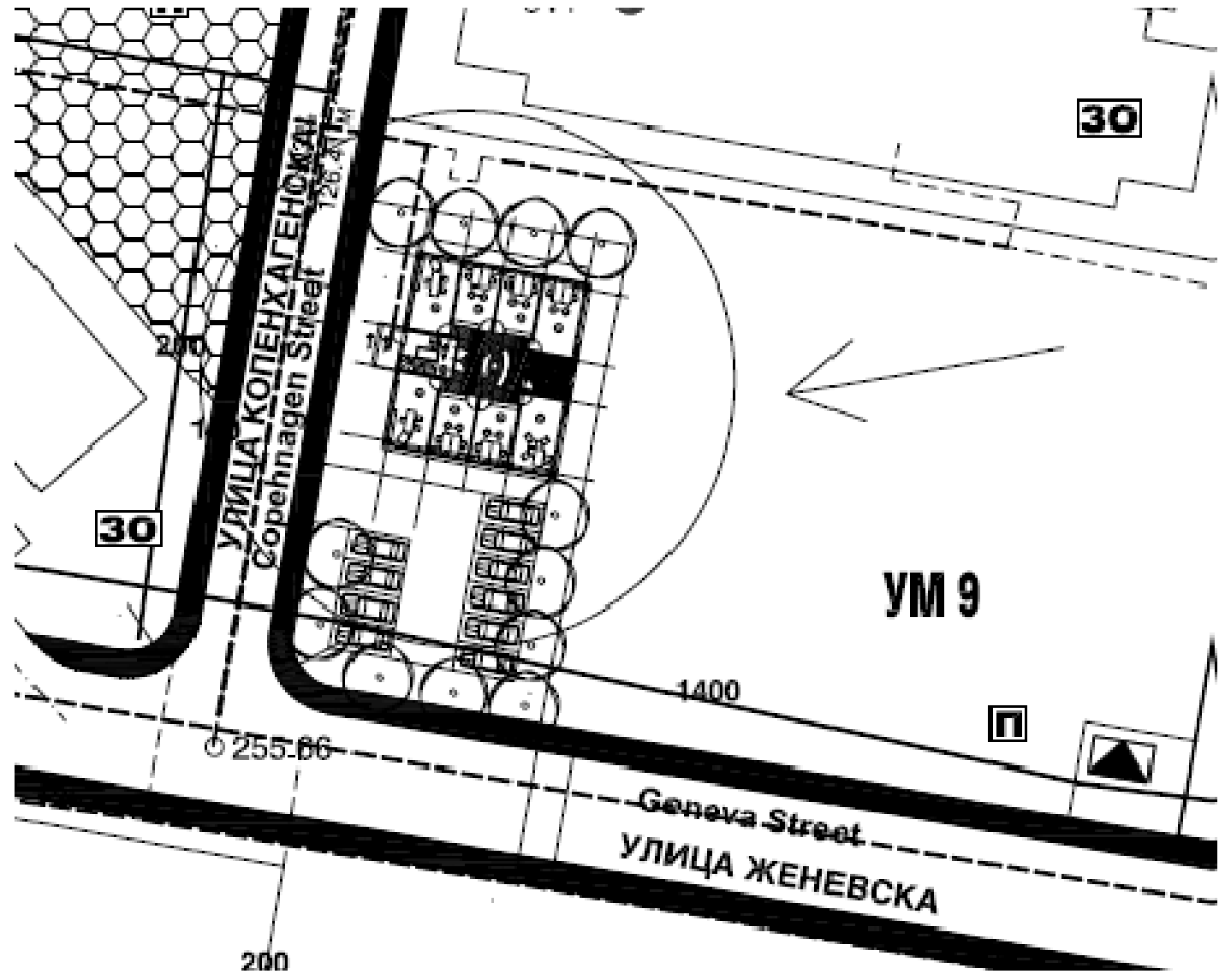


**PHOTOVOLTAIC SOLAR COOLING SYSTEM  
AT THE NEW ZELS HEADQUARTERS  
BUILDING**

Energy can be changed from one form to another,  
but it cannot be created or destroyed.

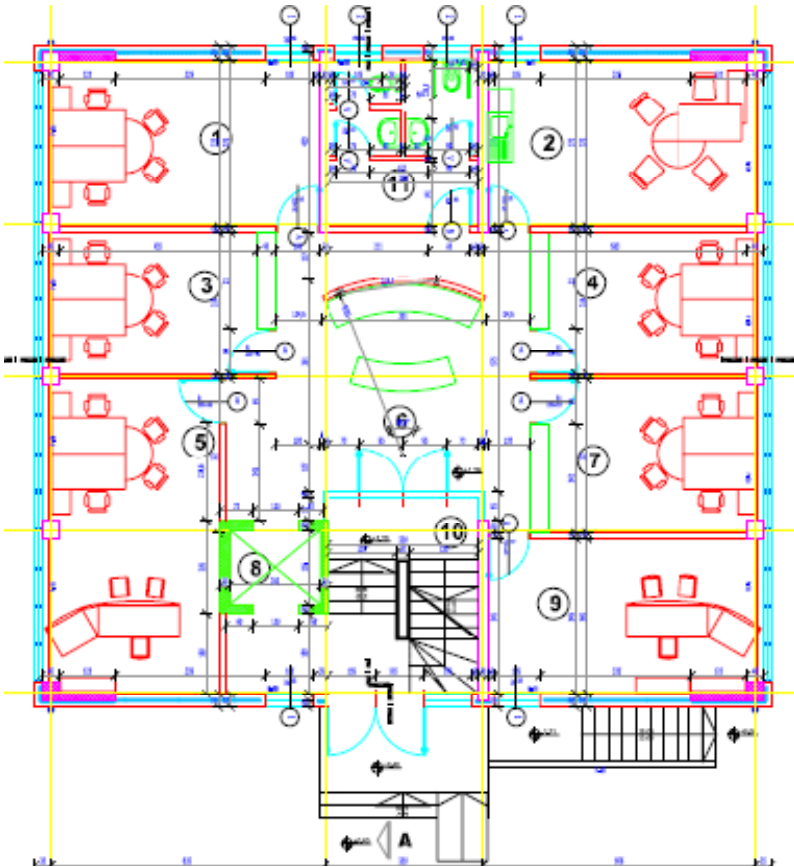
The total amount of energy and matter in the  
Universe remains constant, merely changing from  
one form to another.

# New ZELS Headquarters Building Location

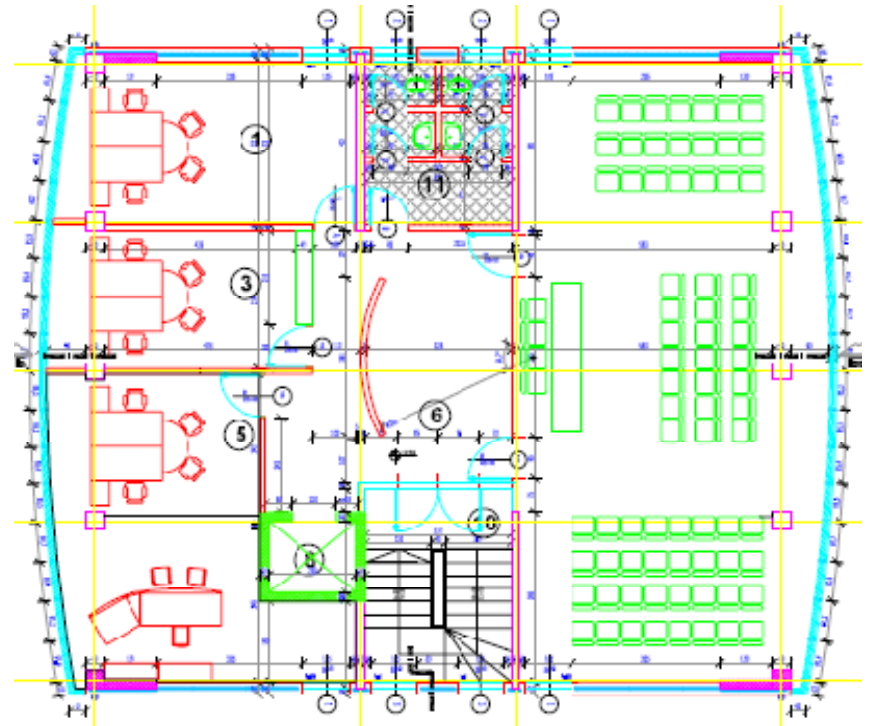


# Layouts

## Ground floor



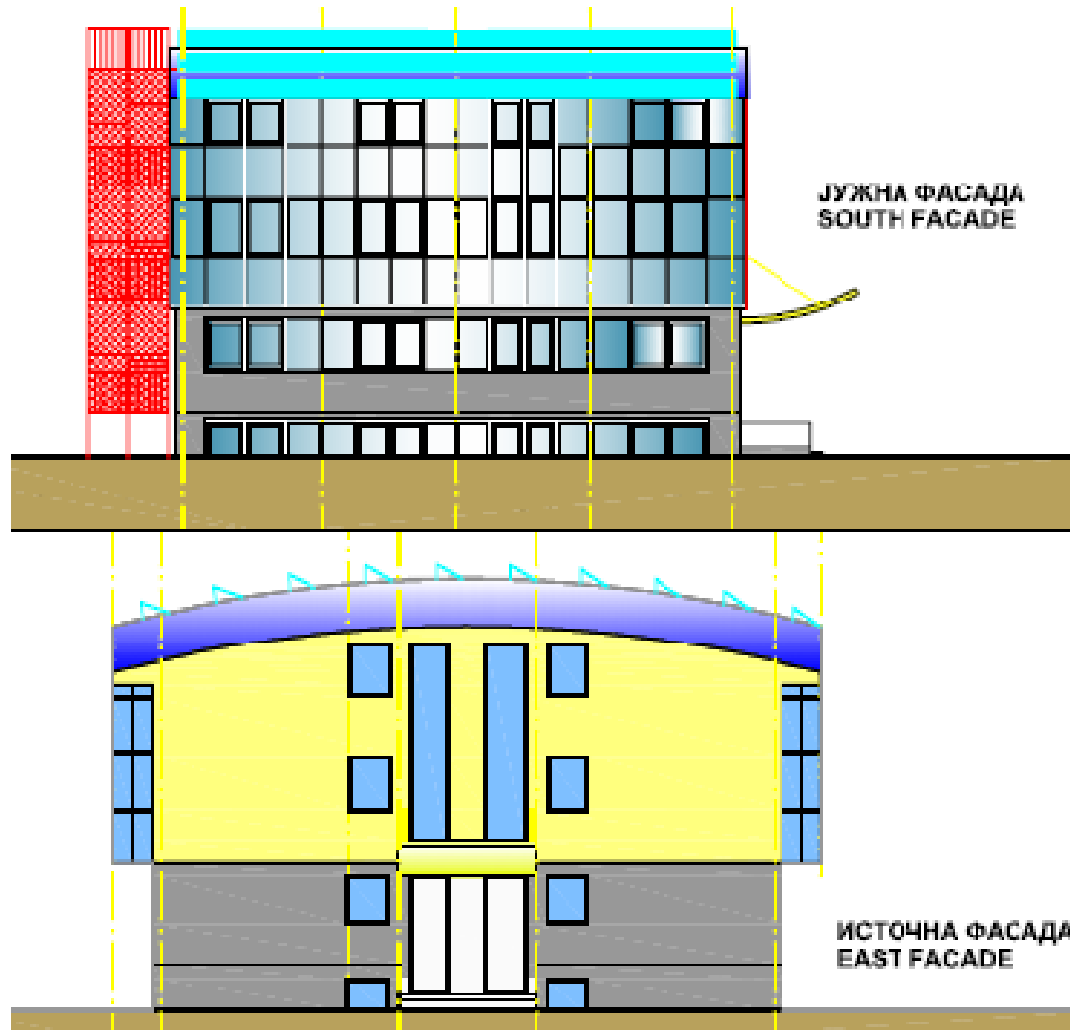
## loft



## Building data

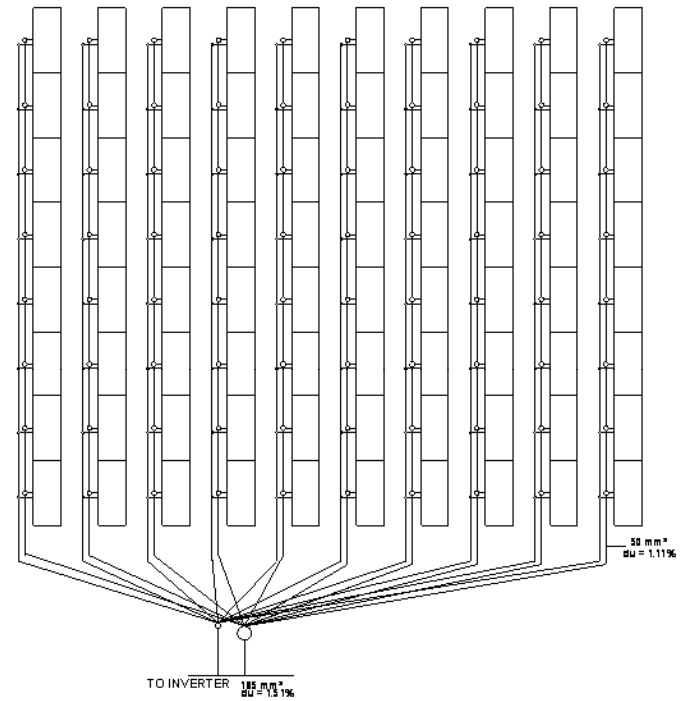
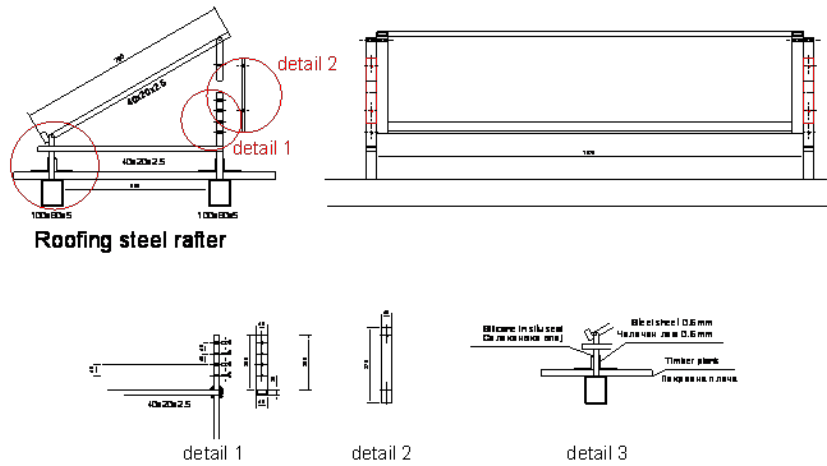
- Dimensions 14.70 x 18.80 m, 8m high;
- Area           basement 209.58 m<sup>2</sup>;  
                  ground and first floor 2 x 213.44 m<sup>2</sup>;  
                  loft 241.29 m<sup>2</sup>  
                  Total 878 m<sup>2</sup>
- Reinforced concrete structure;
- Windows and curtain wall of double glazed thermo panel filled with krypton or argon;
- External walls sandwich of clay hollow bricks and polystyrene.
- All other characteristics according contemporary building standards.

# Facades



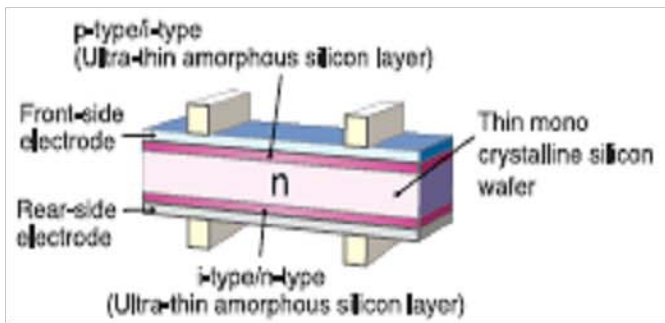
# Installation

## Roof connection diagram

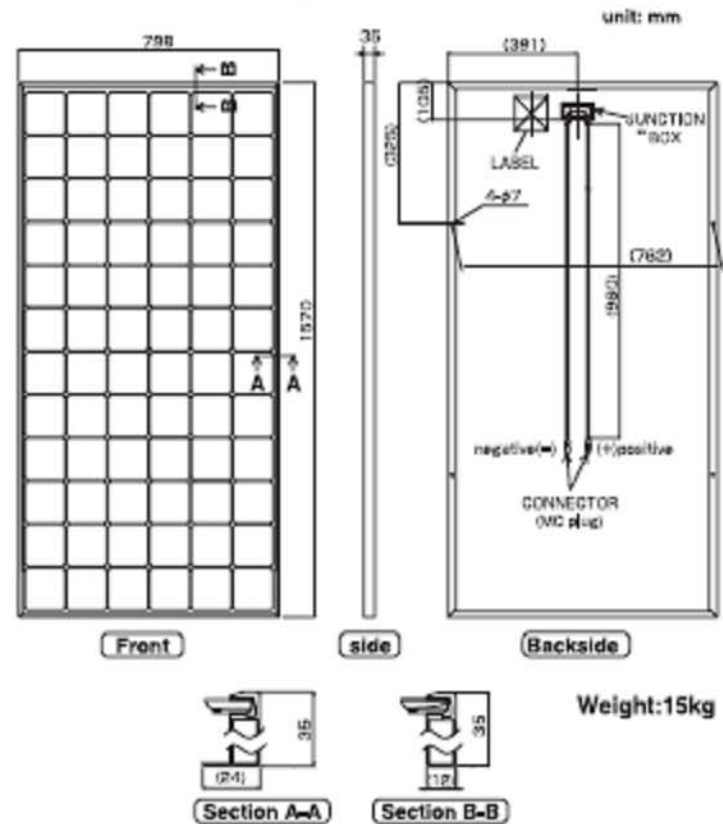


# Panels

Typical panel structure



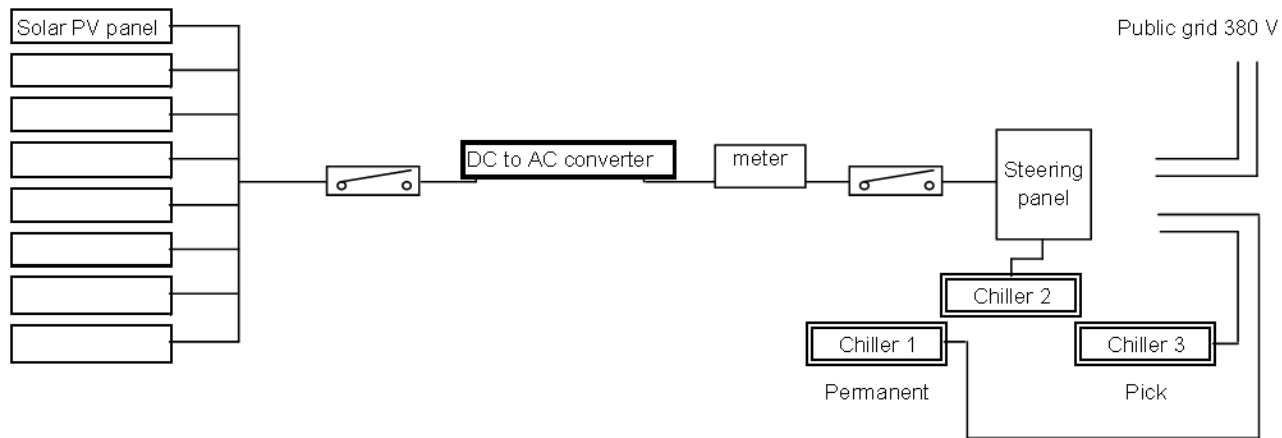
## Dimensions and weight





# The system

All the components are EU merchandise



## System data

Number of panels	80
Unit max. power	160 W
Total max power	12.8 Kw

Chiller consumption	7.67 Kw
---------------------	---------

# Energy Balance of the System

Total potential 80 panels x 160 W = 12,800 W;

Energy island, the chiller electric motor, consumption is 7.67 kW;

Virtual over dimensioning is to cover start up motor pick, and also to put the engine into motion when the sky is not utterly clear.

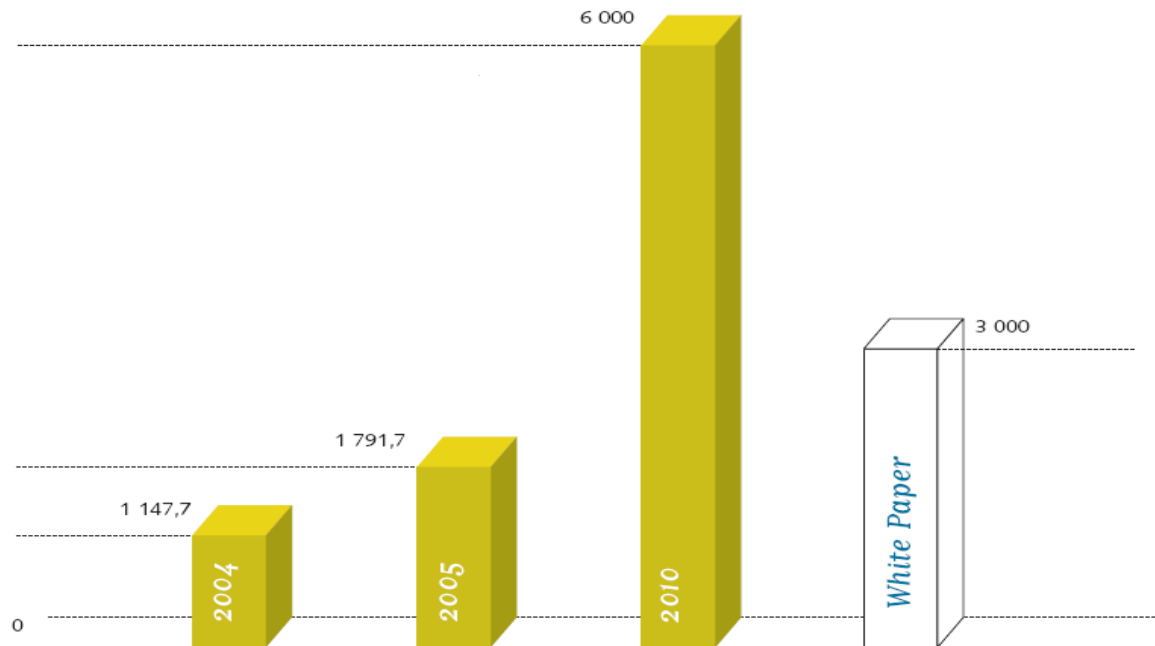
The meter installed is for monitoring purposes.

If monitoring results indicate such a possibility, the energy island may be extended.

# PV in the European Union

Directive 2001/77/EC regulates electricity production and use of renewable energy sources. According green paper on energy supply, and white paper objectives it is expected that photovoltaic electricity production in EU will raise from 52 MW in 1995 to 2000 MW in the 2010.

It is already clear that this target will be significantly trounced.



## Installed photovoltaic capacities in the European Union (in MWp)

	2004 Cumulated power			2005 Cumulated power		
	On-grid	Off-grid	Total	On-grid	Off-grid	Total
Germany	908,000	26,000	934,000	1 508,000	29,000	1 537,000
Spain	23,900	13,400	37,300	37,600	14,200	51,800
Netherlands	44,310	4,769	49,079	45,857	4,919	50,776
Italy	18,700	12,000	30,700	25,200	12,300	37,500
France	8,000	18,300	26,300	12,967	20,076	33,043
Luxembourg	23,200	0,000	23,200	23,266	0,000	23,266
Austria	16,493	2,687	19,180	21,126	2,895	24,021
United Kingdom	7,386	0,778	8,164	9,786	0,878	10,664
Greece	1,257	3,288	4,544	1,412	4,032	5,444
Sweden	0,194	3,672	3,866	0,254	3,983	4,237
Finland	0,193	3,509	3,702	0,223	3,779	4,002
Portugal	0,500	2,200	2,700	0,600	2,700	3,300
Denmark	2,035	0,255	2,290	2,335	0,295	2,630
Belgium	1,210	0,053	1,263	1,712	0,053	1,765
Cyprus	0,255	0,090	0,345	0,490	0,135	0,625
Czech Republic	0,269	0,147	0,416	0,380	0,150	0,530
Poland	0,069	0,165	0,234	0,085	0,232	0,317
Ireland	0,000	0,100	0,100	0,000	0,300	0,300
Slovenia	0,006	0,094	0,100	0,118	0,098	0,216
Hungary	0,055	0,083	0,138	0,085	0,091	0,176
Slovakia	0,000	0,060	0,060	0,000	0,060	0,060
Lithuania	0,000	0,017	0,017	0,000	0,017	0,017
Malta	0,006	0,000	0,006	0,015	0,000	0,015
Latvia	0,000	0,004	0,004	0,000	0,005	0,005
Estonia	0,000	0,002	0,002	0,000	0,003	0,003
<b>Total EU</b>	<b>1 056,038</b>	<b>91,673</b>	<b>1 147,710</b>	<b>1 691,511</b>	<b>100,201</b>	<b>1 791,712</b>

Source: EurObserv'ER 2006

# CONCLUSION

Kyoto protocol has been endorsed by the Republic of Macedonia. Economic instruments for emission targets are still insufficient, although potentials are on place.

Skopje area can utilise some 1500 kWh/m<sup>2</sup> of solar radiation per year.

According First National Communication, 1 kWh of electric energy generates 0.25 kg of green house gasses.

Generation of electric power for the chiller at the ZELS Headquarters shall prevent emission of some 2,100 kg GHG per year.

By Aleksa Tomovski  
Skopje, 23. March 2007



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