
BARCELONA CLEAN ENERGY TOUR



Ajuntament de Barcelona



**Discover
why Barcelona is
becoming the
Economic and
Entrepreneurship
Hub of the
Mediterranean and
a Smart City leader
in Clean Energy**





The Tour will visit one of the most dynamic and interesting areas of the city of Barcelona: **22@Barcelona, the Innovation District**, and the **Forum Area**.

It will cover the following Key Points of Interest:

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TMB CLEAN PUBLIC BUSES

Transports Metropolitans de Barcelona (TMB) is the main public transport company in Barcelona and its metropolitan area, and it manages buses and metro.

Currently, TMB has a large number of buses powered by natural gas (33% of its fleet). It is also making a commitment to the technologies of hybrid vehicles. This commitment is reflected in both the acquisition of new hybrid vehicles and the conversion of diesel vehicles into hybrid vehicles. TMB plans to produce 80 hybrid vehicles (diesel-electric) before 2012, which will represent a significant reduction of emissions (NOx, particulate matter, CO2).

Furthermore, TMB and the company Gas Natural are working together to transform a gas vehicle into a hybrid one by the end of October 2011.

The transport company is also installing filters for particulate matter and NOx in over 500 vehicles. With all these measures by the end of 2012, TMB will have one of the cleanest surface public transport fleets in Europe.



22@

BARCELONA,
THE
INNOVATION
DISTRICT



The 22@Barcelona project transforms two hundred hectares of industrial land into an innovative district offering modern spaces for the strategic **concentration of intensive knowledge-based activities**. This initiative is also a project of urban, economic and social refurbishment to create a high-quality environment for working and living. It is the most important project of urban transformation in the city of Barcelona in recent years, and one of the most ambitious in Europe of these characteristics, with a high real estate potential and a 180 million Euros public investment in the infrastructure plan.

The coexistence of innovative and dynamic companies with local district ones -shopping, small workshops, service sector- configure a rich productive fabric. The presence of enterprises allows the creation of **cluster areas** in several fields of knowledge in which Barcelona is susceptible to obtain international leadership, by means of the concentration in the area of companies, public institutions and scientific and technologic centres of reference. The strategic sectors are: Media, Information and Communication Technologies (ICT), Medical Technologies (MedTech), Design and **Energy**. **Companies in the Energy cluster** already present in the 22@ District are: **Endesa Enel, Alstom Ecotècnica, Schneider Electric, Gas Natural Fenosa**, etc.



01



22@URBAN LAB

IMPLEMENTING SMART CITY SOLUTIONS

Barcelona has made a commitment to develop digital infrastructures and to apply technology for more intelligent city management, becoming a reference in Europe as a **Smart and Innovative City**. In this context, the 22@Urban Lab project was launched to foster the use of the city as an urban laboratory, a testing ground for innovative solutions for companies seeking to implement tests in any field: urban planning, education, mobility, etc.

The aim of this project is to provide companies that are developing innovative projects and that are in the pre-commercialisation stage with the possibility of testing them in the district through pilot trials.

Major pilot projects in the 22@ Urban Lab are:

- Implementation of 12 outdoor **public street lighting points Eco Digital with LED technology** and fitted with sensors, GSM aerials, Wifi Mesh access point and webcam.
 - Rollout of the infrastructure for installing **charging stations for electric vehicles**.
 - Pilot program to **read gas, electricity and water meters telematically** in more than 150 housing units.
 - **Traffic lights adapted for blind people** at all crossroads.
 - **Fibre optic networks (FTTH)** inside homes to multiply the bandwidth.
 - Etc.
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02





AGBAR TOWER

EXAMPLE OF GREEN ARCHITECTURE

It is one of the latest architectural icons of Barcelona's skyline. It houses the headquarters of the AGBAR Group (Barcelona water supply company). Built in 2005, the tower is the work of the French architect Jean Nouvel. It is 142 metres height and has 31 floors with plenty of light, no columns dividing its useful space, and 3 technical floors, with control the building's management systems.

La Torre Agbar was awarded of the **GreenBuilding signet** by the European Commission, which recognizes those non-residential buildings that respect the environment and exceed legal energy efficiency requirements.

A very important part of the tower is a **double skin**. The inner skin is formed by a concrete wall with openings and coated with insulating material, finished with corrugated aluminum plates. The outer skin consists of steel frame and glass slats oriented to minimize solar radiation on the façade.

It has 4,200 **LED luminous devices** that allow generation of luminous images in the façade. In addition, it has **temperature sensors** in the outside of the tower that regulate the opening and closing of the glass shutters of the façade of the building, reducing the consumption of energy for air conditioning.

03



SILKEN HOTEL DIAGONAL BARCELONA

EXAMPLE OF SOLAR THERMAL INSTALLATION ARCHITECTURE

Hotel Diagonal Barcelona (Silken Group) was opened in 2004. It is situated along Avinguda Diagonal and just a stone's throw from the Agbar Tower. The project was carried out by architects Juli Capella and Miquel García who knew it would be impossible to compete with the imposing Agbar Tower. Therefore they decided to construct the hotel as a sort of background screen. The hotel has a **solar thermal** installation on the roof and it is a good example of architectural integration of renewable energy systems.

The city of Barcelona has a local regulation, the **Solar Thermal Ordinance**, that regulates the introduction of active systems to capture and use low temperature solar energy in order to produce domestic hot water in buildings and constructions, regardless of whether they are public or privately owned.

The Solar Thermal Ordinance of Barcelona came into force in 2000 and affects newly built, rehabilitated and fully reformed buildings and those seeking to implement a change of use, with a forecasted large consumption of hot water. The monitoring and assessment of the development of the Ordinance is done by the **Barcelona Energy Agency**.

04



MEDIATIC (MEDIA-ICT) BUILDING

EXAMPLE OF GREEN ARCHITECTURE

A highly personal creation of the Cloud-9 architect's office, led by **Enric Ruiz-Geli**, the new building aims to establish sustainable, economic and energy-generating architecture, conceived using the latest technology. Officially inaugurated in September 2010, the MEDIA-TIC building is designed to be a communications hub and meeting point for businesses and institutions in the world of information and communication technologies (ICTs) as well as for the media and audio-visual sectors.

The building is in the shape of a cube and formed by large iron beams covered in a **plastic coating of inflatable bubbles**, which offer glimpses of the fluorescent structure of the building. The attractive covering also has a functional utility as a way of **regulating light and temperature**, primarily preventing 114 tons of CO2 a year from escaping from the building, and offering a 20% saving on climate control.

Every facade of the Media-TIC is different: from the outside, they reveal parts of their interior spaces and give a diverse plasticity, while from the inside they offer spectacular views. The translucent and innovative covering, **ETFE** (Ethylene Tetrafluor Ethylene), recently approved as a construction material, is in itself an innovation in Spanish building: it acts as an external covering and a mobile sunscreen that helps light to penetrate and affords heat savings. The ETFE skin is activated using pneumatic mechanisms thanks to **"luxometer" sensors** that automatically and independently activate the chamber inflation and deflation devices according to how much solar energy there is. These luxometers are energy independent.

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LIVE BARCELONA PROJECT

LOGISTICS FOR THE IMPLEMENTATION OF THE ELECTRIC VEHICLE

LIVE Barcelona (**Logistics for the Implementation of the Electric Vehicle**) is an open public-private platform that promotes the use of electric vehicles in the city as an opportunity to position Barcelona as a centre of innovation in electric mobility on a worldwide scale. It is promoted by the Government of Catalonia, Barcelona City Council, the Spanish Government, SEAT, ENDESA and SIEMENS.

Today the city has more than 240 **charge stations**. The goal is that every citizen has a station accessible within 5 minutes from home. This public network of recharging points is an example of an innovative infrastructure and is creating new business opportunities. It responds to an open model: some vendors implement different technologies. The city is developing a pilot project on a large scale where you can test and develop new technologies.

In carrer Lope de Vega, 125 (close to the crossing with Av. Diagonal) there is the first Fast Charge Station for electric vehicles installed in Spain, operated by Endesa Cepsa. Pure electric vehicles already in the market, such as Nissan Leaf, can be charged in this station in less than 10 minutes.



www.livebarcelona.cat
www.nissan.es/leaf

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HOTEL ME

A MEMBER OF MOBEC HOTELS: ELECTRIC MOTORBIKES FOR TOURISTS

A Biosphere Hotel and a Responsible Tourism Establishment, Hotel ME was inaugurated in 2008. This tower hotel, reaching 120 metres high, is one of the tallest buildings of the Barcelona skyline. It is the work of French architect Dominique Perrault.

Hotel ME participates in a new initiative, called **Mobec Hotels**, a mobility sharing system for tourists and city visitors with electric motorbikes. The project is driven by the Barcelona Hotel Association and Barcelona City Council. With this service, a network of available **electric motorbikes** will be offered in different hotels of Barcelona in order to reduce pollution and noise in the city. In front of the hotel there is a Mobecpoint (Smart Motorbike Charge Station).

www.mobecpoint.com
www.me-barcelona.com

07



FORUM AREA

EXTENSIVE REGENERATION PROJECT WITH CLEAN ENERGY INFRASTRUCTURES

Barcelona's organisation of the **Universal Forum of Cultures 2004** – an event promoting global dialogue on contemporary cultural and social challenges – involved the urban development of the coastal area next to the River Besòs and the arrival of Diagonal Avenue to the sea.

A new suburban centre made up of major buildings was constructed, a veritable city centre alongside an area occupied by a sewage treatment plant, an incinerator plant and a power station, infrastructure that was transformed into a **combined cycle plant and the new Besòs waste treatment plant**.

The architects José Antonio Martínez Lapeña and Elías Torres Tur were charged with design of the **Forum Esplanade**, and they received various awards for their work, the jury of which valued highly the inherent risk of the proposal and the recovery of one of the city's marginal areas.

From this huge 14 hectare surface the **Forum Building** and the **Convention Centre (CCIB)** rose up, and it was here that the event's open-air activities took place. It covers part of the coastal ring-road (Ronda del Litoral) where the height of the Diagonal prolongation rises 17 metres to clear the road, then gently falling until it reaches the sea.

Coherent with the Forum's principle of **sustainability**, adaption and the reuse of infrastructure, the Esplanade is a veritable technical floor under which pass drains, electricity and water connections and telephone wiring. Chimneys emerge at some points, as do other buildings that form part of the treatment plant on the lower level, elements that are employed to provide visitors with shade. Other extremes (or fingers) of the Esplanade extend until culminating in cliffs overlooking areas of the marina.

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b_TEC FOUNDATION

LEADING THE DIAGONAL- BESÒS CAMPUS

b_TEC strives to create a **cutting-edge university campus** in an attempt to turn knowledge into economic activity more efficiently and with a strong commitment to the local community.

The Diagonal-Besòs Campus is structured as a **research park** comprised of three parks in one: the **Energy Park**, the **Water Park** and the **Mobility Park**. As a result, it serves as the backbone of the project as a whole and is essential for the economic development of the sector.

The park aims to enhance the quality of university teaching, enriching the knowledge developed and providing this knowledge to businesses in the energy, water and mobility sectors.

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CATALONIA ENERGY EFFICIENCY CLUSTER

PUBLIC-PRIVATE SECTOR PLATFORM

The Clúster d'Eficiència Energètica de Catalunya (CEEC) is an organisation that seeks to promote the field of energy efficiency by facilitating collaboration between member companies and organisations from the technology, research, institutional, regulatory, industrial, media and business sectors.

The CEEC was set up as a non-profit business group comprising companies that, as part of their business, supply, promote or develop energy-efficiency products and services for the following sectors: building, mobility, public services, industry and training.

The Cluster encourages collaboration between member companies and organisations in order to reap the maximum benefit from their synergies.



www.clustereficiencia.org

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IREC

CATALONIA INSTITUTE FOR ENERGY RESEARCH

The **Catalonia Institute for Energy Research (IREC** in Catalan), created in 2008, is specialised in technological research and development activities related to saving energy, energy efficiency and renewable energies. More specifically, it has research lines based on technologies related to micro networks, electric vehicles, energy storage, building efficiency, bioenergy and biofuels, and offshore wind energy.

The Institute also has an electrical engineering research area and another devoted to the research, design and characterisation of materials for energy. IREC will gradually continue to develop until 2014, by which time it will have 160 highly qualified researchers.



www.irec.cat

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DISTRICLIMA

HEATING AND COOLING SYSTEM

Districtlima was set up in 2002 to implement, for the first time in Spain, a district **heating and cooling network** for use in heating, air conditioning and sanitary hot water. The project was initially located in an urban remodelled area of Barcelona: Forum.

The project encompassed the design, construction and later use, over a 25-year concession, of the Forum's production station and energy distribution network. In 2005, a second stage started with the amplification of the network to the 22@ Innovation District.

Main environmental advantages of Districtlima: Residual energy sources are generally used (urban solid waste or others) in high performance energy equipment, thus minimising fossil origin primary energy consumption; reduction of greenhouse effect gas emission and significant reduction of refrigerant losses into the atmosphere compared with conventional systems. Districtlima prevented 10,100t of CO₂ emissions and reduced the use of fossil fuels by 56% in 2010.

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FÒRUM SOLAR PHOTOVOLTAIC PLANT

A SYMBOL OF LOCAL ENVIRONMENTALLY
FRIENDLY POLICIES

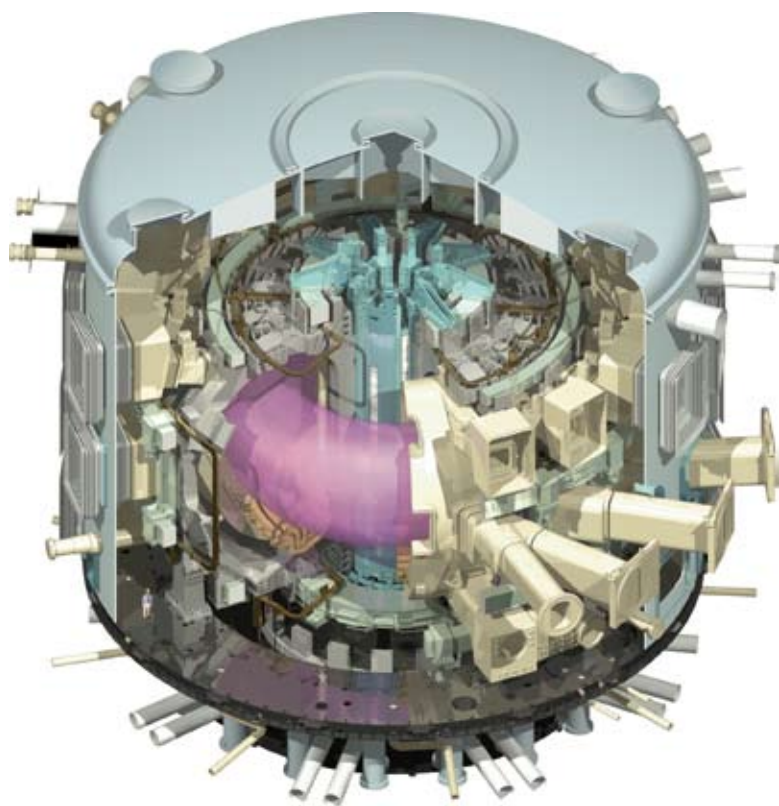
The **Forum Solar Photovoltaic Plant** was inaugurated in 2004 and installed on the prolongation of the Forum Esplanade, a bit further out towards the sea, at the entrance to the new Mariana. The installation provided a good deal of the electrical energy and became established as a **monument to ecological commitment**.

It is a south-facing, 4,500 m² oblique surface mounted on four reinforced concrete pillars; a huge **pergola** receives the sun's radiation and simultaneously produces energy and shade. The power of the solar panel is 1,100 kWp and it is based on silicon monocrystalline cells. In the area there is a sailing school also covered with solar panels.

In 2009, the City of Barcelona through its **Barcelona Energy Agency** assigned the rights for the operation and maintenance of the solar panel to TERSA, among other solar infrastructures. TERSA is a public company specialized in selecting, processing, control, management and recovery of municipal solid waste, with the commitment and assurance of continuous improvement in environmental management activities.

www.teresa.com
www.barcelonaenergia.cat

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FUSION FOR ENERGY (F4E)

EUROPEAN ITER CONTRACTING AUTHORITY

Fusion for Energy (F4E) is the European Union's Joint Undertaking for **ITER** and the Development of **Fusion Energy**. It was established for a period of 35 years, from April 2007 on, and it is located in Barcelona.

F4E is responsible for providing Europe's contribution to ITER, the world's largest scientific partnership that aims to demonstrate fusion as a viable and sustainable source of energy, safe and environmentally friendly. ITER brings together 7 parties that represent half of the world's population – the EU, Russia, Japan, China, India, South Korea and the United States.

F4E will also contribute towards the construction of demonstration fusion reactors. ITER is currently constructed in Europe (near Cadarache in South-eastern France).



<http://fusionforenergy.europa.eu>

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BLOOD & HUMAN TISSUE BANK

EXAMPLE OF GREEN ARCHITECTURE

The Blood & Human Tissue Bank is a public company whose mission is to manage and administer the donation, transfusion and analysis of blood and blood plasma, as well as acting as a centre for obtaining and processing human tissues. The new corporate headquarters is a project designed by architects Joan Sabaté and Horacio Espeche Sotailo (SaAS Sabaté associats) and follows strict energy-saving criteria.

The building uses specific strategies for hot climates, like the Mediterranean, where the primary problem is excess heat. The **thick façade** and high levels of **thermal insulation** act as an exterior shield against overheating. The size of windows has been limited and their solar protection has been assured by design. The air conditioning equipment allows free cooling, natural cooling with cooler air from outside the building when available, heat exchangers allows 100% heat recovery during renovation of air in the building. The **heating and cooling** system is also innovative. It is based on the use of centrifugal compressors with floating turbines, condensed by highly energy efficient adiabatic chillers. **Solar thermal and photovoltaic systems** integrated in the pergola over the roof of the building exploit the solar radiation incident on the roof to help meet the domestic hot water demand and to generate electricity.

The sum of these strategies has enabled the building to obtain an **"A" grade Energy Efficiency Certification**, with an overall heating, ventilation and air conditioning (HVAC) saving of 72% (84% in cooling) compared to a conventional building designed for the same use. This high level of performance is also very cost effective. For all these reasons, the building has been acclaimed as one of the most **sustainable properties** in Europe.

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BICING

BARCELONA'S BIKE PUBLIC URBAN TRANSPORT

Bicing is the name of a **community bicycle programme** of the city of Barcelona. It aims to make available to citizens bicycles for **commuting within the city**, with an economical and sustainable transportation mode. Its purpose is to facilitate short daily trips, but not for tourism or recreational use.

Users must acquire a yearly membership. The system has a network of stations to lend and return the bicycles distributed throughout the city. Most stations are situated next to public transport stops or public parking to facilitate and promote intermodality.

www.bicing.cat



Barcelon**a**ctiva

bcn.cat/barcelonabusiness