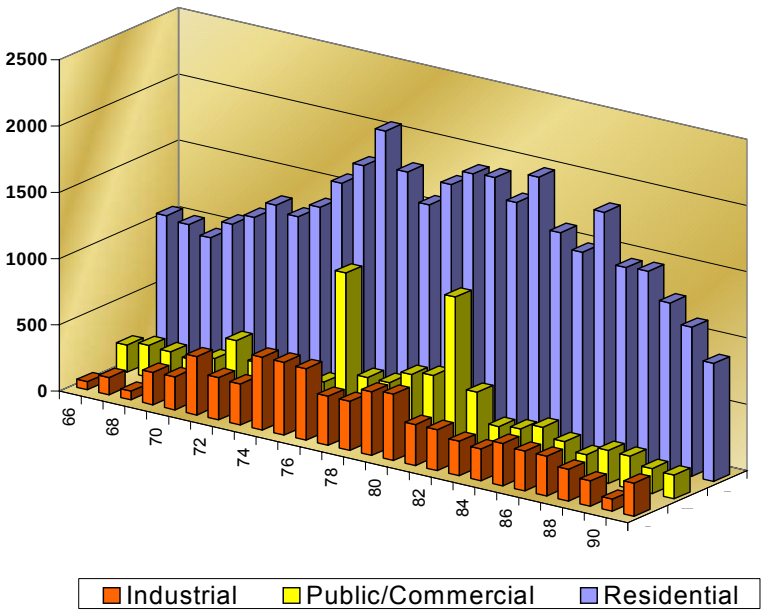

Figure 2: Yearly construction of buildings in gross floor area in 1000 m^2

More detailed information on yearly construction rate is available in Annex 1.

Note: Cumulative floor area of non-residential buildings will be available after June 2007, since currently the national programme of recording the real-estate information is on-going.

The graph below shows the surface repartition per type of building in the tertiary sector Slovenia: 79 % of the tertiary surfaces are used for offices (27 %), commerce (44 %) and education (8 %). [2]

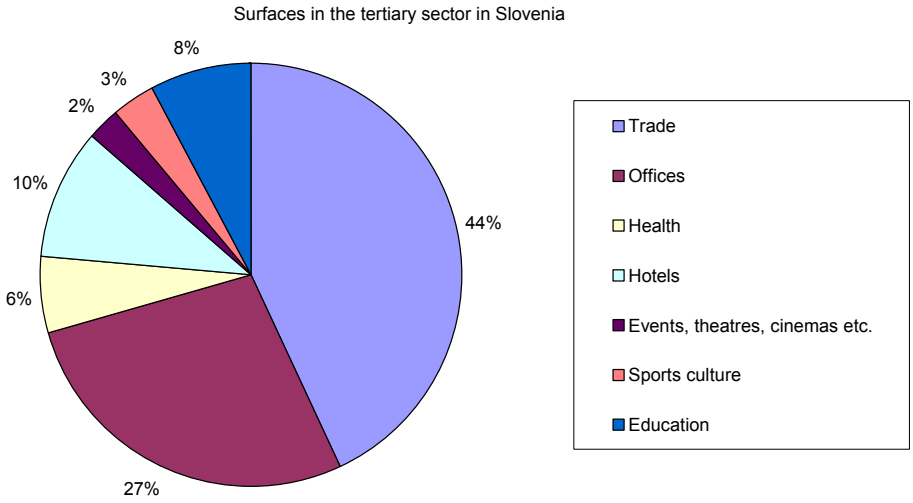

Figure 3: Data net floor space of the buildings according to their type (Source: SDHK)

[2] Based on the staistical data on the last 5 years construction of buildings

Cooling capacity and cooling energy consumption in Slovenia is presented in Table 4, based on the pole done within the Cooling and refrigeration society of Slovenia in 2003. About 70% of data were collected based on the actual information from the building sites; another 30 % of data are estimated (extrapolated to the entire building stock).

Table 4: Cooling capacity and cooling energy consumption, Slovenia (Source: SDHK)

	Cooling capacity [MW]	Operation [h/year]	Cooling ratio COP	Energy consumption [MWh/year]
all	**236**	**0**	**0**	**60.415**
Residential buildings	**59**	**250**	**2,5**	**5.877**
Non residential buildings	**177**	**0**	**0**	**54.538**
Retail	**0**	**650**	**1**	**-**
Trade	**33**	**900**	**2,8**	**10.652**
Offices	**69**	**700**	**2,8**	**17.250**
Health	**16**	**1050**	**2,8**	**6.000**
Factories and garages	**10**	**400**	**1**	**4.000**
Hotels	**20**	**1050**	**2,8**	**7.500**
Events, theatres, cinemas etc.	**15**	**1050**	**3**	**5.250**
Sports culture	**2**	**450**	**2,8**	**321**
Indoor swimming pool	**0**	**650**	**1**	**-**
Education	**4**	**500**	**2,8**	**714**
Agricultural used buildings	**0**	**500**	**1**	**-**
Others non-residential buildings	**10**	**650**	**1**	**6.500**

2.1 Change in the last 5 to 10 years

Between 1993 and 2003 increase of air-conditioning capacity was about 145 MW. Data in diagram are estimated on the base of report of users of segment of air-conditioning. Older data are not so reliable so also increase in decade should be slightly lower.

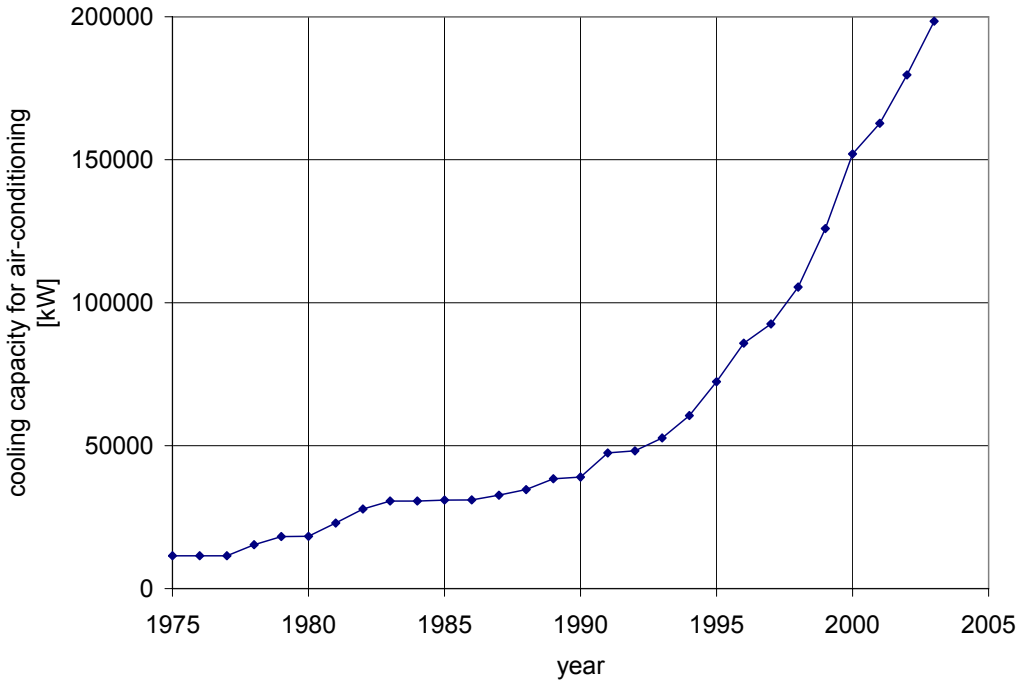

Figure 4: Growth of cooling capacity between 1975 and 2005 (Source: SDHK)

Increase of air-conditioning between 2004 and 2014 is estimated to be 91 MW. Estimation of increase of cooling capacity for air-conditioning is based on estimated grow of GDP. It is expected that increase will be higher in residential sector and lower in commercial and industrial sector respectively on the previous period.

2.2 Expected growth in the next 5 to 10 years

The following graph shows about 10 % raise increase per year of cooling capacity for air-conditioning in Slovenia. The evolution is estimated from 210 MW in year 2004 to 300 MW in year 2014, this means 43 % increase. Firstly, it is explained by the increase of the constructed surface. Furthermore, it's the consequence of the global warming and eventually it might be due to the raise in the internal additional warmth produced, for instance, by computers and other devices.

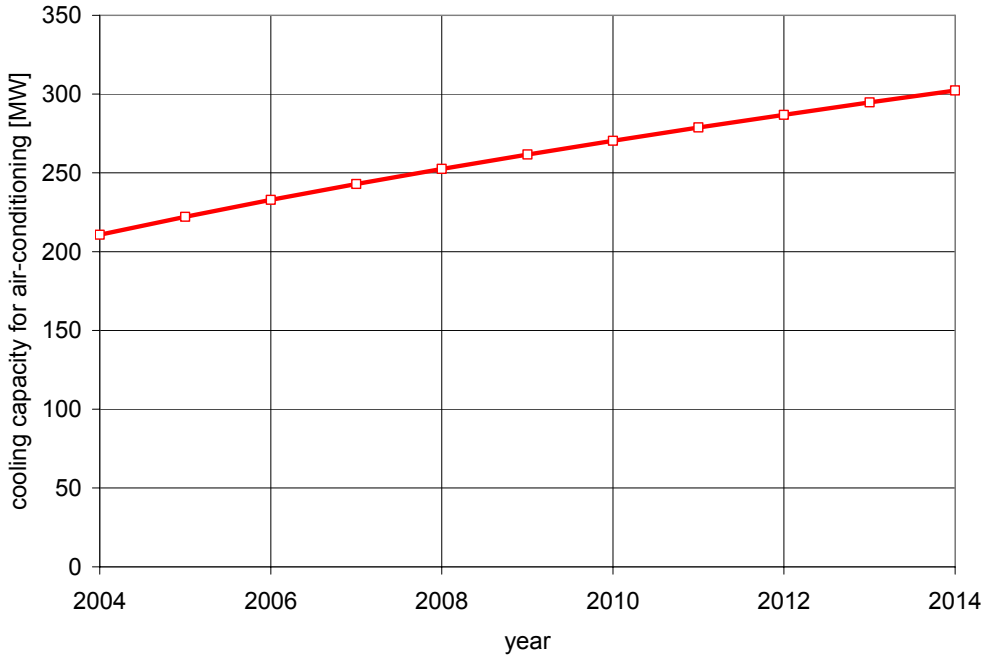

Figure 5: Expected growth of cooling capacity between 2004 and 2014 (Source: SDHK)

3 Total consumption of electricity and benchmarks

3.1 Summer peak electrical loads

The following graphs show trends of electrical consumption in Slovenia in year 2006.
There is a well seen (an expressed) trend of electrical consumption increasing till 9.00 a.m. After 9.00 o'clock the electricity usage reduces, what is even more noticeable in spring period. At that period a trend of electrical reduction is till 20.00 or till 21.00, after when it increases again. In summertime after some slight reduction, the trend of electrical consumption continues increasing till around 15.00 p.m., when it (the consumption) starts to drop again. Tip in consumption is repeated in summer at 21.00, which is a bit later than in spring period.

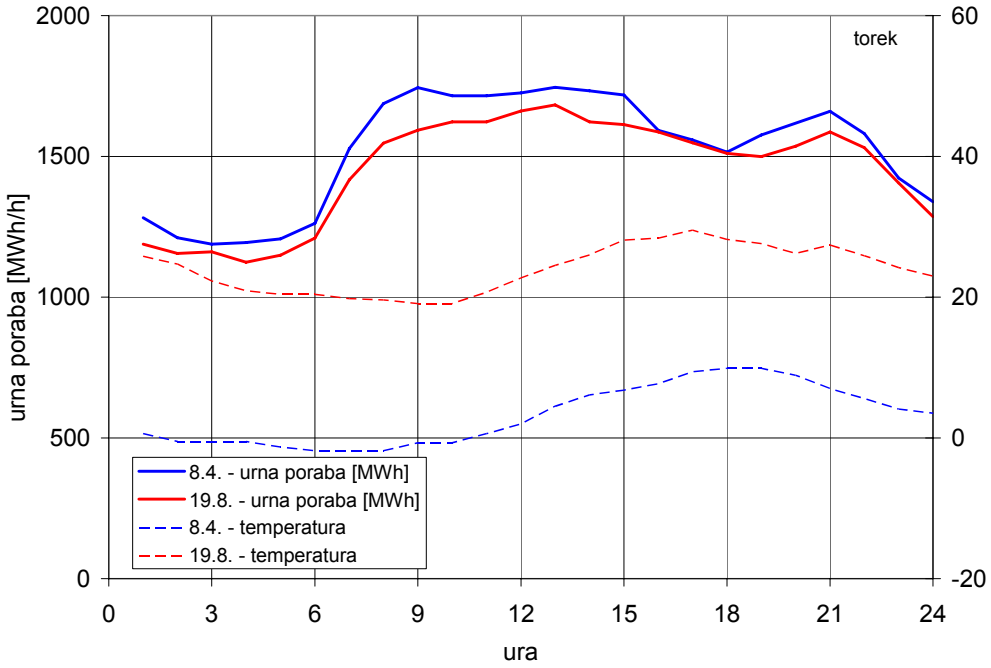

Figure 6: Comparison of hourly distribution of electricity and temperatures in chosen period – total use - Tuesday (Source: Elektro Slovenije)

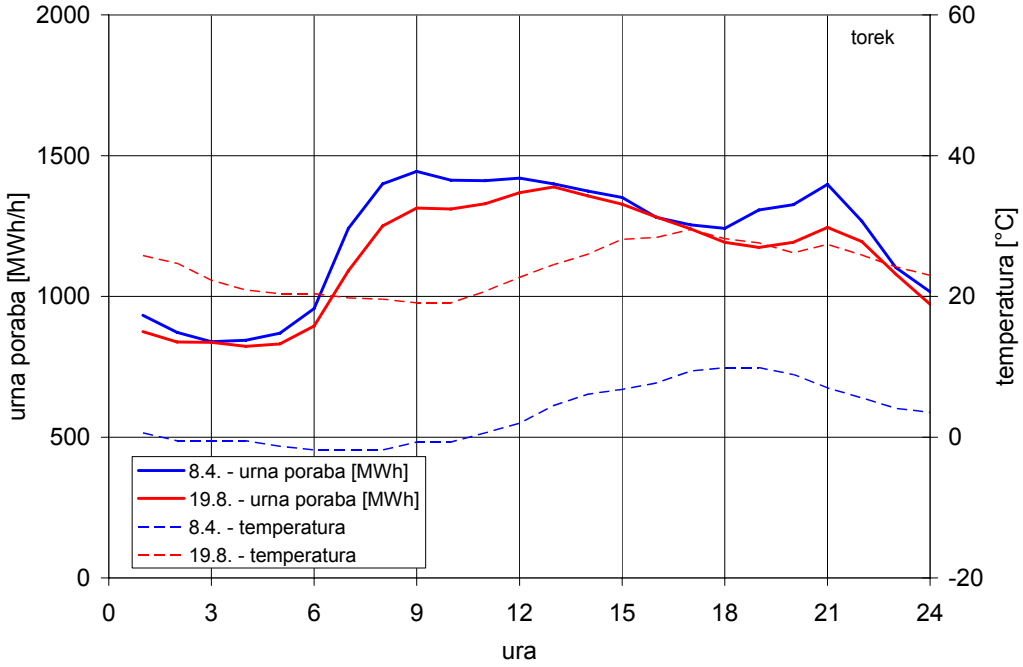

Figure 7: Comparison of hourly distribution of electricity and temperatures in chosen period – distributional use - Tuesday (Source: Elektro Slovenije)

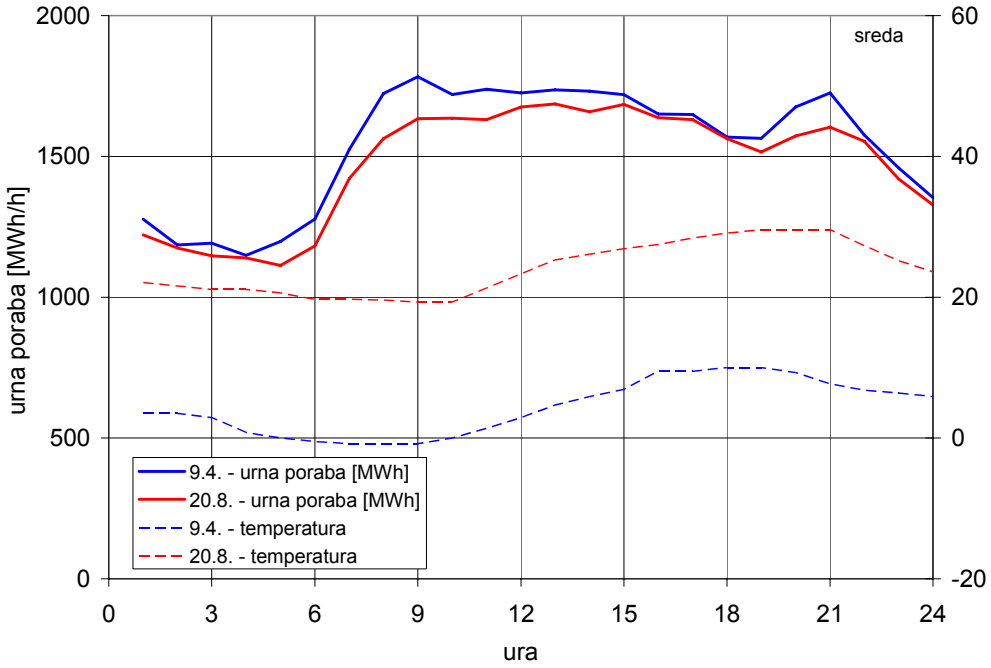

Figure 8: Comparison of hourly distribution of electricity and temperatures in chosen period – total use - Wednesday (Source: Elektro Slovenije)

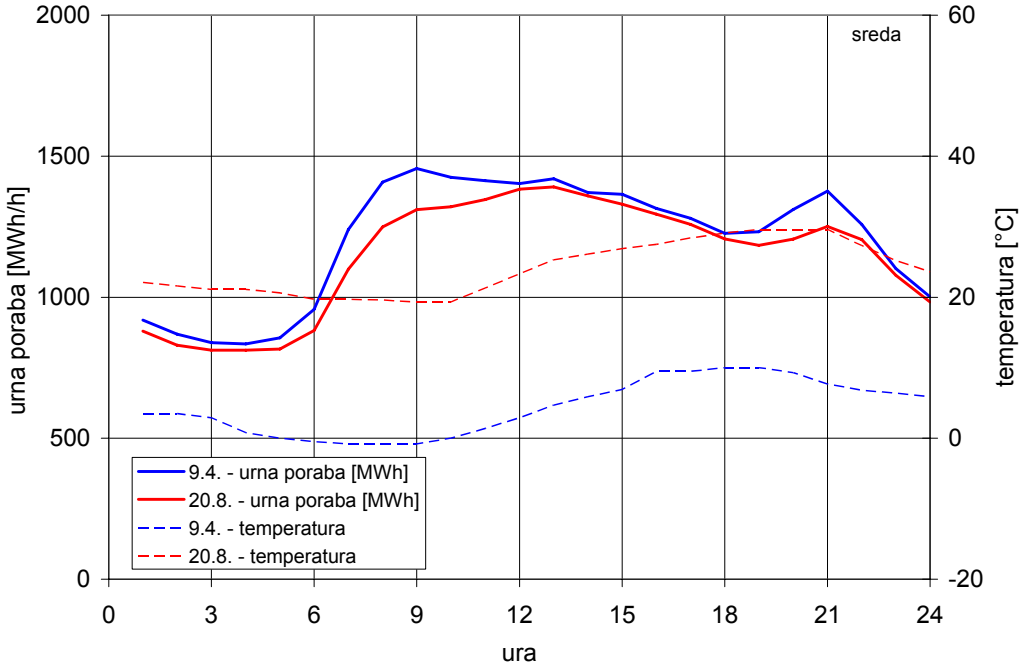

Figure 9: Comparison of hourly distribution of electricity and temperatures in chosen period – distributional use - Wednesday (Source: Elektro Slovenije)

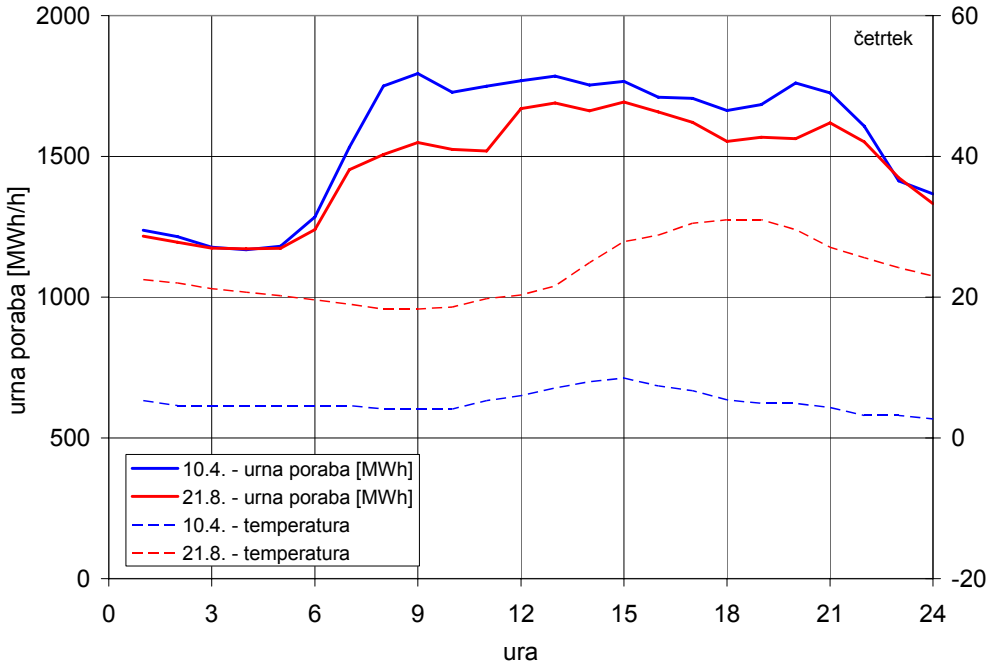

Figure 10: Comparison of hourly distribution of electricity and temperatures in chosen period – total use - Thursday (Source: Elektro Slovenije)

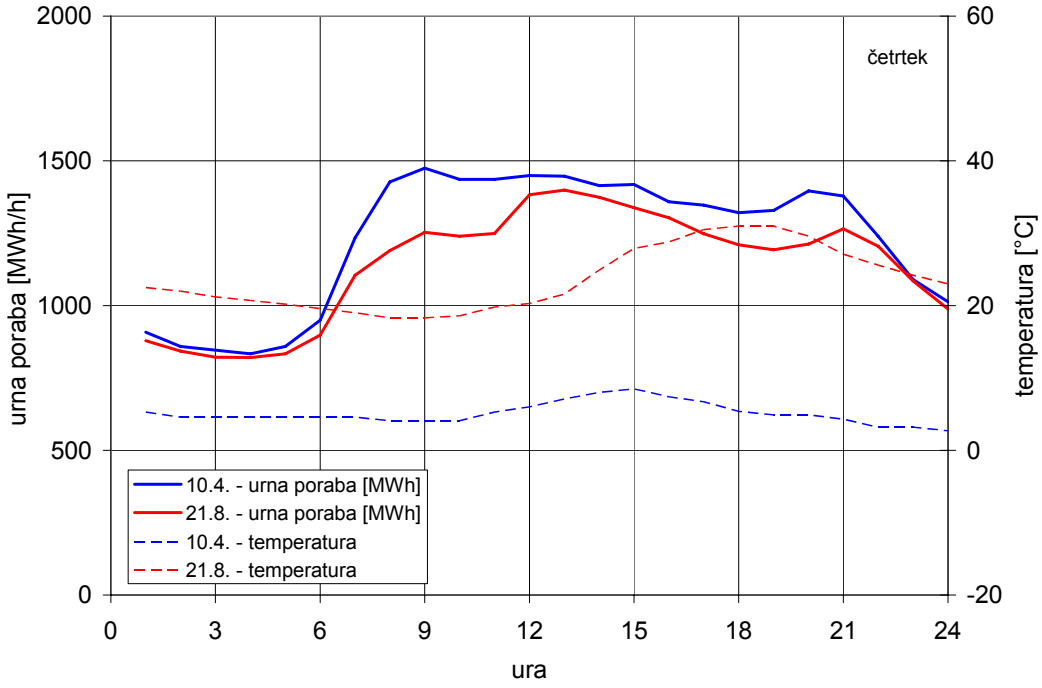

Figure 11: Comparison of hourly distribution of electricity and temperatures in chosen period – distributional use - Thursday (Source: Elektro Slovenije)

Distributional use doesn't consider consumption of electricity for largest industrial consumers (companies with largest consumption: Talum, Impol, SŽ;…) in Slovenia.

3.2 Benchmarks

It's very hard to find data about cooling consumption by building type and to give average values because of the very large difference on building insulation, specific climate condition and specific use of buildings in each sector.

Right now the inventory of real surfaces in Slovenia is being carried out and will be finished until July 2007. More exact analysis for benchmark will be possible at that time.

4 Interviews of actors

4.1 Results of interviews with users

Interviews are used to answer to the following questions and allow extrapolation on the total stock.

- Which building types are air-conditioned?
- Which systems are in use?
- Which area of a building is air-conditioned?
- Which energy consumption is related to cooling?
- What is planned for new buildings?

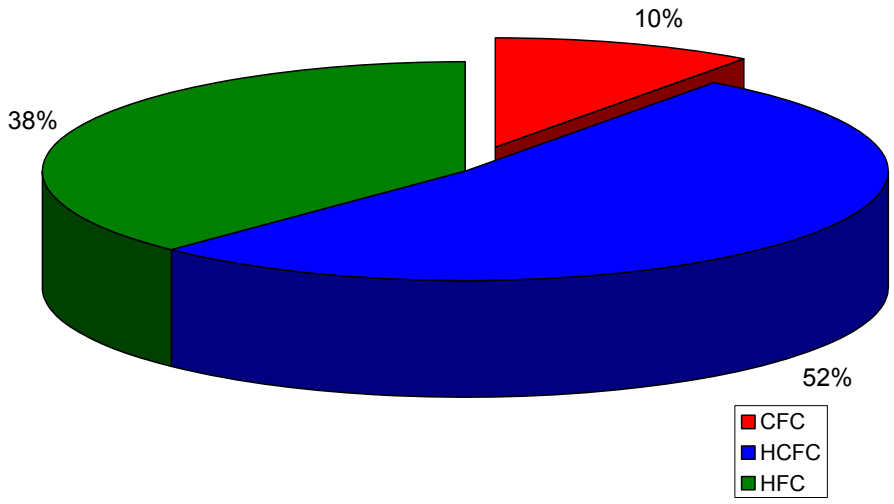

Figure 12: Share of individual group of cooling media, year 2003 (Source: SDHK)

The first air conditioners used some R11 or R12 (CFC) which had a very harmful impact on the ozone layer and on the greenhouse effect. Then, their use was prohibited and they were replaced by R22, which makes part of the family of the HCFC.

4.2 Results of interviews with people working in the air-conditioning field

Manufacturers and fitters

Menerga: g. Gavez (telephone interview 5.3.2007)

In company Menerga offers technical support to design engineers, designing projects and they are delivering air-conditioning devices. They are assuring theirs customers servicing, maintenance equipments and education.

View of company Menerga on problems of reducing cooling energy in Slovenia:
Industry as largest consumer of cooling energy is notni subjected of reducing of consumption with heat recovery systems.
Tertiary sector is subjected of reducing of energy consumption for cooling with heat recovery systems, as a protection of building envelope too.

Energoplus: g. Zupančič (telephone interview 6.3.2007):

Energoplus offer performance of systems for heating, cooling and ventilation theirs costumers. They are assuring investors and designer's engineers' professional help over planning and choice of most optimal solutions considering available investment assets, having regard to time frameworks of project.

They are assuring theirs customers servicing, maintenance equipments and education. They organized professional educational meetings for maintenance staff.

Energoplus annually sells about 60 to 80 cooling generators powers between 20 and 100 kW and about 5 generators bigger than 200 kW.

Also Energoplus annually sells also around 3000 convectors. Increase of sale is not express because of increasing competition on market.

4.3 Results of interviews with contractors

Energetika Ljubljana: g. Škerl (telephone interview ; 6.3.2007):

Pilot study of district cooling was made in Ljubljana. Currently the system operates only in office of Energetika Ljubljana. The cooling power of the system is app. 550 kW. Another absorption cooling generator that is connected on district cooling (cooling power 350 kW) is located in near factory Lek.

A steam district cooling is in a preparation phase for a new paediatric clinic in Ljubljana

Project of district cooling will succeed with:

- greater government interest (help with subsidies) for initial investment to steam station and absorption generators,
- greater ecological awareness.

POSSIBILITIES OF INTRODUCING DISTRICT COOLING SYSTEM IN LJUBLJANA

During the summer months the district heating system of Ljubljana has very low consumption of heat energy.

There is a question at very low consumption of heat energy whether still to use a combined heat and power production or to move over to separate production of heat in peak boilers. The solu-

tion is in bigger consumption of heat energy during summer time by introducing a district cooling system.

Researchment of district heating market has shown a possibility of a 50 MW enlargement potential of heat energy consumption that would be need to drive an absorption chillers. One to the specifics of operation of the district heating system in Ljubljana, a decentralized district cooling system with absorption chillers driven with steam or hot water is preferable. Such systems can be competitive with compression cooling systems if they are integrated in a combined heat and power production system and if the ratio between electric and heat energy costs is propitious.

Comparison of total costs in life time between a compression and absorption cooling system, with a cooling capacity of 1 MW shows, that the a competitive heat energy price should be 0,02 €/ kWh.

(Source- Author: Andrej KITANOVSKI, Janez GROŠELJ, Alojz POREDOŠ)

In the future, cooling needs will increase during the summer months because of an ever-increasing desire for comfort within buildings. Over the last decade, the use of absorption chillers has increased. These chillers require a heat source for their operation. When compared with conventional electrically driven compressor chillers, the electrical energy requirements for absorption chillers are almost negligible. As a heat source, absorption chillers can use fuel gases, fuel oils, steam and hot water.An analysis was made of the influence of the supply and return temperatures on the efficiency of district heating systems (DHSs), with hot-water-driven absorption chillers (HWACs) as a component of a heat-driven distributed district cooliing system. An optimal configuration of HWACs was proposed. A comparison between the efficiency of a DHS and HWACs for a range of hot water supply and return temperatures was made and an optimal operating temperature of 95/80°C was estimated.

(Source - Proceedings of the Institution of Mechanical Engineers, Part A: Journal of Power and Energy, Volume 215, Number 2 / 2001; Author: A Kitanovski, A Poredoš)

4.4 Results of interviews with others

SDHK: g. Janko Remec (meeting, telephone interview)

Type of cooling system depends on application of air-conditioning. Central cooling is used in big buildings and could be combined with cooling needed in industry. Split systems are predominantly used in residential sector and small business sector. A lot of split installations are also in commercial sector, but it is expected to be transferred to central cooling.

5 Results

5.1 Energy consumption for cooling

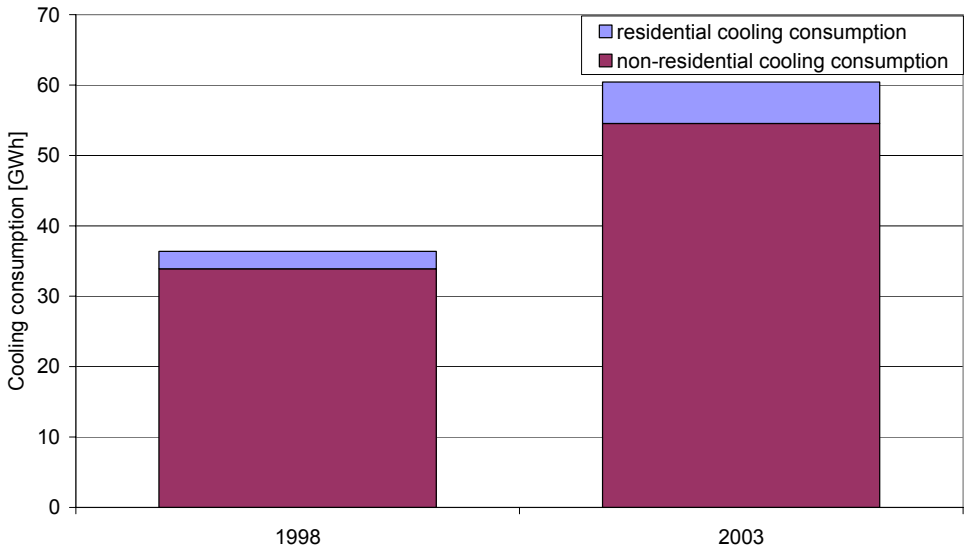

Figure 13: Evolution of residential and other non residential cooling electricity consumption
(Source: SDHK)

We observe that the residential cooling consumption goes from 2,5 electricity GWh in 1998 to 6 GWh in 2003 that means more then 100% increase.

5.2 Energy consumption for cooling for specific building types

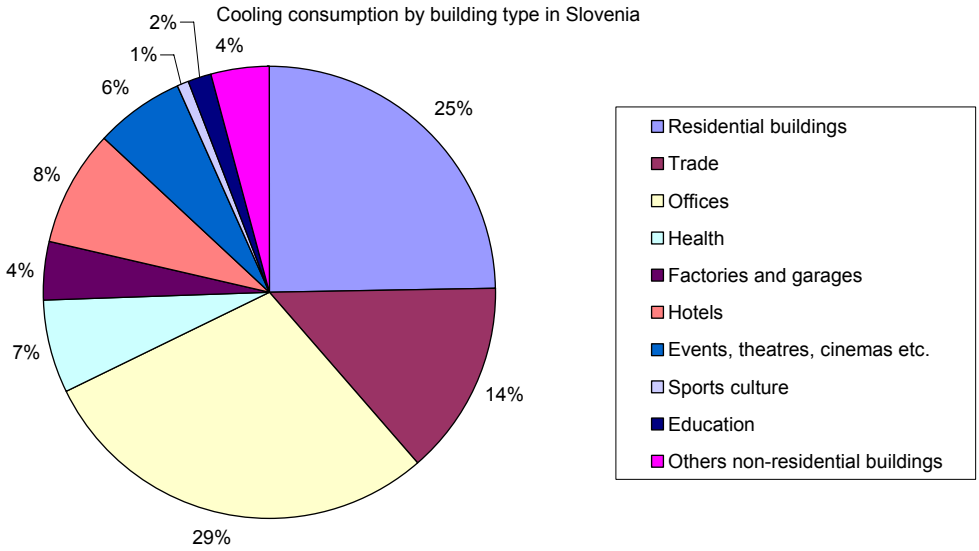

Figure 14: Cooling consumption by building type(Source: SDHK)

5.3 Table of installed systems

Central cooling is used in big buildings and could be combined with cooling needed in industry. Split systems are predominantly used in residential sector and small business sector. A lot of split installations are also in commercial sector, but it is expected to be transferred to central cooling. Free cooling is only possible in cooling systems with air distribution which are predominantly in commercial sector.

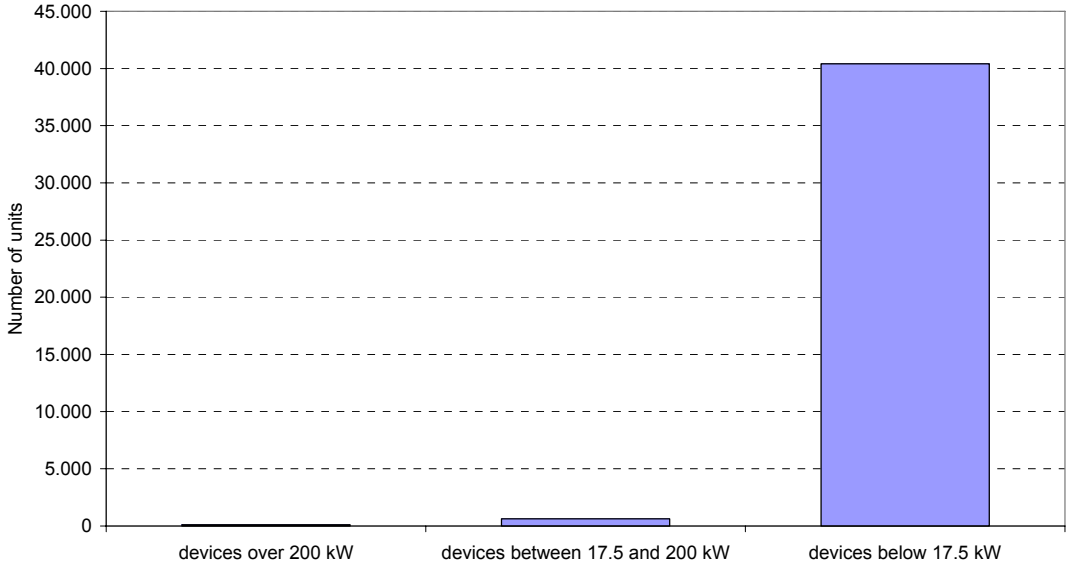

Figure 15: Number of cooling devices divided by power size (Source: SDHK)

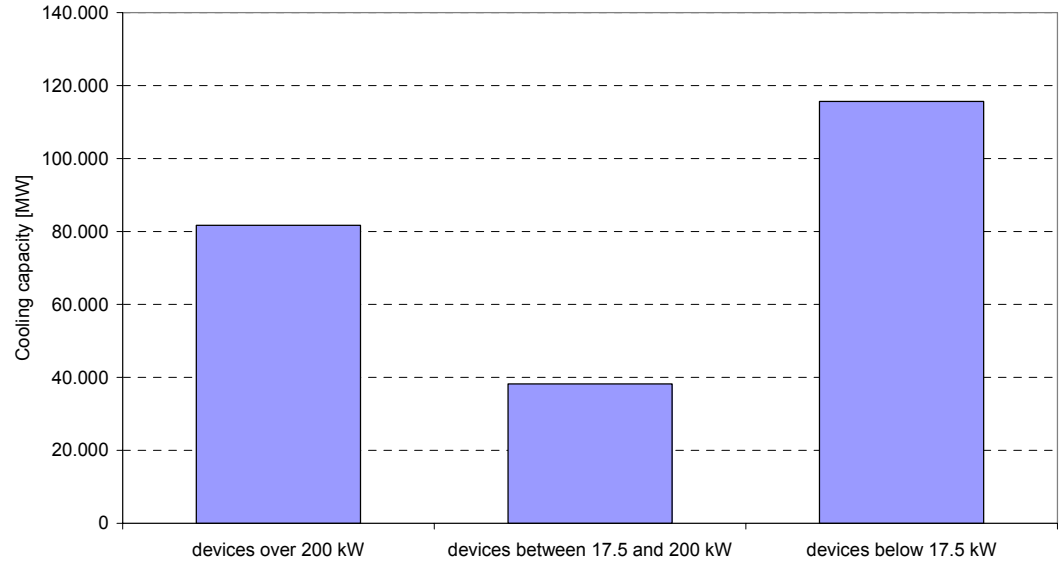

Figure 16: Cooling capacity divided by power size (Source: SDHK)

5.4 The average efficiency of the installed and planned systems

For chillers, the efficiency depends on the fluids which are used and on the type of compressor. The average efficiency is shown in the following table:

Compressor type	Cooling fluid	Efficiency
Reciprocating	Air	2,8
	Water	3,6
Screw	Air	3,5
	Water	4,6
Centrifugal	Air	3
	Water	4,2

Table 5: Average efficiency of cooling devices

5.5 Rates of energy sources in the cooling market.

Annual electrical energy production in Slovenia is around 13·106 MWh. Slovenia has a specific electric energy production (RS MOPE 2004). Almost 40% of all electricity is produced in fossil fuelled electric power plants (38,5%), hydro power plants represents 21,4%, the nuclear power plant 37,7% and the rest is produced by cogeneration power plants (2,4%). As it can be seen, the percentage from renewable sources is relatively high.
For the production of electrical energy in fossil fuelled power plants in Slovenia the lignite is mostly used (64% in total CO2 emissions). The monthly CO2 emissions in the production during the summer are lower than in winter period. The reduction in CO2 emissions from electrical energy production at the end of 2003 is related to the mild weather conditions and increased production in hydro power plants.
It can be seen that in average the monthly CO2 emissions during winter period are high. They reach 700 000 t CO2, due to the maximal power output from the thermal power plants. During the summer the production is for about 20% lower than in the winter period.
On the other side, electrical energy being used for cold production in air conditioning devices has the opposite trend. The peak in energy consumption depends on the hot summer weather conditions in June, July and August. The peak monthly production is estimated to be less then 22 000 t CO2. It represents less then 5% (August) of total CO2 emission in energy transformation sector if we presume that electricity for cooling is all produced in fossil fuelled power plants. For the cooling systems it can be expected that they operate in average between April and September.
Any new cooling systems for air conditioning purposes cause the rise in summer electric energy use, and consequently the increase in CO2 emissions. Because the energy consumption has a important influence on TEWI, it is crucial that the coefficient of performance (COP) of new and also of the large old installation is high.

6 The future energy demand for cooling

6.1 Influence of the EPBD

Slovenian EPBD regulation (expected 4/2007) will introduce also calculations of energy use for cooling. The minimum requirements will be exposed on ten level of final energy consumption with specific regulations for summer conditions. For residential buildings the calculations of

maximum indoor temperature is considered and the building design must ensure summer thermal comfort without cooling devices. Consideration of energy demand for cooling will influence cooling demand on national level.

6.2 Influence of the prohibition of R22

In 2010 R22 will be prohibited in Slovenia. The first air conditioners used some R11 or R12 which had a very harmful impact on the ozone layer and on the greenhouse effect. Then, their use was prohibited and they were replaced by R22, which makes part of the family of the HCFC.

6.3 Development of the future cooling market

Electricity consumption
It is expected that electricity consumption in Slovenia will increase in next period (5-10 years) due to increase in industrial production and residential sector too. Actual estimation is between 4 and 6% per year.

Cooling system rate
Efficiency of cooling system will increase due to better cooling devices, isolation (distribution of cold / cooling media) and higher level of knowledge about appropriate temperature levels. Cooling temperatures for indirect cooling systems will increase what also increase efficiency of cooling systems.

7 Discussion

Type of cooling system depends on application of air-conditioning. Central cooling is used in big buildings and could be combined with cooling needed in industry. Split systems are predominantly used in residential sector and small business sector. A lot of split installations are also in commercial sector, but it is expected to be transferred to central cooling. Passive cooling is rarely used in small applications. Free cooling is only possible in cooling systems with air distribution which are predominantly in commercial sector.

8 Identification of regional Actors

Here is a list of the key actors we have contacted in our region and who will contribute in the next month to define and implement actions to improve energy efficiency of air conditioning in buildings.

Local authorities
- Ministry of the Environment and Spatial Planning Regional Council
- Local Energy Agency
- Slovenia association for cooling technologies (SDHK)

Manufacturers of cooling devices
- Manufacturers networks : KLIMA CELJE

Architects

- STUDIO KALAMAR, SADAR VUGA

Planners
- Regional level: IBE d.d., ENERGO PLUS d.o.o., IMP KLIMA d.o.o., MENERGA d.o.o.

Energy industrials
- ENERGETIKA LJUBLJANA d.o.o.

Building owners
- MERCATOR –business systems,
- Government of the Republic of Slovenia
  Joint Services of the Government

Technical centres and University
- RTC INSTITUT KGH d.o.o.
- Slovenian Chamber of Engineers

ANNEX 1

Statistical data - Division of total Slovenian building stock into sub-sectors (Residential buildings, Public buildings, Industrial premises, ...)

In the enclosed table (Tab. 6) the number, floor area and volume of buildings built in particular year (since 1952 to 1991) in Republic of Slovenia are given. Please see the remarks at the end of the table.
The sub-sectors are determined according to the methodology of the Institute of Statistics:

R residential buildings
A administrative buildings
C cultural / educational buildings
M medical buildings
PC buildings related to physical culture
O other public buildings
I industrial buildings
E other buildings in economy sector

Note: Cumulative floor area of non-residential buildings will be available after June 2007, since currently the national programme of recording the real-estate information is on-going.

Tab. 6. Number, floor area (m^2) and volume (m^3)of buildings built in particular year (from 1952 to 1989) in Republic of Slovenia (the stressed lines in the table remark the change in the thermal regulations)

YEAR	UNIT	R	A	C	M	PC	O	I	E
1952	nr	1.047	13	6	5	-	35	43	57
	m^2	262.344	4.851	6.874	11.414	-	36.271	34.660	39.818
	m^3	-	-	-	-	-	-	-	-
1953	nr	1.489	29	20	16	4	42	33	13
	m^2	333.398	37.528	8.975	29.105	819	142.158	38.342	9.739
	m^3	-	-	-	-	-	-	-	-
1954	nr	1.127	23	21	13	2	13	43	12
	m^2	360.820	11.249	12.848	20.856	539	18.291	44.589	5.248
	m^3	1.354.048	44.160	65.503	73.410	3.995	62.085	488.849	22.838
1955	nr	1.048	30	22	15	3	10	64	9
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1956	nr	1.622	12	19	7	3	9	44	12
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1957	nr	1.594	8	19	7	-	62	32	18
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1958	nr	1.829	18	20	13	3	79	30	20
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
	nr	1.909	12	48	23	4	90	36	53

1959	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1960	nr	2.398	24	39	15	5	83	45	40
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1961	nr	2.786	37	40	16	3	101	83	50
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-

YEAR	UNIT	R	A	C	M	PC	O	I	E
1962	nr	2.693	19	41	23	6	87	61	44
	m^2	919.000	22.000	101.000	24.000	2.000	32.000	-	-
	m^3	2.767.000	76.000	384.000	80.000	7.000	91.000	-	-
1963	nr	2.657	28	43	26	4	82	75	93
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1964	nr	2.611	13	39	15	6	95	89	41
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1965	nr	3.255	18	37	16	5	125	91	47
	m^2	-	-	-	-	-	-	-	-
	m^3	-	-	-	-	-	-	-	-
1966	nr	3.840	14	40	19	8	248	51	93
	m^2	1.038.000	4.000	91.000	24.000	4.000	20.000	71.000	53.000
	m^3	3.086.000	22.000	400.000	87.000	21.000	73.000	452.000	224.000
1967	nr	3.866	7	27	9	5	312	87	178
	m^2	1.011.000	5.000	44.000	55.000	1.000	54.000	150.000	82.000
	m^3	2.959.000	15.000	168.000	199.000	7.000	131.000	940.000	335.000
1968	nr	3.849	11	26	8	7	352	78	142
	m^2	958.000	7.000	44.000	14.000	3.000	26.000	83.000	141.000
	m^3	2.727.000	18.000	179.000	54.000	19.000	72.000	462.000	678.000
1969	nr	4.485	12	40	13	22	171	141	165
	m^2	1.076.000	3.000	53.000	8.000	5.000	15.000	230.000	111.000
	m^3	3.154.000	9.000	103.000	25.000	15.000	41.000	1.440.000	413.000
1970	nr	4.926	7	35	5	18	91	182	186
	m^2	1.167.000	15.000	51.000	3.000	4.000	30.000	269.000	172.000
	m^3	3.260.000	53.000	196.000	32.000	6.000	96.000	1.649.000	594.000
1971	nr	4.825	8	36	7	32	93	220	174
	m^2	1.332.000	19.000	110.000	11.000	11.000	17.000	416.000	245.000
	m^3	3.950.000	346.000	370.000	72.000	39.000	42.000	2.634.000	935.000
1972	nr	4.537	16	36	7	23	238	292	128
	m^2	1.281.000	16.000	86.000	7.000	6.000	44.000	333.000	147.000
	m^3	4.423.000	60.000	372.000	66.000	22.000	134.000	2.122.000	659.000
1973	nr	4.885	16	34	7	16	121	181	116
	m^2	1.364.000	22.000	70.000	23.000	13.000	30.000	350.000	124.000
	m^3	4.017.000	82.000	300.000	108.000	84.000	92.000	2.148.000	589.000
	nr	5.029	26	43	21	12	50	268	189

1974	**m2**	1.586.000	35.000	63.000	23.000	7.000	13.000	556.000	69.000
	m3	4.017.000	67.000	254.000	57.000	50.000	48.000	3.250.000	296.000
1975	**nr**	5036	26	43	15	28	46	238	83
	m2	1.786.000	39.000	52.000	59.000	26.000	36.000	550.000	74.000
	m3	5.578.000	186.000	215.000	241.000	126.000	208.000	3.377.000	445.000
1976	**nr**	4.904	16	31	17	13	19	235	105
	m2	2.049.000	17.000	48.000	51.000	30.000	14.000	528.000	953.000
	m3	5.820.000	61.000	207.000	211.000	166.000	33.000	4.907.000	9.310.000
1977	**nr**	5.625	25	39	15	12	52	199	90
	m2	1.787.000	29.000	130.000	11.000	16.000	33.000	366.000	152.000
	m3	5.609.000	82.000	542.000	40.000	101.000	125.000	2.712.000	567.000
1978	**nr**	4.962	24	36	12	15	63	165	86
	m2	1.570.000	39.000	78.000	65.000	22.000	112.000	354.000	56.000
	m3	5.046.000	141.000	391.000	166.000	172.000	416.000	2.368.000	646.000
1979	**nr**	5680	33	38	25	9	75	182	88
	m2	1.790.000	40.000	90.000	79.000	5.000	127.000	462.000	122.000
	m3	5.219.000	134.000	375.000	355.000	21.000	487.000	2.790.000	663.000
1980	**nr**	5.709	28	63	25	14	93	182	79
	m2	1.904.000	56.000	129.000	75.000	50.000	89.000	488.000	113.000
	m3	5.281.000	170.000	501.000	299.000	327.000	347.000	3.030.000	565.000
YEAR	**UNIT**	**R**	**A**	**C**	**M**	**PC**	**O**	**I**	**E**
1981	**nr**	5356	26	57	25	6	88	157	75
	m2	1.933.000	33.000	152.000	31.000	12.000	620.000	338.000	293.000
	m3	5.388.000	134.000	664.000	147.000	95.000	2.765.000	2.094.000	2.532.000
1982	**nr**	5324	18	43	13	2	74	141	56
	m2	1.773.000	11.000	127.000	32.000	1.000	94.000	333.000	189.000
	m3	4.945.000	51.000	771.000	186.000	3.000	323.000	1.969.000	629.000
1983	**nr**	5779	17	38	7	7	40	137	63
	m2	1.984.000	8.000	87.000	16.000	9.000	53.000	284.000	54.000
	m3	5.678.000	28.000	464.000	64.000	85.000	215.000	1.703.000	275.000
1984	**nr**	5669	7	60	15	13	64	111	65
	m2	1.593.000	36.000	42.000	47.000	12.000	69.000	233.000	67.000
	m3	4.421.000	87.000	166.000	185.000	74.000	221.000	1.638.000	119.000
1985	**nr**	5.203	12	46	9	12	78	171	46
	m2	1.495.000	7.000	150.000	20.000	13.000	81.000	359.000	48.000
	m3	4.212.000	40.000	361.000	83.000	82.000	278.000	3.987.000	259.000
1986	**nr**	6.401	13	31	10	8	50	175	67
	m2	1.831.000	17.000	68.000	47.000	9.000	37.000	322.000	45.000
	m3	5.162.000	127.000	275.000	160.000	58.000	135.000	3.351.000	204.000
1987	**nr**	5382	4	20	8	9	33	133	84
	m2	1.439.000	287	23.000	35.000	15.000	22.000	317.000	67.000
	m3	3.982.000	1.000	99.000	203.000	116.000	94.000	3.116.000	407.000
1988	**nr**	5.255	10	30	23	6	803	137	57
	m2	1.462.000	12.000	51.000	30.000	7.000	55.000	220.000	93.000
	m3	3.982.000	51.000	198.000	98.000	42.000	163.000	1.487.000	558.000
1989	**nr**	5.025	7	28	21	14	565	105	89
	m2	1.281.000	15.000	43.000	54.000	17.000	52.000	159.000	52.000

	m^3	3.601.000	57.000	139.000	193.000	118.000	157.000	927.000	181.000
1990	**nr**	4.247	7	19	11	8	11	40	47
	m^2	1.117.000	12.000	18.000	15.000	8.000	21.000	90.000	93.000
	m^3	3.137.000	50.000	62.000	59.000	42.000	27.000	470.000	323.000
1991	**nr**	3.568	45	129	44	31	58	163	213
	m^2	887.000	24.000	26.000	15.000	15.000	8.000	42.000	77.000
	m^3	2.498.000	89.000	90.000	56.000	105.000	24.000	253.000	259.000

Table 6: Total Slovenian building stock into sub-sectors (source: SL 52-93 (2))

Legend :
R residential buildings
A administrative buildings (buildings used by State authorities, government, jurisdiction, political, professional and mass-organisations, banks, etc.)
C cultural / educational buildings (schools, theatres, museums, etc.)
M medical buildings (hospitals, dispensaries, clinics, health resorts, etc.)
PC buildings related to the physical culture (gymnasiums, etc.)
O other buildings related to the social service (infants homes, halls of residence for students, homes for the older people, etc.) ...
I industrial buildings
E other buildings in economy sector

Prepared by:

Uros Dolinar, BCEI ZRMK

Dr. Janko Remec, SDHK

Dr. Marjana Sijanec Zavrl, BCEI ZRMK