

ProSTO Meeting

“The Bcn STO: 10 years experience”

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- Solar Radiation in Spain and Barcelona
- Barcelona Solar Thermal Ordinance
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Barcelona

- Capital of Catalonia
- Surface: 100,96 km²
 - buildings 55.89%
 - roads 16.57%
 - green spaces 9.42%
 - forests 18.12%
- Located in the Mediterranean coast
- Inhabitants: 1,593,075 (15,779 inh/km²)
- Metropolitan area: >3,000,000 inhabitants



Bcn STO

- In July 1999, Barcelona City Council adopted a local Ordinance forcing all the new buildings to be built (or integrally retrofitted) into the city, to have solar thermal systems.
- Since August 1st. 2000 it is mandatory.

Bcn STO: Why?

- In 1995, as a city councillor, I asked myself one question:
- Why the solar energy was not widely used in Barcelona ?
 - We have the resource: Sun
 - We have needs: heating sanitary water
 - We have surface available in the city

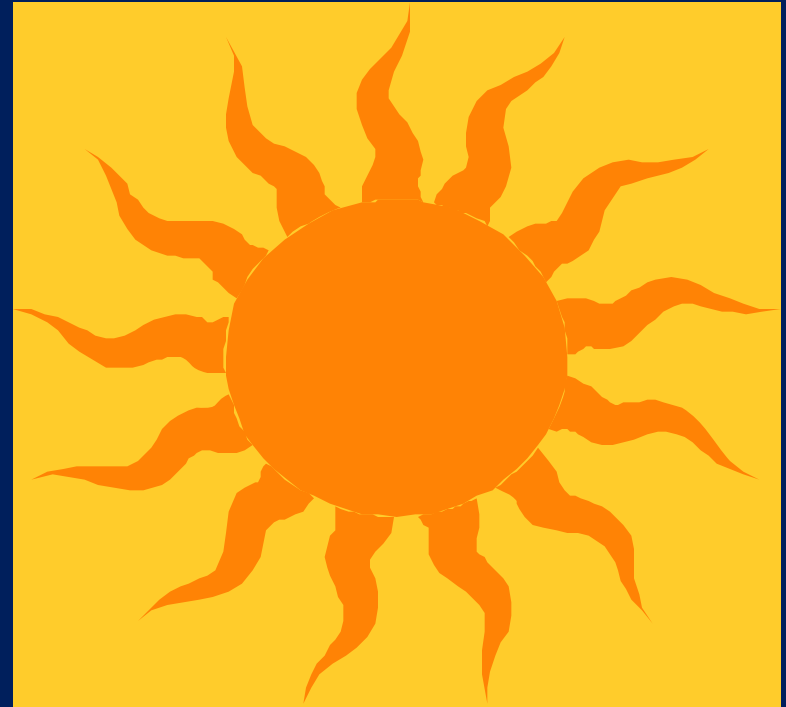
Spain solar radiation: the resource

From 3.2 to 5.2 kWh/m².day



Spain solar radiation: the resource

- In a normal year, Spain receives from Sun:
 - 525 times the PEC
 - 800 times the FEC



Bcn STO: the resource

- The Sun in Barcelona
 - Sunshine hours: 2,351 hours/year
 - Solar radiation: 14.5 MJ/m².day 1,470 kWh/m².year
- The surface of Barcelona municipality receives
 - 524.35 PJ/year = 145.65 TWh/year
 - 10 times the energy consumption of the city
 - 28 times the electricity consumption of the city

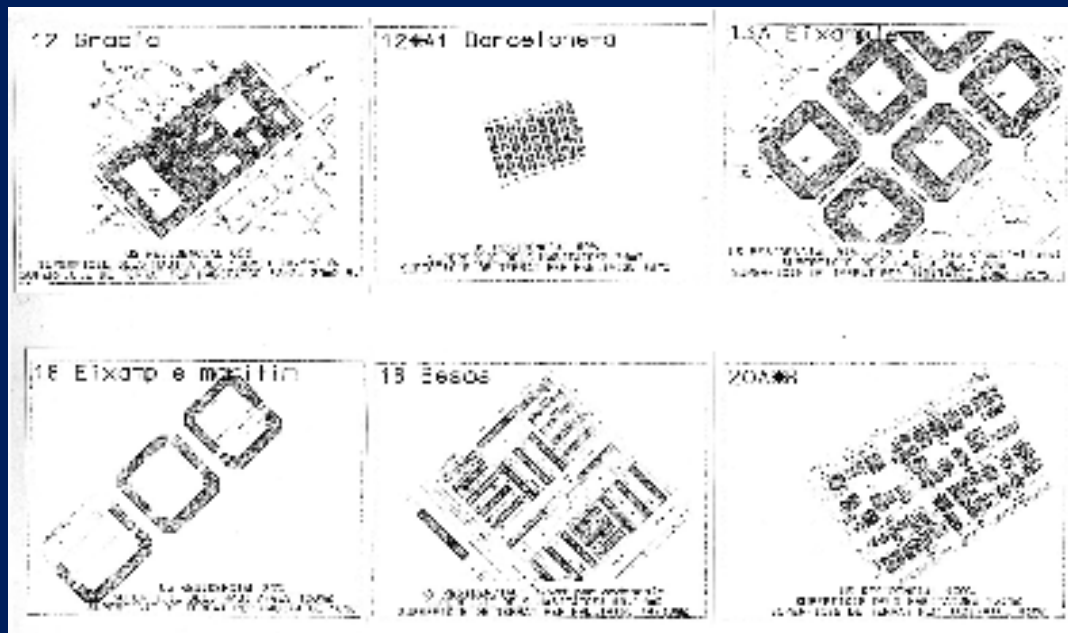
Bcn STO: the needs

- The families living in Barcelona use for sanitary water heating:
 - natural gas: 558 GWh/year
 - electricity: 408 GWh/year
- The result:
 - 200,000 tn CO₂/year
 - $3.8 * 10^{12}$ Bq of radioactivity/year
 - 1,400 kg/year of radioactive wastes



Bcn STO: the available space

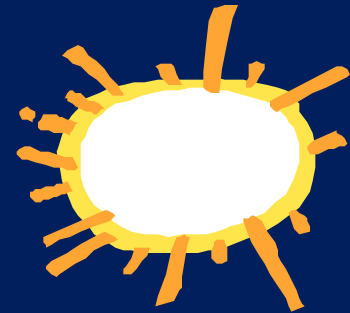
- The buildings in Barcelona
 - mainly have flat terraces on top



between
14 and 43 m²
of terrace per
apartment

Bcn STO: to heat all sanitary water

- To heat all the domestic sanitary water the city uses with the Sun
 - it will be necessary to cover
 - 1.6 km² of surface
 - 1 - 2 % of municipal surface or
 - 2 - 3 % of built surface
 - It represents 1.07 m²/inhabitant
 - 2.4 m²/apartment
 - 20.15 m²/building (residential)



Bcn STO: the path

- **June 1997:** The Sustainable City Councillor's Office translated to Catalan language the Berlin Solar Collector Ordinance Draft. Information to the Mayor.



Bcn STO: the path

- January 1998: The Barcelona Civic Table on Energy adopted a resolution to work on developing a Solar Thermal Ordinance proposal for the city.

Bcn STO: the path

- **The Civic Table on Energy** (municipal body)
 - created in 1994 as a result of a public hearing on environment and energy
 - involved local officials/staff from different departments of the city council with a local representative of a NGO energy platform Barcelona Saves Energy ('Barcelona Estalvia Energia - BEE')
 - **main objective: to build complicities on energy** from all people in different departments of the city council.

Bcn STO: tha path

- 1998: discussion of the Draft of the Barcelona Solar Energy Ordinance with all interested parties:
 - Sceptics said: 'a city like Barcelona has no power to implement a local law on solar energy'
 - The supporters: 'we will proceed and see what will happen'

Bcn STO: the path

- February 1999: the Plenary Session of the City Council adopted the initial text of the Barcelona Solar Ordinance.
- Feb-May 1999: open time period for people/organisations to present written proposals to modify the initial text.

Bcn STO: the path

- July 1999: the Plenary Session of the City Council adopted by unanimity the Barcelona Solar Ordinance.
- 1st August 2000: enforcement of the Barcelona Solar Ordinance

Bcn STO: the results

	n° of buildings	Residential m2	Hotels m2	Sports m2	Hospitals m2	Other m2	Total m2		
1995							700		
1998							1.181		
1999							1.350		
Jul. 2000							1.632		
Ago. 2001							5.233	(*)	
Dic. 2001							6.321	(*)	
Jun. 2002		6.426	2.115	1.458	349	421	10.769	(*)	
Dic. 2002	159	8.130	2.072	1.822	546	1.458	14.028	(*)	
Dic. 2003	232	12.821	2.417	2.126	546	1.684	19.593	(*)	
15/12/2004	327	14.764	5.641	2.200	549	1.378	24.532	(*)	
Dic. 2005	427	19.451	6.150	2.545	957	1.975	31.078	(*)	
Dic. 2006	597	26.923	6.931	2.821	1.100	2.320	40.095	(*)	
Dic. 2007	929	36.094	7.781	3.072	1.262	3.227	51.436	(*)	
	(*) not all already built								
end 2006							23.719	in operation	

Bcn STO: the results

- Evolution of the Solar thermal market in the city of Barcelona.

– July 1995:	700 m ²	0,5 MW
– July 2000:	1,632 m ²	1.1 MW
– Dec. 2005:	34,614 m ²	24.2 MW
– Dec. 2006:	40,095 m ²	28.1 MW
– Dec. 2007:	51,436 m ²	36.0 MW

- 1995-2000: *2.3
- 2000-2005: *21.2
- 2000-2007: *31.5

Bcn STO: a solar city?

- The city opened the door to the Sun

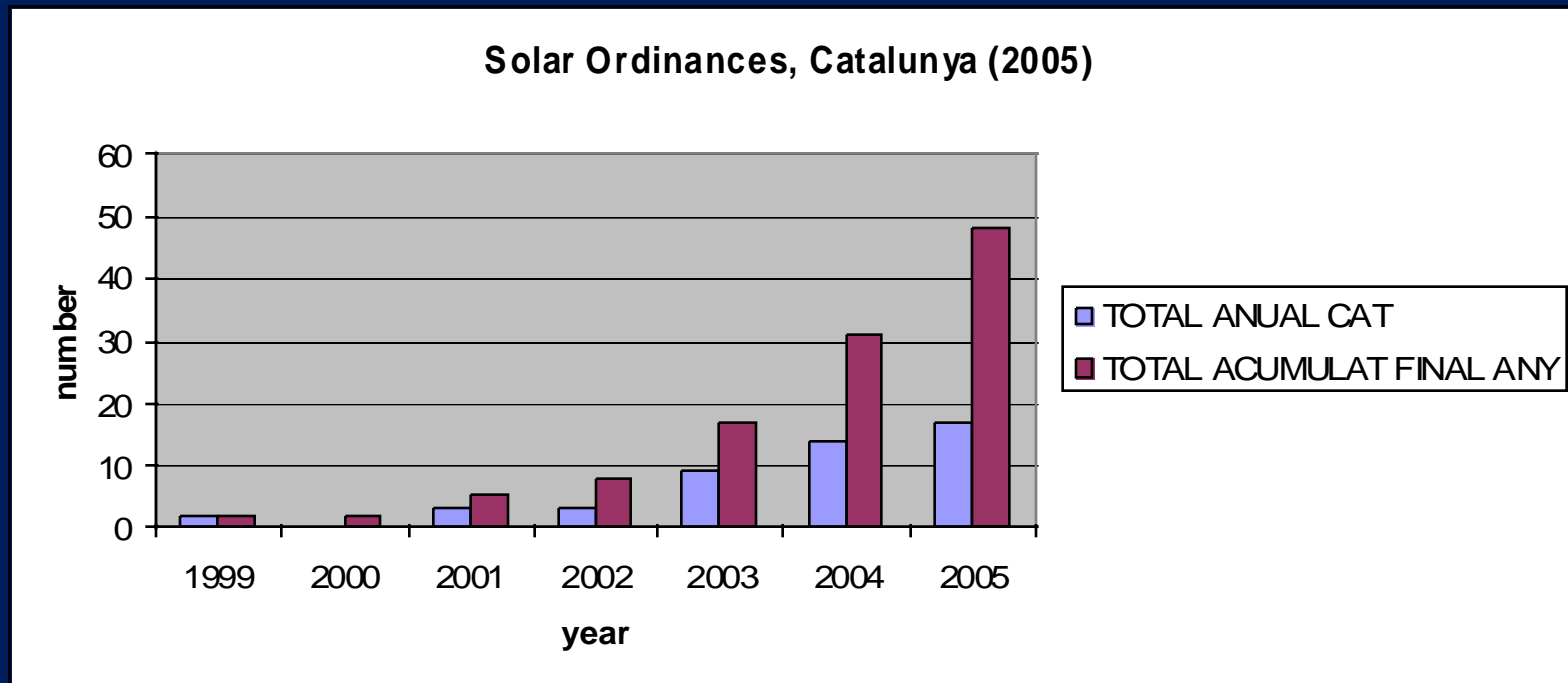


Bcn STO: a solar city?



STO in Catalonia

- In Catalonia (end 2006)
 - Adopted by **52 municipalities**



A STO for Catalonia

- All the work done by these pioneer municipalities opened the door to have a **Solar Ordinance for all Catalonia region**:
 - February 2006: the Catalan Government enacted a Decree on ecoefficiency in buildings
 - All the buildings consuming more than 50 liters/day of hot water (60°C) must have a solar heating system to cover between 40 and 70 % depending of the climatic zones

STO in Spain

- In **Spain** (end 2005): **24**
 - Andalucía (6+2): Sevilla, Granada, Malaga (p), Marbella (p), Estepona , Fuengirola, Rota, Puebla de Don Fadrique
 - Valencia Country (6): Valencia, Gandia, Onil, Silla, Montserrat, Castell de Castells
 - Madrid (5): Madrid, Getafe, Rivas-Vaciamadrid, Soto del Real, San Sebastian de los Reyes
 - Burgos, Ceuta, Eivissa, Mieres

A Spanish STO

- March 17th. 2006: the Spanish Council of Ministers adopted the new Technical Building Code (CTE – Código Técnico de la Edificación)
 - It is one of the three documents for implementing European Directive 2002/91/CE on Energy Efficiency on Buildings

A Spanish STO

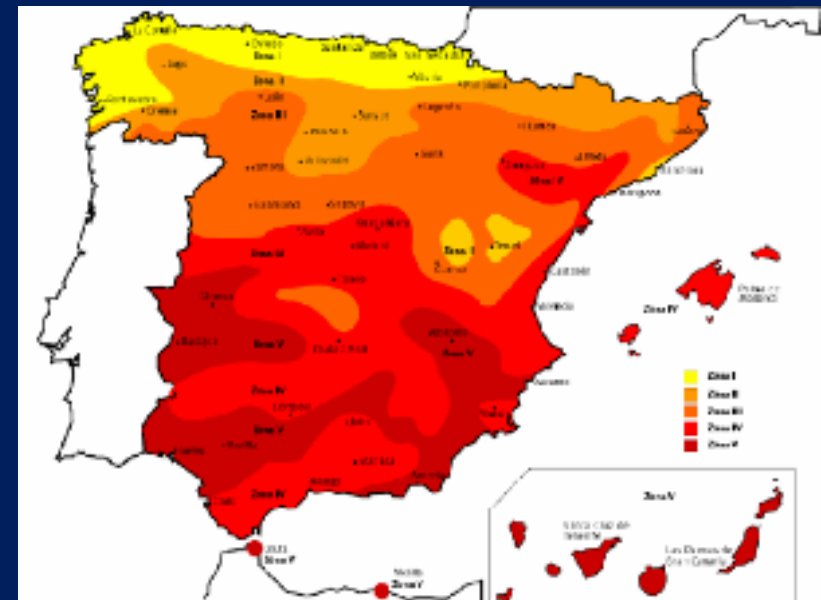
- The CTE establishes basic quality requirements for buildings:
 - Structural security
 - Fire security
 - Security of use
 - Hygiene, health and environmental protection
 - **Energy savings** and thermal isolation

A Spanish STO

- The CTE defines and develops five basic requirements for energy savings:
 - HE1: limitation of energy demand
 - HE2: energy efficiency of thermal installations
 - HE3: energy efficiency of lighting
 - **HE4: minimal Solar contribution for sanitary hot water**
 - **HE5: minimal PV contribution for electricity**

A Spanish STO

- HE4: According with the climate zone and the energy demand, the minimal Solar contribution ranges between 30 – 70 %



Bcn STO: showing the way

- It is a clear case that shows how **the 'impossible' becomes a reality !**
- Not only in one big city
- But also in other big and small cities in Catalonia and in Spain
- And perhaps in other countries

Bcn STO: the lessons

Three conditions must meet to have success:

- political will: commitment of elected councillors
- technical ability: committed & skilled technicians
- people's involvement: facilitate public participation

PARTNERSHIP

Bcn STO: the lessons

- To implement policies the municipality made use of **two key instruments**:
 - **the Civic Table on Energy** ('Taula Cívica de l'Energia')
 - **the Local Energy Agency** ('BarnaGEL - Barcelona Grup de Energia Local').

Bcn STO: the lessons

- **The local Energy Agency BarnaGEL** (independent)
 - EU-PERU (now SAVE) project, 1994
 - Main proposers: **Leicester City Council and Metropolitan Area of Barcelona**
 - Other local Partners: **Ecoserveis** (local NGO on energy & environment), **ICAEN** (Regional Energy Agency of Catalonia) and **UAB** (Autonomous University of Barcelona)
 - **Main objective: to build complicities between local actors in order to develop energy projects**
 - In 2000 the municipality decided not support anymore BarnaGEL, but it created a new energy agency directly dependent from City Council

Bcn STO: the lessons

- The **results** of the work (1995 -1999)
 - an EE&RE demo caravan
 - the Sustainable City Resources Centre
 - doubling the solar thermal collector area
 - solar thermal: from 700 to 1,350 m²
 - 29 times more solar PV collector area
 - solar PV: from 80 to 2,400 m²
 - the Solar Law (Solar Ordinance)

Bcn STO: the lessons

- **The solar/wind/efficient caravan:**

Equipment being used in Barcelona city and around Barcelona province's villages and cities to show in real operation how a house could run with renewables and energy efficient appliances



Bcn STO: the lessons

- **The Sustainable City Resources Centre:**

A municipal fixed facility equipped with a permanent exhibition with energy efficient devices and appliances and renewable energy devices. It's open to the public, free of charge, since May 1999.



Bcn STO: the lessons

- Solar Thermal Water Systems in all the existing municipal sports facilities.



Bcn STO: the lessons

- A PV Solar Roof at the two main buildings of the City Hall

EC Thermie
Project

1,000 m²,

100 kWp



Bcn STO: the lessons

- Biogas valorisation from organic fraction of wastes
 - Garraf Landfill
 - 3 Methanisation Plants (75,000 tn each):
 - the first one now in operation
 - two more in construction



Bcn STO: the lessons

- All that have not been possible without a lot of complicities, ranging from companies to NGOs.



Bcn STO: the first lesson

- The Bcn STO has been a process:
 - involving many different actors
 - involving many different actions
- We can say that it has been the culmination of a process

Bcn STO: the lessons

- Other lessons:
 - If someone wants to adopt a STO
 - Look for a municipality acting as a model of something (the others will follow)
 - Look for a team of committed people involving politicians, technicians and citizens
 - Write a clear text with no uncertainty
 - Work to create an independent body for managing and monitoring the process
 - Think for a way to incorporate to the STO all the existing buildings (because they are the main stock of city buildings and nobody addresses the problem)

**Thanks
and good luck**

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