PHOTOVOLTAIC SOLAR ENERGY:
STATUS, CASES AND OPPORTUNITIES IN IBIZA

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Cover photo:
Self-consumption installation on Villa Urania, Ajuntament de Barcelona, Barcelona. Peak power of 19,125 kWp.
Source: Image and data provided by the installer, Effective Energy

EXECUTIVE SUMMARY

Photovoltaic (PV) solar energy is possible and desirable for Ibiza. The technologies are mature and prove to be profitable, the climate is optimal, and legislation, despite being complex and restrictive, provides an array of opportunities for individuals, companies, organizations and public administrations to take a step and push forward the opportunities for clean, free and sustainable renewable energy.

There are still **significant barriers** (an important one being the psychological aspects due to the legal uncertainties caused by the Spanish Government) but there are also **interesting opportunities** to develop photovoltaic solar energy in Ibiza.

- The current law provides a stable legal framework both for solar farms and Self-Consumption facilities at houses or businesses.
- With current prices of solar energy installations and electricity fees, the investment in PV energy is cost-efficient (will be returned between 6 to 11 years)
- The famous “sun tax” (back-up toll) does not, at present, apply to Self-Consumption facilities in Ibiza. Even if the back-up toll was applied later, it is not a significant obstacle for investment profitability.
- The Balearic Government is promoting solar PV development with subsidies.
- PV solar energy development brings not only environmental and energy improvements, but also a new economic activity.

Together with renewable electricity production possibilities, a shift from conventional mobility to **electric mobility** is an important aspect in achieving this sustainable energy model, since consumption from transportation represents about 40% of the total energy consumed on the island. Electric mobility has growth potential in Ibiza:

- The island's size makes it ideal for electric vehicles, which now have a range of 200-250 km.
- The Balearic Government, Ibiza’s Consell and five municipalities are promoting free recharging points at their buildings and working together for its development.
- Several private companies are installing recharging points for electric vehicles at homes and offices.
- The optimal option is to combine recharging points with the installation of a PV solar system of Self-Consumption.

By 2050, the Balearic Government aims to achieve an energy model with **zero CO2 emissions** based on renewable energies. Ibiza’s local authorities are also promoting renewable energy production. It is a good moment for **business and citizens**, in their various capacities and roles, to join the development of PV solar energy and electric mobility in Ibiza.

1. INTRODUCTION AND OBJECTIVES

Solar energy is a non-polluting free and endless energy resource.

Photovoltaic (PV) solar energy converts solar energy into electric power, and electricity is an energy carrier which serves to meet all energy needs.

Technology costs for photovoltaic energy production have declined drastically in recent years to approximately one tenth of what they originally were.

Ibiza has many sunshine hours and high levels of solar radiation in comparison to other European countries where this technology is already abundant and highly developed.

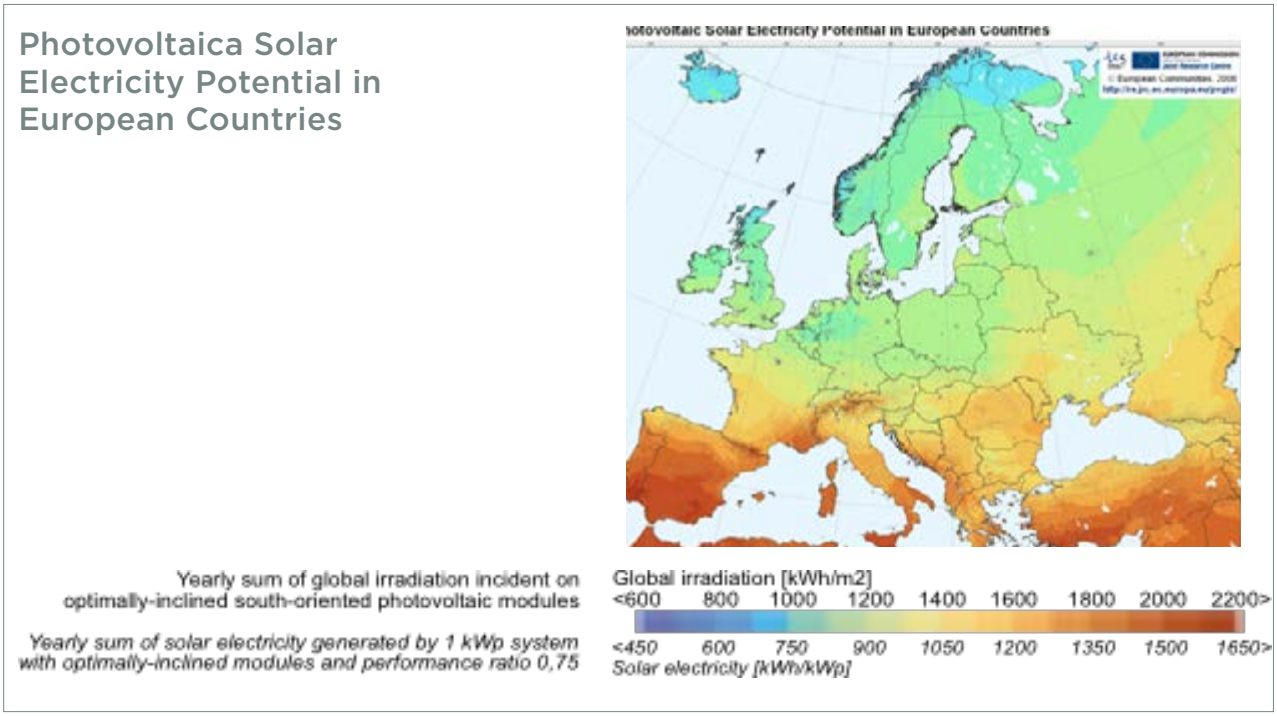


Figure 1.- Map of Horizontal Global Irradiation of the European Union. Source: IES

Because of the concern for Climate Change[1] and a growing interest in sustainability, the world is moving towards a New Energy Model. There is deliberation of decarbonisation[2], self-sufficiency[3] or 100% based on renewable energy[4] by 2050. How this New Energy Model will be, it is still an unknown, but progress is made today with the sustainable energy technologies available. To this path where we invest in modifying the current system is what is called Energy Transition.

This document uses the term Ibiza 100% renewable to refer to the New Energy Model because the use of available renewable energy, and photovoltaic especially, is key for the island to achieve self-sufficiency and decarbonisation.

[1] Climate Change: The United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines' climate change 'as:' a climate change attributed directly or indirectly to human activity that alters the composition of the atmosphere Which adds to the natural variability of the climate observed over comparable periods of time '. The FCCC distinguishes between 'climate change' attributed to human activities that alter the atmospheric composition and 'climate variability' attributed to natural causes.

[2] Decarbonisation: This term is used to qualify a system that reduces and eliminates the combustion of fossil fuels as a base of its economy, avoiding the impact of the CO2 emissions derived from these systems.

[3] Self-sufficiency: This term is used to define a system that is capable of self-sufficiency of all the energy that it requires for its economy and which comes from renewable or residual sources.

[4] Renewable energies: Energy sources that are sustainable, within a short time frame when compared to the natural cycles of the Earth, and include non-carbon technologies such as solar, hydrological and wind, as well as neutral technologies in Carbon, such as biomass.

This report will provide a comprehensive review of the current framework and viability of PV solar energy, as well as its potential as a free, clean, renewable energy resource and as one of the key tools for moving towards a sustainable energy model for Ibiza.
For this purpose, this document aims to:

- Portray the vision of energy sustainability around the world, especially with respect to the New Energy Model being built around us;
- Clarify the misinformation about the photovoltaic solar systems situation on the island; particularly in relation to regulation and practice, as it creates confusion and discourages installation of PV systems; and.
- Trigger the interest of local Ibizan companies and individuals to promote and implement solar photovoltaic systems as a key factor towards a sustainable energy model for the island.

This document is the result of a work produced with much effort, dedication and love through:

- Researching the international, national and local Balearic regulatory and historical frameworks.
- Field work, primarily interviews featuring representative islanders that share their vision and experience with solar photovoltaic energy production; and
- Analysis of PV viability on the island for various businesses and establishments (hotels; bars and restaurants; supermarkets; industrial buildings and housing)

This report will serve, above all, to inform, since current misinformation about PV may be one of the main reasons holding back development of this sector in Ibiza.
The practical information included in this study will help individuals and companies to understand how they can invest in photovoltaic energy today and the relevant savings that would be made for their business or establishment, both economically and environmentally.

2. IBIZA, WHY A 100% RENEWABLE ISLAND?

2.1 The current energy model

As a reference, some of the basic data of the electric system in Ibiza:
Electric power installed in Ibiza (GESA station): 280 MW
Electric power of the connection Mallorca-Ibiza: 100 MW
Peak electric demand in Ibiza (2015): 228 MW
Annual electricity consumption in Ibiza (2015): 894.699 MWh
Producing 1 MWh of electricity in Balearic Islands from fossil fuels costs €150, with renewables, only €50

The types of energy use in the Balearics are shown in Figure 2. This distribution can be assimilated to that of the island of Ibiza. Electricity generation together with ground transportation are the largest sources of Green House Gases (mainly CO2) in the islands (around 70%) and is based on the combustion of fossil origin products: natural gas, gas oil and gasoline.

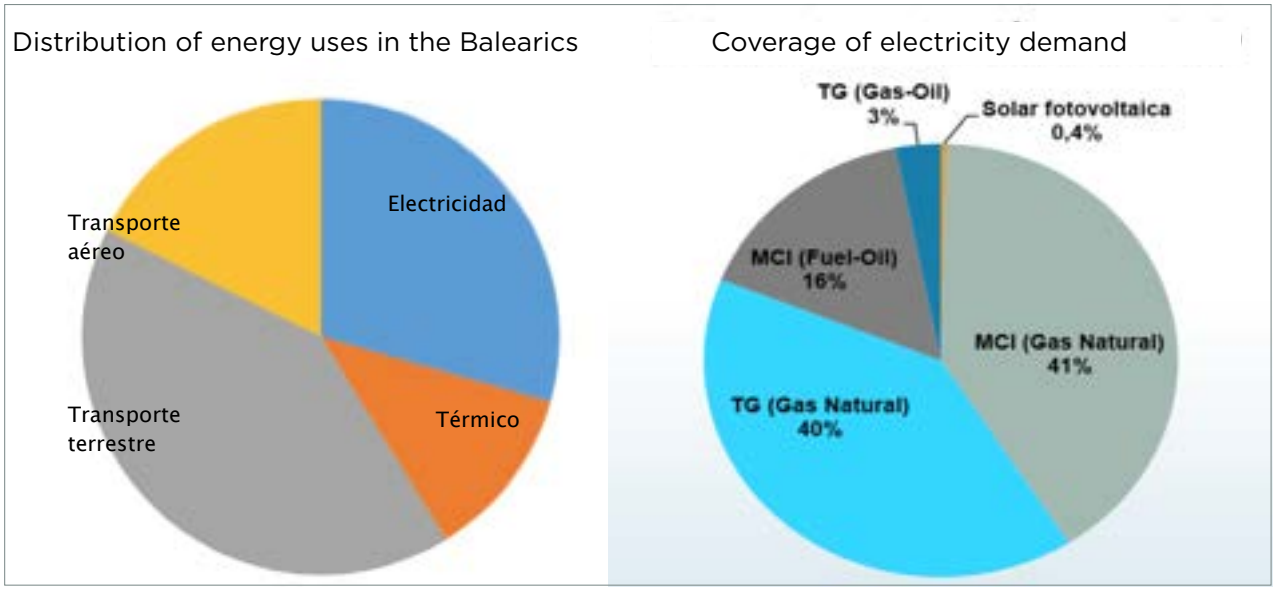


Figure 2.- Distribution of energy use in the Balearic Islands. Source: Joan Groizard. Paper: Balearics and climate change

Figure 3.- Coverage of electricity demand during 2015 for Ibiza and Formentera. Source: Red Eléctrica Española (REE). TG: gas turbine; MCI: internal combustion engine

Ibiza today bases its electricity production on non-renewable resources from fossil fuels, mainly oil and natural gas. All non-renewable electricity comes from the lonely central plant from Gesa-Endesa.
Figure 3 shows the sources of energy for electricity production at the Gesa-Endesa plant in Ibiza in 2015, 81% natural gas. By contrast, during the year 2016 and early 2017, electricity production was 85% with fuel oil (and only 15% with natural gas) due to the high prices of natural gas versus gas-oil in the international markets of these years.
Natural gas saves 30% of greenhouse emissions, but emits half of the hazardous gases (such as nitrogen dioxide) and suppresses the emission of sulphur. According to Spanish law, the company Gesa-Endesa has the right to produce according to its interests, where appropriate economically, in relation to environmental ones.
As shown in Figure 3, the percentage of renewable energy production in Ibiza and Formentera is extremely low at approximately 0.4%. Moreover, this renewable energy portion is primarily attributable to the solar farm in Cala Saona, Formentera, with a power of 1.9 MW, and operating since 2008.

We have an energy model highly dependent on external resources and on petroleum, as well as high levels of CO2 gas emissions on the island.

Joan Groizard, General Manager of Energy and Climate Change, Govern Balear

"In order to achieve the objective of total decarbonisation of the Balearic economy, with a non-dependence of fossil fuels by 2050, it is necessary that the future Balearic Law against Climate Change and Energy Transition (see point 2.2.3):

- *Set targets for reducing CO2 emissions by sector*
- *Establish energy production targets with renewables"*

2.2 Climate change and the New Energy Model: renewable energies, self-sufficiency and decarbonisation

2.2.1 World Climate Change concern: Paris conference

The Paris Agreement provides the first serious binding commitments by many governments (including China) for reducing CO2 emissions into the atmosphere.

The Paris Conference on Climate (COP21), held on December 2015, resulted in 195 countries signing the first global binding agreement on their responsibility regarding global warming (the Kyoto Protocol, signed in 2005 was not binding).

To avoid dangerous climate change, the agreement, known as the Paris Agreement, establishes a global action plan that sets the limit of global warming well below 2ºC.

Figure 4.- Representatives from countries in the COP21, Paris 2015

Governments agreed on:

- The long-term goal to **maintain the increase in global average temperature well below 2ºC** above pre-industrial levels, and limit its increase to 1.5ºC, which considerably reduces the risk and impact of climate change.

- **Global emissions to peak as soon as possible.**
- Meet every five years **to set more ambitious targets**.
- Assess progress towards the long-term goal through a solid mechanism of **transparency and accountability.**
- Strengthen the **capacity of societies to mitigate the consequences** of climate change.
- **Offer developing countries** a better and more permanent **international aid** for adaptation.

At COP21, countries recognised the enormous importance of the initiatives of cities, regions, local businesses and civil society that are committed to achieve the goals set in the Paris Agreement. It makes sense that the island of Ibiza has its own position on its actions and strategy to fight against climate change.

Ángeles Nogales, Manager of Tourism Promotion, Director of Ibiza Sun Apartments and Consultant of Ibiza Koncept

"The World Tourism Organization recommends that the islands, as far as possible, be self-sufficient in energy, so that a model for Ibiza based on renewable energy would be desirable and a goal to be met. The year 2017 is the year of Sustainable Tourism"

2.2.2 Europe's fight against climate change: energy policy of the EU

The European Union (EU) establishes a road map in Europe with its directives (to be enforced by member states) to meet the requirements of COP21. The objective of the EU is to develop a New Energy Model in Europe that is self-sufficient (without oil and by-products) and decarbonised (without CO2 emissions).

Directive 2005/28 / EC (of the European Parliament and of the Council of 23 April 2009, (*link to the Directive*), on the promotion of the use of energy from renewable sources, establishes binding national targets for all The EU with the overall aim of ensuring that renewable energy sources account for **20% of EU energy and 10% of energy specifically for the transport sector by 2020.**

Spain, like all member countries, has developed a Renewable Energy Plan (PER 2010-2020, *Link to Plan*) and has the obligation to demonstrate compliance with the objectives each year.

2.2.3 *Strategy on Climate Change in the Balearic Islands*

The *Balearic Strategy on Climate Change* aims to achieve an energy model in the Balearics in 2050 without CO2 emissions.

Over one year, the Balearic Government carried out, and recently finished, a participatory process for the development of the future *Balearic Law for Climate Change and Energy Transition* (*link to web*).

Joan Groizard, General Manager of Energy and Climate Change, Govern Balear

""The Balearic Law for Climate Change and Energy Transition aims to decarbonise the Balearic economy by 2050 and set targets for work between the Government, Councils and Town Halls, in order to be able to reach this date with a single economy based In renewable energies."

The objectives of developing a future *Balearic Law on Climate Change and Energy Transition* are:

- Obtain an energy diagnosis of the Balearic Islands
- Make future scenarios for the years 2030, 2040 and 2050
- Perform a real analysis of energy data, by islands, not only based on percentages of territory.
- Establish a percentage of renewables installation for each of the defined zones.

2.3 New Energy Model; Ibiza perspective

2.3.1 The anti-oil drilling movement in Ibiza. Departing point for a 100% renewable Ibiza?

On the islands of Ibiza and Formentera, the civil society, private sector and public administrations united unanimously and firmly in 2012 to protest against any oil related projects.

In May 2012, all sectors joined forces and began to work together in a unique and inspiring way. Environmentalists, corporations, associations and public administrations of diverse political backgrounds, diverse objectives and different working models, came to an agreement to declare their objection to the oil exploration project in the Gulf of Valencia (promoted by the Scottish oil company Cairn Energy). They created the **Alianza Mar Blava** organization for this purpose.

Eivissa Antipetrolífera and **Eivissa Diu No**, social movements that brought together thousands of citizens who were totally against oil prospecting.

the demonstration against the oil prospecting project of Cairn Energy in the Gulf of Valencia, February 22, 2014

Alianza Mar Blava + social movements were a significant influencer to cancel up to four oil projects that surrounded the Balearic Islands: Cairn Energy, Spectrum, Schlumberger and INOGS (MedSalt-2). These have been great victories for society and Alianza Mar Blava.

Currently, Alianza Mar Blava is working towards the approval of a *State Law for a Mediterranean Free of Oil Prospecting.*

2.3.2 Initiatives in Ibiza for a New Energy Model

The anti-oil movement has been, in a way, a precursor to the current reflection on the desirable energy model for the island of Ibiza. In this line, there have been and still are several initiatives to promote renewable energy for Ibiza.

- **The lines of work Alianza Mar Blava is undertaking today to promote a renewable Ibiza are**
  - Promotion of Renewable Energy
  - Promotion of Sustainable Mobility

- **The Project ¡Conéctate al sol!** *(link)*
  Promoted by Amics de la Terra and with the support of the Ibiza Preservation Fund (IPF), was created with the objectives of informing the population and the private sector on the importance of solar photovoltaic energy, both at the level of promoting facilities as well as contracting green energy through different electricity suppliers of renewable energy.

> *Hazel Morgan, President de Amics de la Terra Eivissa*
>
> *"One of the most important results of the project ¡Conéctate al sol! Has been that some of the public administrations of the island and the Balearic Islands have put out to tender the contracting of 100% electric energy from renewable energy for all its buildings. Also at present it seems that other municipalities will follow this example. We hope that these good practices will also serve as a reference for citizenship."*

- **The documentary "Ibiza y Formentera 100% Renewable"** *(link to video)*

The documentary, produced by the *Ibizan Association Camarógrafos por el CamBio (BIOCAM)* with the support of the IPF, has contributed significantly to raising awareness and encouraging the use of renewable energy sources in Ibiza and Formentera.
The authors wanted to make known the current energy dependence of the islands, as well as the possibilities that renewable energy represent by showing concrete and practical examples.

> *Chris Dews, President of Ibiza Ecologic and Ibiza Fènix*
>
> *"We are 100% in favor of the installation of solar plants and wind mills to generate wind energy, wherever it is considered necessary and timely. We also support any renewable energy for producing electricity or hot water. Installed and interconnected, the renewable energy systems could serve to generate almost all the electricity used on the island of Ibiza. That it would be possible just if administrations and the public participate in its evolution reference for citizenship."*

All these initiatives to promote renewable energy, with the aim of a Spanish Mediterranean free of oil prospecting, must go hand-in-hand with taking responsibility for our local energy model. That is to progress from a model based today on fossil fuels from petroleum, to a new self-sufficient, decarbonized model and based primarily on renewable energy sources.

3 ENERGY TRANSITION TOWARDS A 100% RENEWABLE IBIZA: STRATGIES AND CHALLENGES FOR A NEW ENERGY MODEL

Based on the current energy model, where about 70% of energy uses are for electricity and ground transportation, to achieve a new sustainable model (decarbonised, self-sufficient and based on renewable energy), we must act in the two areas of the energy system within our reach: The use of energy (demand) and in the production of energy.

The main energy uses in Ibiza are electricity and ground transportation. The use of energy can be reduced by:

- Investing in energy efficiency, such as installing LED lighting in buildings, increasing insulation in facades and installing solar protection. With these actions, electricity demand is reduced.
- Changing to electric mobility (more efficient than combustion) and encouraging the use of cycling and public transport. With those actions, the energy demand for terrestrial mobility is reduced.

In parallel to reducing the use of energy, it can invest in production systems with **renewable energy**

> **In Ibiza, the renewable energy source with the most potential is solar energy**. The hours of sun the island has a year make it ideal for the implementation of solar energy. **Photovoltaic solar energy is, at this moment, a mature technology, profitable and with great potential to make a first step forward towards a New Energy Model.**
> Linked to increased production of renewable electricity, electric mobility, which is also already an affordable and cost-effective technology, can also act to reduce energy use for ground transportation and has the potential to be supplied with this renewable energy source.

3.1 The role of PV in a 100% renewable Ibiza

3.1.1 Potential of photovoltaic to cover the demand for energy of the island

Photovoltaic solar energy is the available resource with the greatest potential for development on the island. If we join the demand curves for monthly electricity in Ibiza with the curves of solar photovoltaic production, we see that it does not fit perfectly (in the spring months there is an excess and in winter it does not meet the energy needs) but has the potential to cover a very high percentage of the demand, about 90%.

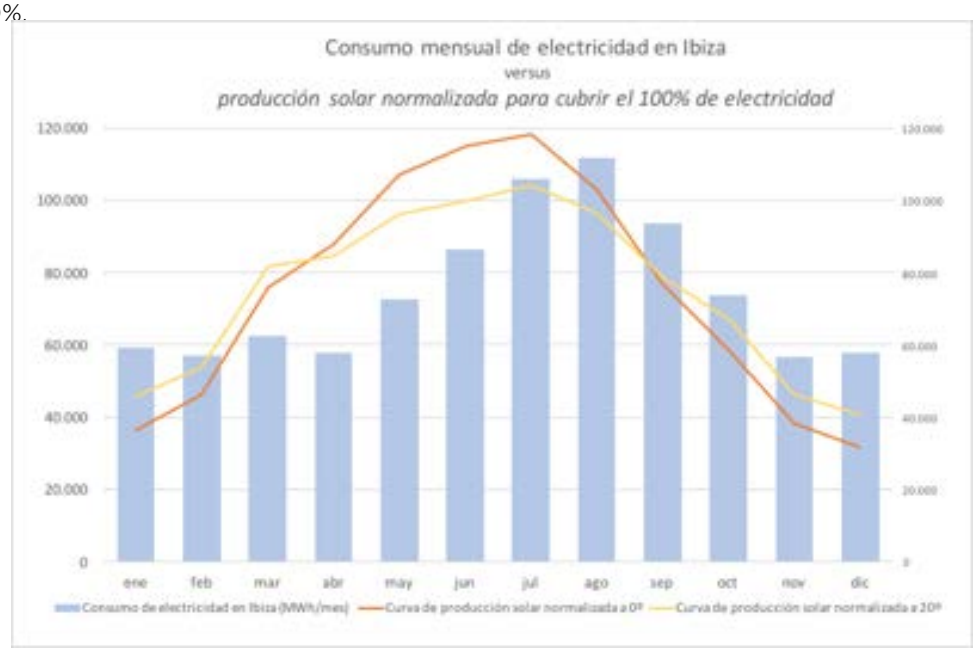


Figure8.- Monthly electricity consumption curves against the solar production curve to cover 100% of current electricity. Source: Self-Made.

The Govern Balear document *Strategies and Actions EERR Balearics*, 2014, produced a study on the potential of the various renewable energy resources in the Balearics. The conclusions from this study concerning PV solar energy are summarized below:

1 - Capacity of PV energy production on common rural lands: excluding terrain of steep slopes and protected areas, Ibiza's rural land has the potential capacity to enable production of more than 11 times the amount of the energy consumption in Ibiza.

Potencial de generación de energía fotovoltaica en suelo rústico no protegido						
	Energía anual GWh	Poténcia MW	Respecto consumo 2011 por isla	Superfície necesaria	% ocupación territorial	Superfície por 100 % consumo
Mallorca	92.208	59.719	2100 % 21 veces	1.471 km²	40,00%	1'92 %
Menorca	9.730	6.392	1936 % 19 veces	158 km²	22,00%	1'16 %
Ibiza	8.909	5.601	1151 % 11 veces	134 km²	25,00%	2'15 %
Formentera	2.024	1.289	3526 % 35 veces	32 km²	39,00%	1'11 %
Islas Baleares	112.871	73.001	1972 % 19 veces	1.749 km²	6,00%	1'9 %

Figure 9.- Potential of photovoltaic energy generation on unprotected rustic soil. Source: Strategies and Actions EERR Balearic, 2014

2 - Total land occupancy: to cover 100% of the energy consumption on the island with PV facilities, it would be necessary to occupy less than 2% of the total land.

Figure10.- Image of the total occupancy of the territory to cover with PV 100% of the demand of electrical energy of Ibiza. Source: Strategies and Actions EERR Balearics, 2014

2% of the territory of Ibiza could cover 100% of current electricity needs

3 -Potential for PV energy production on roofs: the total surface area of building roofs in Ibiza has a potential capacity to enable production of 52% of the energy consumption in Ibiza.

Covering all the buildings of Ibiza with photovoltaic, could cover 52% of the current electrical needs

Potencial de generación energía fotovoltaica sobre tejados					
	Energía anual GWh	Potencia MW	% respecto consumo 2011	Superficie ocupada km²	% superficie ocupada
Mallorca	2.473	1.752	56 %	44'8	1'23
Menorca	377	274	75 %	7'8	1'12
Ibiza	400	277	52 %	7'4	1'38
Formentera	28	20	48,00%	0'4	0'51
Islas Baleares	3.278	2.323	57 %	60'4	1'21

Figure11.- Potential of photovoltaic energy generation on roofs of buildings. Source: Strategies and Actions EERR Balearics, 2014

Combining self-consumption facilities on the roofs of buildings and realizing some solar farms, photovoltaic solar energy can become an important source of energy in Ibiza.
This technology is, today, a mature technology, with competitive costs and that is developing widely around the world. However, in Ibiza, its implementation is testimonial.

- PV facilities are amortized (in Spain) between 6 and 11 years (particular cases reach 18 years)
- After 25 years, up to 3.5 times what is invested

In Ibiza, its implementation is testimonial. The facilities that are most developed in Ibiza are in isolated houses of network, rural houses with great difficulty to access the electrical network.
Despite the isolated PV systems, in Ibiza there are some testimonial examples of the implementation of PV systems in the historical regulatory framework with premiums and basically carried out by the public administration.

3.1.2 The PV sector in Ibiza; key players

Juan Manuel Díaz, President of the Association of Employers of Small and Medium Businesses (PIMEEF), Owner of ZAID and delegated company of Feníe Energía

"The volume of work of all the associated companies is so great, that there are no compelling reasons for wanting to develop a powerful line of solar photovoltaic energy because only with the work of ordinary electrical installations and with companies Which is in Ibiza, is hardly enough. Therefore, there is no strategic interest in enhancing the services of renewable facilities, so that the supply and demand of jobs is very low. The market for electrical installations is saturated."

Despite the potential it currently has, there are practically no specialists or dedicated companies exclusively for solar photovoltaic energy as can be widely found on the peninsula. The companies that install photovoltaic are companies of installations of buildings that include this service for their portfolio of clients.

On the other hand, several companies from outside have tried to develop in Ibiza in this sector and they have many difficulties: access to information about the procedures, the changing rhythm of the island, general distrust of companies outside the island and the difficulty of gaining a stable portfolio of clients to have a minimum workload.

If we expect photovoltaic to develop to its full potential, it will have to greatly increase the sector in Ibiza with new companies and with the growth and promotion of the current ones. To date, to find **specialized companies that can carry out a photovoltaic installation in Ibiza we can use**:

- **PIMEEF (Association of Employers of Small and Medium Businesses,** *web*)**:** which has the data of all the associated installation companies that offer the photovoltaic service
- Electricity suppliers such as **Holaluz** *(web)* y **Feníe Energía** *(link)*: they offer this service to their customers. You can consult your own electricity supplier to see if they have this service.
- List of companies that compiled the project **¡Conéctate al Sol!** *(link)*

For its part, the Ibizan businessperson's distrust of renewable energy is due to the past negative and re-troactive change of the renewable laws in Spain and by the disinformation and challenges presented by the new regulation of self-consumption facilities.

Joan Bufí, President of CAEB (Confederation of Business Associations of the Balearic Islands)

"Photovoltaic solar energy is a great opportunity for the island of Ibiza, both at the environmental and economic levels, as this activity can generate many new jobs, and the creation of new specialized companies. There is currently insufficient confidence in the renewable sector, caused by a lack of information. For example, in relation to the media and very famous tax on the sun, the general impression of business and society, is that this tax is applicable to the Balearic Islands, when it is not, at least today."

There are, however, some companies that invest in photovoltaics. In the calls for subsidies for self-consumption by the Balearic Government (see section 3.3 for more detail) the following Ibiza projects were presented (the total for the Balearic Islands is in brackets):

Call	Total	Companies	Individuals
2016	10 (128)	5 (59)	5 (69)
2017	9 (136)	2 (53)	7 (83)

A good example is the photovoltaic installation on a roof that was realised last year by the company Dipesa Group.

Dipesa Group is a private distribution and transport services company. It has a fleet of vehicles (from coaches to luxury cars) that are kept daily for rent.
The solar photovoltaic plant feeds the reverse osmosis plant to make the water and the paint booth portable, but it also provides power to the four electric vehicles in its fleet.

Name of establishment	Installed PV system				
Dipesa Group	Design criteria	Surface adjusted to ensure that the entire solar production is consumed			
Characteristics: Service company of distribution and rental of vehicles. Includes washing line, osmosis plant, painting booth and 2 recharge points for electric vehicles	Characteristics	Ppv **37 kWp**	Surface **250 m2**	Inclination **35°**	Batteries **no**
	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 1			
	Installation costs	Total investment **53.000 €**	Cost per Wp **1,43 €/Wp**	Granted with subsidy on the call for Self-consumption of 2016 from the Govern Balear	
Contracted Power **4,4 kW**	Benefits	Annual solar electricity production **40% of annual consumption (expected value)**			
	Long-term benefits	Expected pay-back time **15 years**			

Table 1.- Photovoltaic installation at Dipesa Group. Source: Self-made Details provided by the General Manager of the company

The installation of self-consumption in the building of the company Dipesa Group has a capacity of 37 kWp, inclined plates 35 ° and facing south, with the forecast to cover 40% of annual consumption. The investment was 53,000€ and was subsidized in the call for aid to the self-consumption of 2016 of the Govern Balear.
The time of realization of the project, from conception until its implementation, has been six months. Including: proposal, decision making, realization of the installation, legalization, start-up and presentation to the subsidy.
The company has carried out energy management measures to concentrate higher energy consumption in the hours of solar production to ensure maximum use of solar energy. This measure has helped raise awareness of the sustainability and renewable energy of all company personnel.
The motivation of this company has been the conscience for a healthier and sustainable island. However, as will be demonstrated later in this document, investing in photovoltaic solar energy is profitable nowadays.

Emilio Díaz, General Manager of Dipesa Group

"The important thing here is not that we choose to take a step to the renewables seeing it as merely "Profitable", but that we realize that the impact of fossil fuels on the environment and on general health is enormous. We say it from the conviction and the economic effort that we make to have the cleanest vehicles that our company can afford."

3.2 *Electric mobility in a 100% renewable Ibiza*

Electric mobility is one of the most important challenges in moving towards a sustainable energy model, since it represents the greatest energy use of the island (about 45%).

Electric motors are **more efficient** than internal combustion engines (conventional diesel or gasoline), as they **do not pollute the roads** with gases, are much quieter, and reduce dependence on fossil fuels because **they can be supplied with renewable electricity,** which is simpler than changing fuels.
In Ibiza, there is a growing interest in developing electric mobility **and the first electric vehicles are already commuting on the island:**

✓ Many public administration buildings have recharging points available to the public and, at the moment, free of charge.
✓ Buying an electric vehicle in Ibiza is no longer difficult or expensive as it used to be and many of the car dealerships are already marketing at least one or two models of electric car (Peugeot Ion 5 Doors, Kia Soul Elèctric, Renault Zoe, Citroen Mehari etc'). There is also a second-hand market for electric cars on the island at very affordable prices.
✓ Specialized equipment for optimization of the charging of electric vehicles can be purchased on the island: electric vehicle charging points (PRVEs[6]) for both individuals and companies. Two of the companies that sell them are Feníe Energía, which distributes the brand "Circutor", and Decópolis, which distributes the brand "Fagom")
✓ There are a few companies already based on electric mobility, such as: Ibiza Green Car, an electric car rental company, and Green Delivery Ibiza, a home delivery food company with electric vehicles

The potential for further development of electric mobility is held back by the lack of a network of charging stations for electric vehicles (or electro-stations). For example, the PIMEEF Rent a Car Association has already stated publicly that they would be interested in investing in electric mobility, but only once there is a network that would cover their fleet of cars.
The development of electric mobility should go hand in hand with the development of solar photovoltaic energy, Both are based on clean energy and self-consumption installations on buildings can be the basis for a network of electro-stations powered with solar energy (copying the Fastned model).

3.3 Public administration actions for the Energy Transition in Ibiza

The Balearic Strategy against Climate Change from the Govern Balear, as well as the policies of the Consell d'Eivissa, is firmly committed to developing photovoltaic solar energy and electric mobility in Ibiza.
As explained in chapter 2.2.3, the Govern Balear carried out a participatory process for the development of the future *Balearic Law for Climate Change and Energy Transition.*
During 2017, the Govern Balear lunched several subsidy lines to promote photovoltaic solar energy and electric mobility, both for the public and private sectors (companies and individuals):

• Subsidy (with a budget line of €400,000 in 2017) [7] and favourable financing (ISBA)[8] for photovoltaic facilities of self-consumption.
Even though profitability for photovoltaic facilities is already a fact, the Govern Balear's purpose is to support the business community given the "risk of uncertainty" caused by inconsistencies in the Spanish

[6]The PRVEs are intelligent equipment that communicate with the vehicle to optimize the charging time and the durability of the batteries. The speed of the load depends on the power of the equipment, from 3.7kW (8 hours) to 40kW (20 minutes). There are wall mounted and tower type models for parking in the public roads
[7]In the section of Subsidy Programs, the conditions of subsidy for the photovoltaic of 2017 are detailed
[8]In the section of Subsidy Programs, the conditions of subsidy from ISBA-CAIB on 2017 are detailed

legislation.
By 2018, it plans to re-include these lines and is considering incorporating a specific subsidy for batteries in self-consumption facilities

- Line of aid of 1,2 million Euros for self-consumption facilities on public buildings for 2017-2018.

The Consell d'Eivissa is initiating investments in photovoltaic facilities on its buildings.

- Subsidy for electric and hybrid taxi vehicles (with a budget line of €400,000 in 2017
- Subsidy for electric vehicle recharging facilities of local public administrations, public business entities and public trading companies (with a budget line of €600,000 in 2017).

In this call, applications have been submitted to install 11 new recharging points in Ibiza.
Finally, a collaboration agreement between the Conselleria de Territori, Energia i Mobilitat (the Balearic Government's department in charge of territory, energy and mobility), the councils and town councils for the development of Electric Mobility in the Balearic Islands (MELIB) is currently being drafted and negotiated (see also, chapter 4.4.3).

Giandrea di Terlizzi, Coordinator of mobility, Consell d'Eivissa

"Our priority is to develop solar photovoltaic power on the roofs of buildings throughout the island, rather than to develop solar farms, and to avoid large installations with great visual impact. The Consell d'Eivissa is working on this year's tender for a new installation of Self-Consumption in the building of the Consell (20 kW) and for 2018 in the Technical Vehicle Inspection Station (ITV) of 80 kW."

4 POSSIBILITIES FOR THE DEVELOPMENT OF PHOTOVOLTAIC ENERGY FACILITIES

4.1 Introduction: the electric system and renewable energy production in Spain

The basic legislation of the energy sector depends on the State, the sector's reference standards and application to renewable facilities depends on the state government.

The evolution of the regulations in the Spanish electricity sector is very well described in section 3.5 of the Energy Manual of the organization Energy and Society (*Link to Manual*)

Solar photovoltaic installations must be carried out in compliance with the laws and regulations of the electricity sector.
The recent history of the production of electricity with renewable energy in Spain is characterized by uncertainty, given that the premiums that existed and were paid for the energy produced by these facilities were retroactively reduced or annulled, and this caused:

- the bankruptcy of companies that had invested in these technologies; and
- a growing distrust of investment in Spain due to the uncertainty of the regulatory regime.

Additionally, in 2015, a new legal framework to produce electricity with renewable energy, the self-consumption type facilities, was regulated introducing the new concept of tax to the renewable energy production (the famous “Impuesto al sol”).
The current state of the regulatory framework for photovoltaic energy production is not favourable (especially if we compare it with other countries). Even so, the photovoltaic technology proves as profitable in Spain within the limitations of the current legal framework, partly also due to the many sun hours in the country. One could say that photovoltaic energy production is still profitable even in the "worst-case" scenario.
In addition to general state legislation, the autonomous regions have regulation competencies of the energy sector in some respects. The photovoltaic installations in Ibiza, therefore, must be coherent with the state legislation of the electric sector and the corresponding regional regulations.

The Spanish electricity system
The Spanish electricity system, as we know it now, was born as a public service and regulated by the Government, until its liberalization in 1997.
In the Spanish electrical system, the following actors are found.
Producers: Includes any company, individual or entity that generates electricity. They are grouped into different categories according to their dimensions (power) and the primary energy source they use. In Ibiza, the most important producer of electricity is Gesa-Endesa with its thermal power station.
REE: Red Eléctrica Española: It is the owner and operator of the Spanish electrical transport network as well as the electrical system operator
Distributors: they are the owners and managers of the lines that go from the transformation substations (REE) to the consumers (medium voltage). In Ibiza, the distributor company is Gesa-Endesa
Suppliers: they are the companies that represent users in the electricity market (buy electricity for us) and also act as representatives of small producers with renewables. You can hire any dealer in Spain; it does not depend on the area

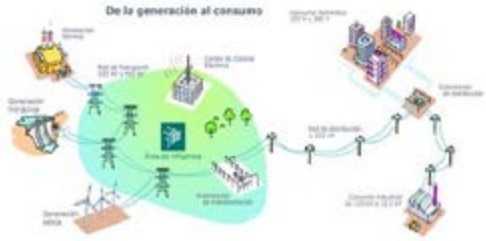


Figure 11.- Diagram of operation of the Electrical Network. Source: REE

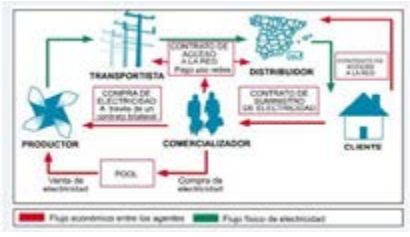


Figure 12.- Scheme of the operation of the economic flow of the Electricity Market. Source: REE

The program of the sixth column ” (*link*) gives an overview of the history of photovoltaic solar energy in Spain, since its time of great development, the change of laws and their impact on people and current legislation, especially with respect to Self-consumption.

4.2 Regulatory framework of renewable energy production

The regulatory framework for renewable energy, defines four types of fundamental actions, each of them applies to specific regulations:

- **Large Renewable Energy Facilities:** Installations with high-power renewable energy (over 50 MW). Its function is to generate electricity to be sold to the general electricity market, connect to the electricity transport network and competing on prices with conventional energy producers (thermal plants, combined cycle, etc). The Government awards these projects through a public tender called the Renewable Auction.
- **Solar Plants:** Medium-sized renewable energy facilities to supply the electrical system (less than 50MW). Its function is to generate electricity to be sold to the general electricity market but integrated in a specific regime for renewable energy (the so called "Regimen Especial") and connected to the distribution network. Solar plants on rustic land are also called solar farms.
- **Off-the-grid installations:** Renewable energy production facilities for a user not connected to the main electricity network. 100% of the electricity they consume comes from the renewable energy facility installed.
- **Self-consumption facilities:** Renewable energy production facilities for a user connected to the main electricity network for self-consumption (new or existing). They cover their electricity consumption with the solar energy produced, and consume from the grid the excess energy they require that is not produced.

There is a specific regulatory framework for electric mobility that establishes different forms for the charging of electric vehicles:

- **Electricity sales points:** facilities for the sale of electricity to load a vehicle, commonly known as electro-stations because it is a model like gas stations. The regulation determined that this activity may be carried out by companies with the specific activity of suppliers or the ones called "gestores de carga".
- **Electricity private load:** installations in private buildings for the loading of a private electric vehicle or for a third-party's electric vehicle.

The following sections include the state and regional conditions and opportunities for the development of photovoltaic energy production facilities and electric mobility in Ibiza.

4.3 PV systems in Ibiza. Case studies

In this section, we detail the current conditions, regulations, process and requirements of each of the types of photovoltaic installations possible on the island of Ibiza.

4.3.1 Large-scale Renewable Energy Facilities

Installations with high-power renewable energy (over 50 MW)

These are awarded by the state government through a public Renewable Auction. In the 2017 auction, all the power has been awarded to wind energy, and all in the Peninsula, mainly due to the lower production price.

The Govern Balear's claim of a specific auction for the Balearic Islands would offer the possibility of carrying out large-scale renewable energy installations on the islands, without having to compete with the production prices and installation capacities possible on the peninsula.

A solar farm of 50MW requires approximately 60 hectares of land. Therefore, on a small island such as Ibiza it is less feasible to carry out any such installations.

4.3.2 Solar Plants

Medium-sized renewable energy facilities to supply the electrical system (less than 50 MW)

To carry out this type of installation, it is necessary to locate a permitted site and to get a connection to the electricity distribution network.

In Ibiza such installations exist, for example, some of the public administration installations: Cas Serres (3.06 kWp); Escoleta de Santa Eulària des Riu (3.06 kWp), a kindergarten; and the headquarters of the Consell (8.4 kWp). These installations were carried out before the concept of Self-consumption was created, and under the previous regulatory framework where this kind of installations were promoted and granted on the electricity produced. At present, facilities of this small size, outside the concept of Self-consumption, are not profitable, and should be carried out under the Self-consumption regime.

At present, carrying out solar plants in Ibiza makes sense mainly in the form of solar farms (solar plants on common rustic soil and on the ground).

The following figure summarizes the connection scheme as well as the key points of the feasibility of Solar Plants.

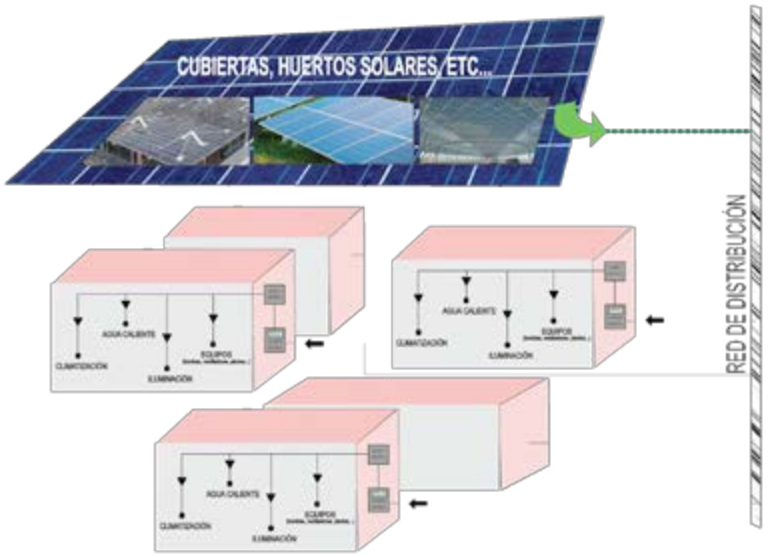
NAME (type)	Solar Plants
LEGISLATION framework	- *Ley del sector eléctrico* - *Plan Director Sectorial de Energía de las islas Baleares* (from now on *PDSEIB*) - *Ley de Impacto Ambiental de Baleares; Ley 12/2016 de 17 de agosto* (from now on *EIA)*
DIAGRAM	
OBJECTIVES	Production of renewable electricity to supply into the grid
TYPE OF PROPERTY	Mainly in rustic land, but they could fit on big roofs or roofs aggregation (with low feasibility in Ibiza)
CAPACITY & SCOPE	Up to 50 MW Minimum 3 hectares per 2.5 MW
SPECIAL CONDITIONS	The distributor company (Gesa-Endesa) is the one that establishes the point of connection to the main electricity grid
BARRIERS	- Negative public opinion on the impact of the landscape-ecologic-cultural - Information on the suitability of parcel is decentralized in different administrations [not clear?] - Access to the electricity network is essential for its viability - Plots of small size enable small solar farms affecting profitability
EXAMPLE	Solar farm of Sant Joan de Labritja Power: 2.5 MW Extension: 3 ha Status: In 2017, the period of public exhibition of the Environmental Impact Study presented by the promoter has been finalized

Figure12.- Key aspects for the promotion of a photovoltaic solar plant in Ibiza. Source: self-mad

All solar farms promoted in Ibiza must comply with:

- The **PDSEIB**, which defines the types of photovoltaic installations according to their capacity and occupation of territory, as well as areas suitable for the installation of photovoltaic solar energy facilities on rustic land. It also defines the grouping limits for different facilities, as well as the cases in which these facilities require the declaration of general interest or public utility.
- The **EIA** (which explains what type of photovoltaic solar energy installations must be submitted to the EIA procedure) requires that the farms be subject to a binding assessment of the Balearic Environment Commission, which will decide whether the project can be implemented.
- **The process of public consultation**, within the EIA, where the project is subject to public oppositions to the project.
- **The impact on the social, environmental, cultural, ethnological ... sensitivities of the territory**, which will be revealed by the administrations and various local organizations.

> *Joan Carles Palerm, President of GEN-GOB Eivissa*
>
> *"To this day, Gen-Gob does not have a unified decision or position in relation to solar photovoltaic energy and in particular regarding solar farms, as for example in Menorca, where solar farms have already been set up, and oppositions have been made to the projects. What we do know clearly is that photovoltaic energy production is necessary and has to be promoted, but mainly on roofs, since there are thousands of square meters available on industrial properties and public buildings. The solar plants should not be promoted on soils protected by the Natura 2000 Network or the Natural Spaces Act (LEN), and should be promoted with caution on common rustic soil."*

The connection to the distribution network depends on the distributor in Ibiza (Gesa-Endesa). Before proceeding with the development of a detailed project, it is recommended to enquire about the possibility of connecting to the main electricity grid.

The electricity produced is sold to the general Spanish electricity market and within the Special Electricity Production Regime. The most common is to hire a representative; it is the energy Suppliers (who sell electricity to consumers) who perform this role.

To summarize, in practice, in order to carry out a solar farm in Ibiza, you must:

1. Locate a parcel allowed by the PDSEIB (the greater the suitability, the more chances of success) and check if there are facilities nearby that meet the requirements of the regulations.
2. Ensure it is common rustic soil (not protected by any European nor regional regulations), away from any cultural property, unique landscapes or areas with high ecological values in general. It is highly recommended, prior to embarking on any solar farm project, to consult with the insular council and the town council of the municipality to identify the most suitable plot of land.
3. Ask the distribution company for a point of connection to the distribution network. If the point awarded by the distributor is far from the installation, it will probably make the project economically unfeasible.
4. Deposit an guarantee of 10 € / kW (in the form of cash or bank guarantee)
5. Execute an executive project report and Environmental Impact Study to present to the Directorate General of Energy and Climate Change in order to obtain administrative authorization.
6. Obtain administrative authorization and work permits for the installation.
7. Complete the construction and setting up of the installation
8. Hire a representative.

With this PDEIB approved and for the areas of high or medium suitability nowadays solar farms in Ibiza can be considered viable.

In Ibiza, until 2017, four solar farm projects have been promoted. All of them are still in various proceedings and none have yet been completed.

The most advanced project is the Can Mariano Lluquí solar farm, which begun and finished the process of

public consultation of the EIA in 2017. Located on a rustic plot of land in the municipality of Sant Joan de Labritja, the project is planned to have a capacity of 2.5 MW, and is promoted by a company from outside the island. The project's capacity would cover 10% of the municipality's annual electricity consumption. Once the project is completed, it will be the first solar farm in Ibiza.

The development of solar farms in cooperation with a local partner from the island can facilitate the process.

The risks and opportunities of solar farm developments are described below:

Risks:	Opportunities:
• The distributor provides a point of connection too far from the plant • There is a nearby facility that limits the viability of developing a new one according to the PDSEIB • An installation of this type may affect landscape, cultural or ecological values • Civil society objects to the solar farm, on landscape or ecological aspects • The local administrations, Consell and City Council, issue unfavourable reports to the solar farm (for affectation to landscape and nature values)	• The new PDSEIB determines areas of high and medium suitability for photovoltaic energy production. In parcels with this classification, the processing is supported by the Direcció General d'Energia i Canvi Climàtic • The development of small solar farms is necessary for a 100% renewable Ibiza.

With this PDEIB approved and for areas of high or medium aptitude, solar farms in Ibiza can be considered viable. The solar farms are fundamental to reach a 100% renewable Ibiza.

Photovoltaic installation for self-consumption of 5.5 kWp in an isolated network house, Sant Rafel, Ibiza. Source: Image and data provided by the owner.

4.3.3 Off-the-grid installations

Renewable energy production facilities for a user not connected to the main electricity network.

Off-the-grid PV systems do NOT need to comply with the regulations of the electricity grid, They only must comply with the Low Voltage Electrotechnical Regulation, the general regulation of any electrical installation in a building.
Its design is specific for each case and is based on:

- Designing a facility that can cover almost 100% of the daily electricity demand.
- Incorporating batteries that accumulate daily production to enable electricity consumption at any time of the day.
- Including an energy management system that directs the main consumption to take place during the hours of sunshine (for example, the pump of the swimming pool or electrical heater).
- Installing an auxiliary system for the times when there is insufficient solar production or several days of rain (usually a diesel generator).

In Ibiza, there are numerous examples of such facilities in rural dwellings that have limited access to the main electric network; it is more expensive to do the work necessary to bring the electricity cable of the distribution network to the house than to set up an off the grid installation which is 100% self-sufficient.
The Govern Balear allocated in 2017 a budget line of 400,000 Euros to subsidize these facilities for individuals, non-profit entities, companies and business associations[9] .

4.3.4 Self-consumption PV systems (new law of 2015)

Renewable energy production facilities for a user connected to the main electricity network for self-consumption (new or existing).

This scheme of renewable electricity production associated with consumption has been available since 2015 and regulated with the ***Real Decreto 900/2015 of 9 October***, *which regulates the administrative, technical and economic conditions of the modalities of electric power supply with self-consumption and production with self-consumption.*
This law allows, with certain limitations, the realization of photovoltaic production facilities in relation to an electricity consumption contract (new or existing).

It can be applied to buildings or any place with electric consumption:

- Single-family housing.
- Multi-family dwellings; but only to the buildings communal uses because shared self-consumption is prohibited.
- Buildings occupied by business activities such as industry, tourism and the service sector in general, including hotels, restaurants, agritourisms, industrial and agricultural buildings.

[9] In the section on Subsidy Programs, the conditions of the subsidies for photovoltaic of 2017 are explained

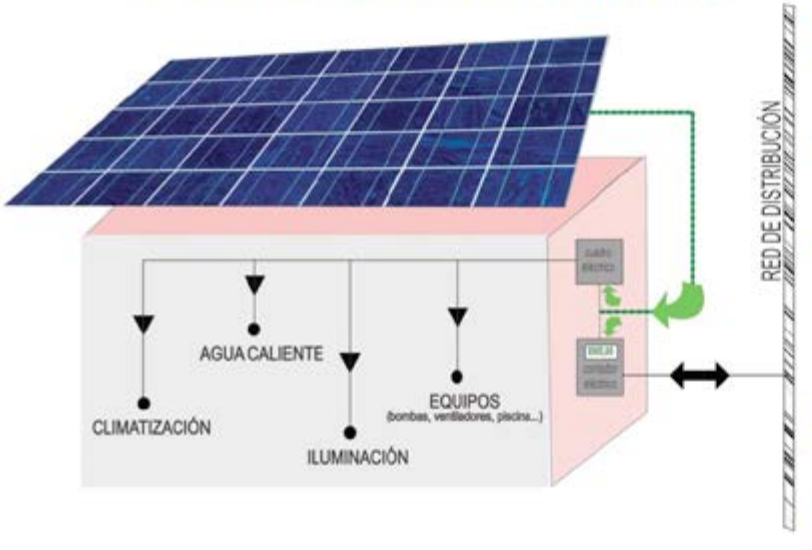
NAME (type)	Self-consumption
LEGISLATIVE framework	- *Real Decreto 900/2015* - *Leyes del sector eléctrico*
DIAGRAM	
OBJECTIVES	Electricity production for Self-consumption
TYPE OF PROPERTY	Fundamentally buildings, but also in consumer centres without a building
CAPACITY	Specific in each case, always with a photovoltaic power lower than the power of the contracted electricity
SPECIAL CONDITIONS	- The law of Self-consumption is complex and establishes many special conditions for each case. Later in this document the most important aspects are described. In any case, it is advisable to consult with a specialist to make a proposal for each case. - The Govern Balear has destined a budget line to subsidize these facilities for individuals, non-profit entities, companies and business associations (400,000 Euros in 2017)[10], and for the public administration (1,200,000 Euros in 2017-2018). - ISBA-CAIB (Fondo de Garantía Recíproca) provides guarantees for investments related to self-consumption with renewable energies and the Balearic Government finances 100% of interest. This aid is for self-employed individuals and SMEs[11].
BARRIERS	- Fear of complex regulations, the history of the renewable sector in Spain and the "Sun Tax". - The distributor of the area must give authorization to the installation. The distributor has discretion to deny the connection if the power lines that reach the house exceed the 50% photovoltaic facilities limitation. - The sale of surplus is possible as far as the installation is registered as type 2 (see below for further information). The power sale is made at the general market price, less than half of the purchase price of electricity. Installations for buildings that operate only during season will have lower profitability on the sold power, so, as alternative, should limit the power installed.
EXAMPLE	Installation in the transport company Dipesa Group Installed power 37 kW Year of installation 2016

Figure 15.- Key aspects for the realization of a self-consumption facility in Ibiza. Source: Self-Made

[10] In the section of Subsidy Programs, the conditions of the subsidies for photovoltaic of 2017 are explained

[11] In the section of Subsidy Programs, the ISBA-CAIB finance conditions for 2017 are explained

The **key aspects of a PV** system for self-consumption are:

1) **The fundamental use of the installation and energy produced is the reduction of electricity consumption costs deriving from the different activities;** According to this criterion, the law establishes a condition that the power of the PV plant (Ppv) is less than or equal to the contracted power of the building's electricity consumption.
2) The surplus power may or may not be exported to the grid. **The use of batteries is allowed** to minimize the electricity being fed into the network.
3) **The surplus energy can be sold to the network or fed into the network without compensation.** To sell the surplus to the network, it is necessary to declare as type 2 (see below) to register as a generator, have a representative and submit quarterly reports to the treasury.
4) **It is necessary to apply for a connection with the distributing company;** the distributor has the discretion to require reinforcing of the cable if the sum of the previously installed powers of photovoltaic exceeds 50% of the load in some sections of the cable line. This requirement is mandatory even if no power is expected to be exported to the grid. The connection study by the distributor has a cost (from €160 to €400 depending on the size of the installation).
5) **The Back-Up Tolls (the famous "sun tax") are charged in the electricity bill for any excess energy NOT CONSUMED** when using photovoltaic solar energy for consumption.
6) RD 900/2015 establishes two types of self-consumption facilities: Type 1 of Supply with Self-consumption and type 2 of Generation with Self-consumption. These are further described in the following paragraphs.
7) The installation must be registered in the Conselleria de Territori, Energia i Mobilitat, from the Govern Balear. **All procedures can be done online on the "Finestreta Única"** platform (*link here*) of the Govern Balear.

The web is structured in steps and includes all the necessary links for the administrative process, from the connection request to the distributor, to the registration in the Register of Self-consumption and (for type 2 installations) the Generator Register

The selling price of the PV surplus is at the wholesale market price, about 50% less compared to the purchase price

If the load of the line is exceeded by 50%, the installation can only be done by paying for the reinforcement of the electricity line (distribution), which greatly compromises its economic viability

Backup tolls ... do not apply

In Ibiza, at present, an entry with lower values to the Peninsula is predicted as it has been done in Mallorca and Menorca.

For consumers with contracted power less than 10 kW (housing) There is currently no facility as the Government has not developed the regulations to implement. However, this situation could change with retroactive effect.

Miguel Vericad, Conseller de Medi Ambient, Consell d'Eivissa

"It would be necessary to introduce renewable energy in the tourism sector, through the Conselleria de Turisme, both in hotels and holiday homes. The positive impact would be very important"

The characteristics of the two types of installations are detailed below. Examples of each are included.

Type 1: power supply with self-consumption

Self-consumption facilities are Type 1 when the following two conditions are met:

- the contracted power of the user is less than or equal to 100 kW; and
- The consumer = the producer

When an installation is registered as this type, then:

- it is compulsory to register in the administrative Self-Consumption Register; and
- the energy surplus exported to the distribution network will NOT be compensated.

There are several case studies in Ibiza that would be considered are Type 1.

> The dwellings are all included in this type 1 (the power contracted in houses is usually 4.4 to 8.8 kW, rarely exceeds 10 kW).
> The consumption of services (especially in SMEs) usually have contracted powers of less than 100 kW. For example, an apartment complex in Ibiza with 50 apartments and a swimming pool can have a contracted power of 70 kW; And a supermarket in industrial warehouse 85 kW)

Below are preliminary analyses based on the annual electricity consumption and costs information (from monthly or bi-monthly electricity bills) and from the information on roofs available in Google.
The costs of the installations include the project, legalization, materials and works; do not include specifics with respect to civil works or additional structures (such as pergolas).
The economic variables used for the economic balance are with a CPI of 2% and an increase in the cost of electricity of 4% per year. Calculations of accumulated income at 25 years and Pay-back (not simple) have been calculated with these variables.

Installation for private housing

Type of establishment		Proposed PV system				
Single family house	Design criteria	Surface adjusted to ensure that the entire solar production is consumed				
Characteristics: villa or shared wall house, in the countryside or in the city. Must have its own roof or land.	Characteristics	Ppv **3,0 kWp**	Surface **19 m2**	Inclination **25º**	Batteries **no**	
	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 1				
Contracted Power **4,4 kW**	Installation costs	Total investment **7.330 €**	Cost per Wp **2,44 €/Wp**		Potential grant subsidy by Govern Balear	Subsidy amount **2.050 €**
Annual electricity consumption **10.920 kWh/year**	Benefits	Annual solar electricity production **4.650 kWh/year (42,6% of annual consumption)**			Savings on electricity bill **561 €/year (32% of annual costs)**	
Annual electricity bill **1.754 €/year**	Long-term benefits	Accumulated income in 25 years **20.309 €**	Pay-back time **10 years**		including subsidy	Pay-back time **8 years**

Table 2.- Example of a PV system for a single-family housing. Source: Self-made

A photovoltaic installation for a single-family dwelling (small-medium), with the current regulation of Self-consumption, **can be of 3.0 kWp**. With this installation, **42.6% of the annual electricity consumption is covered with photovoltaic panels** instead of consuming it from the main electricity grid. The total cost of the installation is 7,300 Euros (and 5,280 Euros if the subsidy of the Balearic Government is received). As the savings in electricity bills is estimated at 561 Euros per year, the investment is returned within 10 years (and within 8 years with the subsidy).

This installation is of Type 1 and of a capacity less than 10 kW. The Back-Up Tolls ("sun tax") are not applied and if there is excess electricity that is not consumed by the house, it is exported to the main electricity network, without compensation. These facilities are exempt from legalization taxes from the Conselleria. The response of the distributor to give the connection point and to come and review the installation once complete is 10 days in both cases. The expected time from planning to completion of a photovoltaic installation of this type is approximately two months.

Installation for a small-sized business: for example, a cafeteria bar

Type of establishment		Proposed PV system				
Bar - cafeteria	Design criteria	Surface adjusted to the limit of the contracted power. Includes batteries				
Characteristics: Bar-cafeteria in an independent building, with own roof or land. Open all year	Characteristics	Ppv **5,2 kWp**	Surface **33 m2**	Inclination **20º**	Batteries **yes**	
	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 1				
Contracted Power **5,5 kW**	Installation costs	Total investment **14.952 €**	Cost per Wp **2,88 €/Wp**		Potential grant subsidy by Govern Balear	Subsidy amount **3.120 €**
Annual electricity consumption **39.251 kWh/year**	Benefits	Annual solar electricity production **8.684 kWh/year (22,1% of annual consumption**			Savings on electricity bill **1.069 €/year (21,1% of annual bill)**	
Annual electricity bill **5.074 €/year**	Long-term benefits	Accumulated income in 25 years **35.786 €**	Pay-back time **11 years**		including subsidy	Pay-back time **10 years**

Table 3.- Example of a PV system for a small-sized business, a Cafeteria Bar. Source: Self-made

A photovoltaic installation for a small-sized business (like a cafeteria bar), with the current regulation of Self-consumption, **can be of 5.2 kWp and with batteries.** With this installation, **22.1% of the annual electri-**

city consumption is covered with photovoltaic energy production instead of consuming it from the main electricity grid. The total cost of the installation is 14,952 Euros (and 11,832 Euros if the Balearic Government subsidy is received). As the savings in electricity bills is estimated at 1,069 Euros per year, within 11 years the investment would be returned (or within 10 years with the subsidy).

This installation is of type 1 and of a capacity less than 10 kW. The Back-Up Tolls ("sun tax") are not applied and if there is excess electricity that is not consumed by the business, it will be exported to the main electricity network, without compensation. The response of the distributor to give the connection point and to come and review the installation once completed is 10 days in both cases.

Installation for a medium-sized business: for example, a restaurant

Type of establishment	Proposed PV system				
Restaurant	Design criteria	Surface adjusted to ensure that the entire solar production is consumed			
Characteristics: Restaurant in isolated building, with its own roof or land. Open all year	Characteristics	Ppv **15,6 kWp**	Surface **99 m2**	Inclination **20°**	Batteries **no**
	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 1			
Contracted Power **17,3 kW**	Installation costs	Total investment **25.324 €**	Cost per Wp **1,62 €/Wp**	Potential grant subsidy by Govern Balear	Subsidy amount **9.360 €**
Annual electricity consumption **92.049 kWh/year**	Benefits	Annual solar electricity production **25.740 kWh/year (28% of annual consumption**		Savings on electricity bill **2.860 €/year (25,4% of annual bill**	
Annual electricity bill **11.275 €/year**	Long-term benefits	Accumulated income in 25 years **90.765 €**	Pay-back time **7 years**	including subsidy	Pay-back time **6 years**

Table 4.- Example of a PV system for a medium-sized business, a Restaurant. Source: Self-made

A photovoltaic installation for a medium-sized business (like a restaurant), with the current regulation of Self-consumption, **can be 15.6 kWp.** With this installation, **28% of the annual electricity consumption is covered with the photovoltaic energy production** instead of consuming it from the main electricity grid. The total cost of the installation is 25,324 Euros (and 15,964 Euros if the subsidy from the Balearic Government is received). As the savings in electricity bills are estimated at 2,860 a year, within **7 years the investment** is returned (6 years with the subsidy). In evaluating this example, it can be observed that the electricity tariff they are paying is quite high compared to the current market prices, so that photovoltaic solar is more profitable than in the rest of the cases.

Even if there is any energy surplus in this case, it is worth feeding it to the grid without compensation and staying in type 1.The Back-Up Tolls are not applied. As it is an installation of more than 10 kW the response of the distributor to give the point of connection and to come to review the installation once finished is 30 days in both cases.

Installation for a large-sized business: for example, a tourist apartment complex

Type of establishment	Proposed PV system					
Touristic apartment complex	Design criteria	Maximum surface on the roof with flat solar panels				
Characteristics: 50 apartments with swimming pool. Opened during tourism season	Characteristics	Ppv **20,8 kWp**	Surface **132 m2**	Inclination **0°**	Batteries **no**	
Contracted Power **70 kW**	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 1				
Annual electricity consumption **126.338 kWh/year**	Installation costs	Total investment **32.596 €**	Cost per Wp **1,57 €/Wp**	Potential grant subsidy by Govern Balear	Subsidy amount **12.480 €**	
Annual electricity bill **18.727 €/year**	Benefits	Annual solar electricity production **31.200 kWh/year (24,7% from annual consumption)**		Savings on electricity bill **2.710 €/year (14,5% from annual bill**		
	Long-term benefits	Accumulated income in 25 years **103.116 €**	Pay-back time **11 years**	including subsidy	Pay-back time **7 years**	

Table 5.- Example of a PV system for a large-sized business, a Tourist Apartments Complex. Source: Self-made

A photovoltaic installation for a large-sized business (such as a tourist apartment complex of 50 apartments), with limited roof surface, **can be of 20.8 kWp.** With this installation, **24.7% of the annual electricity consumption is covered with photovoltaic energy production** instead of consuming it from the main electricity grid. The total cost of the installation is 32,596 Euros (and 20,116 Euros if the subsidy of the Balearic Government is received). As the savings in electricity bills are estimated at 2,710 Euros a year, **within 11 years the investment** is returned (7 years with the subsidy). In evaluating this example, it can be observed that the annual savings are comparably low since for several months a year, not all the solar electricity that is produced is consumed (due to seasonality of the tourism sector). Also, the subsidy of the Balearic Government has a big effect on the profitability.

Also in this case, although there is an energy surplus during the "off-season", it is worth feeding it to the grid without compensation and staying in type 1. The back-up tolls are not applied. As it is an installation of more than 10 kW the response of the distributor to give the point of connection and to come to review the installation once finished is 30 days in both cases.

Installation for large-sized business: for example, a supermarket in an industrial building

Type of establishment	Proposed PV system					
Supermarket	Design criteria	Surface adjusted to ensure all solar energy produced is consumed in the building				
Characteristics: In industrial area, of about 600 sqm building dimensions. Open all year	Characteristics	Ppv **61,88 kWp**	Surface **399 m2**	Inclination **25°**	Batteries **no**	
Contracted Power **85 kW**	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 1				
Annual electricity consumption **305.856 kWh/year**	Installation costs	Total investment **79.306 €**	Cost per Wp **1,28 €/Wp**	Potential grant subsidy by Govern Balear	Subsidy amount **15.379 €**	
Annual electricity bill **31.623 €/year**	Benefits	Annual solar electricity production **102.721 kWh/year (33,6% of annual consumption**		Savings on electricity bill **7.821 €/year (24,7% of annual consumption)**		
	Long-term benefits	Accumulated income in 25 years **312.332 €**	Pay-back time **8 years**	including subsidy	Pay-back time **7 years**	

Table 6.- Example of a PV system for a large-sized business, a Supermarket in Industrial Building. Source: Self-made

A photovoltaic installation for a large-sized business (such as a supermarket in an industrial building), can be of 61.88 kWp, ensuring that all the solar production is consumed in the building. With this installation, **33.6% of the annual electricity consumption is covered with photovoltaic energy production** instead of consuming it from the main electricity grid. The total cost of the installation is 79,306 Euros (63,927 Euros if the Balearic Government grant is awarded). As the savings on electricity bills are estimated at 7,821 a year, **within 8 years the investment** is returned (7 years with the subsidy).
Even if there is any energy surplus, it is worth feeding it to the grid without compensation and staying in type 1. As it is an installation in Ibiza, now, the back-up tolls are not applied. As it is an installation of more than 10 kW the response of the distributor to give the point of connection and to come to review the installation once finished is 30 days in both cases.

Type 2: production with self-consumption

Some of the buildings in the tourism sector (such as large hotels) will have surpluses in winter when the facilities are closed. For these cases, it is worthwhile to study the interest of selling surpluses by entering type 2.
Type 2 is applicable provided that the owner of the photovoltaic installation is not the consumer of electricity; Either because the company that invests is an energy services company or because the installation is owned by the building owner and does not coincide with the user.

The facilities where one of the following conditions are met would fall under this type:

- the contracted power of the user is greater than 100 kW; or
- the consumer is different from the producer; or
- there is an interest in selling surplus energy

When an installation is registered as Type 2:

- it is compulsory to register in the administrative Self-consumption Register; and
- it is compulsory to register in the Producers Register; and
- The surplus energy fed into the main electricity network may receive compensation in accordance with the current legislation and must satisfy the corresponding Generation Dumps. To be able to sell the surplus energy produced, the producer must:
    - Hire a generator representative in the Special Regime. This activity is carried out by some suppliers
    - Submit quarterly reports to the Treasury about the activity of the generator of energy.

An example case study was carried out in Ibiza, which would be included in Type 2 with a capacity under 100 kW.
This is a preliminary study based on information on annual electricity consumption and costs (from annual electricity bills) and the information on roofs available on Google.
The costs of the installations include the project, legalization, materials and works; do not include specifics with respect to civil works or additional structures (such as pergolas).
The economic variables used for the economic balance are with a CPI of 2% and an increase in the cost of electricity of 4% per year. Calculations of accumulated income at 25 years and Pay-back (not simple) have been calculated with these variables.

Installation for a large hotel

Type of establishment	Proposed PV system				
Hotel	Design criteria	Maximum surface on the roof with flat solar panels			
Characteristics: 4 star hotel with 99 rooms; with swimming pool, restaurant and parking. Opened during tourism season months	Characteristics	Ppv **57,2 kWp**	Surface **363 m2**	Inclination **0°**	Batteries **no**
Contracted Power **119 kW**	Applicable legislation	RD 900/2015 *Autoconsumo* tipo 2			
Annual electricity consumption **338.288 kWh/year**	Installation costs	Total investment **75.595 €**	Price per Wp **1,32€/Wp**	Potential grant subsidy by Govern Balear	Subsidy amount **12.480 €**
Annual electricity bill **41.953 €/year**	Benefits	Annual solar electricity production **83.855 kWh/year (24,8% of annual consumption)**		Savings on electricity bill **5.579 €/year (15,7% of annual bill)**	
		Surplus **15.533 kWh/year (15% of solar production)**		Income from sale of surplus **629 € (included in savings)**	
	Long-term benefits	Accumulated income in 25 years **251.475 €**	Pay-back time **9 years**	including subsidy	Pay-back time **7 years**

Table 7.- Example of a photovoltaic installation for a hotel. Source: self-made

A photovoltaic energy production installation for a 4 star hotel with 99 rooms open only during the season, with the current regulation of Self-consumption, **can be 57.2 kWp.** With this installation, **24.8% of the annual electricity consumption is covered with photovoltaic energy production** instead of consuming it from the main electricity grid. Approximately 15% of the solar energy produced is fed into the main electricity grid during the "off-season" when the hotel is closed. The total cost of the installation is 75,595 Euros (and 59,736 Euros if the Balearic Government subsidy is obtained). The estimated savings on annual electricity bills is 6,579 (including 629 Euros which is levied on the sale of surpluses). Therefore, **within 9 years the investment** would be returned (8 years with the subsidy).

The back-up tolls do not apply to this **installation of Type 2** for the moment. This installation will be registered in the Register of Self-Consumption and in the Register of Producers. A Representative should be hired for the sale of surplus energy and for submitting the quarterly statements of income received to the Treasury. The response of the distributor to give the connection point and to arrive and review the installation on site once completed is 30 days, in both cases.

For installations with photovoltaic power exceeding 100 kW, the following is required::

- Administrative authorization must be obtained directly from the Directorate General of Energy and Climate Change of the Balearic Government.
- The connection to the distribution network must be made at the same connection voltage (medium or high voltage). These types of connections can make the process more challenging, impose additional costs and thus reduce profitability.

The *2015 Self-Consumption Law* is a complex and restrictive law. However, it defines a concrete framework in which photovoltaic solar installations for self-consumption can be made that are cost-effective and which mean a reduction of the own electricity consumption.

The Balearic Government is committed to self-consumption for individuals, companies, non-profit organizations, business associations and the administration itself through grants and bonuses. In addition, the Balearic Government has developed a system of legalization through its web platform "finestreta única" that facilitates the process.

Today, self-consumption is viable and favorable in Ibiza. It is advisable to always ask for 3 offers to companies specialized in photovoltaic before deciding, and that includes carrying out all the steps on behalf of the client.

Self-consumption, both in companies and homes, is a key component to move towards a 100% Renewable Ibiza.

4.4 Electric Vehicles

Electric mobility has two basic points of view: as a user of an electric vehicle and as sellers of electricity for electric vehicles.

As a reference, some data regarding electric vehicles:

- On average, they spend between 15-20 kWh / 100 km
- They have an autonomy around 200-250 km
- They can be recharged with conventional (private) systems at a power of 3.7-7.2 kW, ranging from 6 to 8 hours
- In a fast charging system the power is 50 kW and the battery can be charged within 20-30mins.

4.4.1 Electric vehicles Recharging sales points: Electro-stations

Electric vehicle charging stations distributed throughout the territory.

The regulation establishes that this activity may be carried out by the suppliers and companies with the economic activity of "Gestor de Carga".

In Ibiza, there is no network of electric-stations, although there are various initiatives to make it possible. It would be desirable to have a system based on photovoltaic energy production (such as Fastned).

Miguel Vericad, Conseller de Medi Ambient, Consell d'Eivissa

"It would be necessary to carry out a Sustainable Mobility Plan for Ibiza, including electric mobility, electro-stations, bicycle lanes, pedestrianizing of urban areas, etc."

4.4.2 Electric vehicles Recharging private points

EV Recharging points in private buildings for charging private or third-party electric vehicles.

Electric vehicles have the advantage that they can be recharged in buildings with a conventional electric system. It is advisable, however, to install a point / recharging point for electric vehicles (PRVEs) in the house / building for its load.

The PRVEs are intelligent equipment that communicates with the vehicle to optimize the charging time and durability of the batteries. The recharging speed depends on the power of the equipment, from 3.7kW (8 hours) to 40kW (20 minutes). There are wall-mounted and tower-type models for public parking on roads.

The MOVEA Plan of the Ministry of Industry launched a subsidy program for the purchase of electric vehicles, setting-up of recharging points and for the increase of power[12] . The plan is relevant for individuals and for businesses.

The charging of electric vehicles increases the electrical consumption of the house / building. Therefore, the optimal option is to combine it with the installation of a photovoltaic solar system of the self-consumption type and recharge the vehicle with renewable and free electricity. If night charging is required, batteries can be installed to store solar energy during the day and have it available for recharging during the night.

When the setting up of a photovoltaic energy production system is not viable, it is advisable to hire a rate with hourly distinction (different prices in the daytime hours) and to recharge during the night.

4.4.3 Free electric vehicles Recharging points from the public administration

The public administrations of Ibiza have created several EV recharging points in public buildings and they are free (map of the recharge points, *link*).

The Govern Balear has developed distinctive methods to count and number the electric cars on the island, and to facilitate access to free EV recharging points on the island

[12] In the section on Subsidy Programs, the conditions of the MOVEA plan are further explained

- MELIB adhesive badge/sticker to place in the electric car *(link to apply for the MELIB card)*
- MELIB card, for free access to recharging points *(link to the form)*

The MELIB sticker and MELIB card serve to incentivize recharging of the electric cars for free in the charging points created by the public administration in their buildings.

They can be applied for at the Department of Industry on the third floor of the Consell d'Eivissa, by providing the documentation of the vehicle, a technical inspection card and a valid driving license.

The sticker to place in the car has a cost of 4.92 Euros and is received on the spot.

In 2017, the Govern Balear, Consell and Town Councils are working on a joint agreement to establish a network of public charging points and unify the advantages offered by each municipality to incentivize electric mobility. The main ideas of the agreement are:

- Free parking in ORA zone for electric vehicles
- Discounts in municipal car parks (directly managed by the city council)
- Tax bonuses on the Vehicles Tax
- Free recharging at municipal charging points for at least two years.

Electric mobility is a key element for a 100% Renewable Ibiza as it provides the island with independence from external fuels. With electric mobility, it is necessary to develop sufficient renewable electricity production to cover it.

The Balearic Government, Consell Insular and town councils of Ibiza are working on the promotion of electric mobility and offer many benefits for its users.

The Central Government subsidizes the purchase of electric vehicles, points of vehicle recharging and increase of power of the electrical installation.

5 CONCLUSIONS AND RECOMMENDATIONS

Ibiza is a small paradise with a high-energy intensity that is currently based almost entirely on the in-situ combustion of fossil fuels (diesel, gasoline and natural gas). CO2 emissions and other pollutants of this conventional energy model have a direct impact on the island's inhabitants and the millions of visitors annually, and energy supply is highly dependent on foreign oil-exporting countries.

In the past, this energy dependence has provoked the proposal of oil prospecting initiatives in the environment. Ecologists, companies, associations, public administration and civil society in Ibiza have demonstrated their willingness to prevent these initiatives from being realized. **Although this resounding position against oil prospecting by the Ibizan society has opened up the debate for an island based on renewable energy.**

Moving towards a sustainable energy model – self-sufficient, decarbonised and based on renewable energy – is already a reality that is being implemented worldwide. **For an island like Ibiza, the benefits of debating a New Energy Model are clear: the opening up of a new market, a healthier and cleaner environment, reduction in energy costs and creating an independence from fossil fuels.**

Photovoltaic solar energy is possible and desirable for Ibiza. The technology is mature and profitable, the climate conditions are optimal and legislation, despite being complex and more restrictive than desirable, provides an array of opportunities for individuals, companies, organizations and public administrations to take a step forward by pushing forward this technology that offers clean, free and sustainable renewable energy.

Together with renewable electricity production possibilities, the transformation of conventional mobility on the island to electric mobility is an important aspect in achieving this sustainable energy model, since mobile consumption represents about 40% of the total on the island.

Electric mobility will create an increase in electricity production demand and it will only be sustainable when it is supplied with renewable energy sources.

The energy sector in Spain is governed mainly by the Central Government. Renewable energy policies in Spain have gone through obstacles in recent years: "the scam of the sun", "the sun tax", are some of the phrases used in the media and which discourage private and corporate investment in the field.

Despite all this, Spain must comply with the guidelines that the European Union defines and has also signed, with 194 countries, the commitment of the COP21 (the Paris Agreement) to combat climate change. **The current regulation of renewable energy in Spain is not ideal, and yet solar photovoltaic energy production has proven profitable and many facilities are being established throughout the peninsula.**

The Govern Balear has a set strategy and a clear proposal to make the Balearic Islands self-sufficient and decarbonised, based on renewable energy. All political parties on the islands express their agreement with this vision. Currently, the regional government is promoting photovoltaic solar energy with grants and subsidies to individuals, companies, non-profit entities and public administrations.

The Consell d'Eivissa and the five municipalities are also interested in promoting renewable energy production. As they do not have energy, their actions are primarily expressed by installing photovoltaic energy production installations on their buildings, by setting up free recharging points for electric vehicles and by active participation in the dissemination of renewable energy and electric mobility on the island.

The private sector, both private individuals and businesses, is at a standstill mainly due to uncertainty, lack of information and difficulty in identifying specialized companies in the field.

The photovoltaic sector must develop and grow substantially if it is to optimize the vast potential of this technology in Ibiza. It is necessary to enhance the professional human capital in the sector both for those companies who pioneered and already realized installations on the island, as for those who wish to pursue new investments in the market.

Recommendations to Advance Solar Energy in Ibiza

To advance solar energy in Ibiza, all sectors have to assume responsibility. Below is a series of recommendations to help in this direction:

Recommendations Targeted to the Local Public Sector (Consell and Ayuntamientos)

1. Establish a dedicated office for the promotion of photovoltaic energy production in Ibiza, representing the goals of the Balearic Government, Consell d'Eivissa and the local town councils. This office should include professionals specializing in renewable technologies and personnel with relevant legislation background, and serve as the primary place ("one-stop shop") for consistent information on suppliers and the process.
2. Develop financial incentives to companies offering services in photovoltaic energy for training and/or hiring professionals; both local and international companies wishing to invest in Ibiza would be eligible for these incentives.
3. Modify the subsidies from the Balearic Government to self-consumption so they are not limited in time (they should remain open until the completion of the allocated budget).
4. Enact municipal laws that obligate tourist accommodation establishments to install a solar energy production facility at the time a renovation is made or when license renewals are applied for.

Recommendations Targeted to Central Government

5. Carry out a renewable energy auction specifically for the Baleares that would consider installations in Ibiza according to size.
6. Develop a net energy metering system for the island's tourism sector. With these businesses sometimes closed for 4-6 months during the year they could contribute to the reduction of energy production from fossil fuels during the off-season.

Recommendations Targeted to the Private Sector

Businesses that Offer Energy Related Services

7. These businesses, already active in the energy industry should train and allocate more employees to areas related to solar energy.

Other Businesses and Private Individuals

8. Assume responsibility regarding personal and business contribution to climate change. For example, calculating emissions and taking measures to reduce and offset them, such as installing solar panels and driving an electric vehicle.
9. Assume more responsibility to study the technical, economic and legal information regarding self-consumption installations and when attempting to install one, to seek at least three proposals from suppliers to create healthy competition.

Recommendations Targeted to Civil Society

10. Develop a detailed study of the island, including uses and sectors with hourly and monthly profiles. Define energy consumption and production related indicators to help monitor the progress of the renewable energy transition.
11. Facilitate relationships and communication between business owners (mainly from the tourism sector) and companies in the solar energy sector, to moderate the prevailing sense of uncertainty in the sector.
12. Enhance communication activity to encourage individuals and companies to carry out installations at their homes and businesses.

A STEP BY STEP GUIDE SELF-CONSUMPTION INSTALLATIONS IN FAMILY HOUSING

The houses that today can enjoy self-consumption in Spain are single-family homes, both semi-detached and independent houses, in the countryside or in the city.

Dwellings in multi-family buildings (apartments) cannot carry out these installations with the current regulations. In multi-family buildings, the community of neighbours can make an installation for communal uses (elevator, swimming pool, stairs, etc.) but not for the apartment's private use.
Self-consumption is the "in-situ" production (inside your home) of electricity from a renewable source such as wind, solar or cogeneration. It is considered to be a self-consumption facility because it is an internal installation to the house: a device inside your electrical installation but instead of consuming energy, it produces energy.

All installations incorporate an intelligent system **that uses the solar energy when there is sun and public electricity from the main grid when necessary (no sun).**
Batteries that store excess solar electricity can be put in when needed. That makes the installation a bit more costly. It makes sense if significant consumption cannot be achieved during the day when there is the most sunlight; for example, when the house is used intermittently (if used on weekends) or when charging an electric vehicle at night.

Usually, the best solution is to consume the most energy during sunshine hours (washing machines, pool pumps, etc.). There are various systems that can be programmed to initiate the most consuming equipment automatically when there are high levels of solar production.

If there is excess production over consumption which cannot be stored (because there are no batteries etc.), this electricity will be fed into the grid. Another neighbour will consume it. Energy you do not consume or store is consumed by others but without compensation to the producer. For this reason, today, the design criterion of the self-consumption for housing facilities is to ensure all produced solar electricity can be consumed instantaneously in the dwelling.

What is achieved with a self-consumption facility is a reduction in the producer's electricity bill. All the electricity produced by the solar photovoltaic installation **is a free, clean and renewable energy.**

The Spanish law on self-consumption requires that installations accomplish several requirements and legalizations. Companies specialized in photovoltaic can offer to carry out all these obligations and actions on behalf of the client.

These obligations are summarized in:

- Limit the photovoltaic power to that contracted. Most homes have enough with 2-4 kWpv (to ensure all solar electricity is consumed in the home). The power that has been contracted will be between 4.4 kW and 8.8 kW.
- Legalize the installation with the Balearic Government and register the installation on the Self-consumption Register. The main office is in Palma, however, there is a website from which the entire process of self-consumption can be managed: the "finestreta única"*(link).*
- Get permission for a connection from the distribution company of the area (in Ibiza, it is Gesa-Endesa). The distributor has discretion to deny the connection if the power lines that reach the house exceed the 50% photovoltaic facilities limitation. All the requirements with the distributor can be made through the website "finestreta unica".
- "Lose" the excess solar electricity, which is not stored or consumed by the producing house, to the main electricity grid without compensation.

In Ibiza, to find a specialized company in photovoltaic, you can search in one of these ways:

- PIMEEF (Association of Employers of Small and Medium Businesses, *web*): que dispone de los datos de todas las empresas instaladoras asociadas que ofrecen el servicio de fotovoltaica
- Some electricity suppliers such as Holaluz *(link)* and Feníe Energía *(link)* offer this service to their customers, so it is recommended to initially consult with the current electricity supplier of the house to see if they have this service.
- List of companies that compiled the project ¡Conéctate al Sol! *(link)*

It is advisable to request three proposals.

Once a photovoltaic installation company is chosen, then, the steps to follow are:

1) Present to the "*finestreta única*" the project proposal and request a connection to the distributor. The distributor must respond within ten days. The applicant has three months to confirm if proceeding with the project and the proposal has a validity of 15 months. The distributor has discretion to deny the connection if the power lines that reach the house exceed the 50% photovoltaic facilities limitation. The *Directorate General d'Energia i Canvi Climàtic* can be approached when a rejection is made.

2) With the approved connection point, you can start the installation. It takes approximately two to three weeks for the materials to arrive and two to three days of installation work in the house.

3) Once the installation is finished, a new procedure is carried out that leads to the technical review of the installation by the distributor company. A technician from the distributor company should arrive to adapt the electricity meter connections to the new installation. The distributor has ten days to do so after submitting the application.

4) The last step is the registration in the administrative *Register of Self-Consumption*.

The companies specializing in photovoltaic installations coordinate and manage the process for the client, including all the requirements and obligations.

Basic installation

A photovoltaic installation for a house of 4,4 kW and annual consumption of 2,000€ could be of 3 kW photovoltaic and would occupy about 20 m2.
The installation can be placed on the ground or roof on prefabricated structures of concrete that lean to the surface, inclined to 30º and facing south. This is the most economic design criteria. A 3 kWpv installation on structures costs around € 9,000.
This installation can produce about 40% of the annual electricity consumption, so the bill would be reduced by 700€ on a typical house. After 8 years, the investment would have been recovered, and thereafter the consumption attributable to the production can be considered pure profit, both economically and environmentally.
Depending on the dwelling and its use, a basic installation could recover its investment within 8-10 years.

Installation with batteries

If the consumption pattern of the house does not match the solar production pattern, for example, there are peaks of production when the house is hardly consuming (if you want to connect an electric vehicle to charge it at night or there is intermittent use only on weekends), then it is advisable to install a battery. With a battery, the cost would rise to 12-14,000€ , so the investment recovery would be 13-17 years.
This calculation has been done without considering the saving in gas when changing to an electric vehicle.

Architectonical integration

To reduce the visual impact of the photovoltaic system, there are several design strategies:

- Tilting them down to ensure they are cleaned in the rain (10º). In this way, they would practically not bulge out on a flat roof.
- Integrating them into a structure that serves as shade; new or existing, even putting them in horizontally. If they are placed horizontally, maintenance must be carried out to clean them in a timely manner.
- There are glass facades with integrated photovoltaic panels.

All are more expensive solutions than the basic installation, but, since the installation has a life span of more than 25 years, it may be worth deploying the best solutions, not only in technique, but in design as well.

Photovoltaic solar energy is possible and desirable for any home in Ibiza. The technology is mature and profitable, climate conditions are favourable and legislation, despite being complex and more restrictive than desirable, leaves ample room for manoeuvre for individuals to take the next step forward by deploying this technology that offers clean, free and renewable energy.

ANNEX:
SUBSIDY PROGRAMS

Subsidies for the promotion of photovoltaic solar energy installations on the Self-consumption regime for private individuals, non-profit entities, companies and business associations in 2017

Applications were open from May 19 and the application period finished on August 30, 2017
All the information related to this call for subsidies can be found in the following *link.*
It is granted:

- 40% of the photovoltaic installation cost for self-consumption to SMEs and business associations
- 50% of the photovoltaic installation cost for self-consumption to private individuals and non-profit associations;

from the V.I.A. *Valor de Inversión Máxima Admisible* (maximum admissible investment) of 1,5 €/kWp.
A maximum capacity of 3 kWp peak power installations are subsidized for private individuals, communities of owners and non-profit associations and up to a capacity of 30 kWp of peak power installations promoted by companies and business associations.

The processing is done online. On the website there is link to the online procedure.
To apply for a subsidy, it is necessary to submit the following documents:

1. Applicant data and eligibility for grants
2. Technical data of the installation and proposed budget
3. In the case of budgets of installations above 50,000 Euros or of technical consultancy above 18,000 Euros, one must present three proposals .

Additionally, it is necessary to submit:

- A copy of the email addressed to the distribution company for the request of the connection point for the installation; and
- A copy of the latest electric bill.

The total allocation in 2017 made for these subsidies has been 400,000 Euros.

Impulse Plan for Mobility with Alternative Energy Vehicles (MOVEA)

A support plan promoted by the Ministry of Economy, Industry and Competitiveness, providing financial support for the acquisition of alternative energy vehicles and the implementation of charging points for electric vehicles.
The MOVEA 2017 Plan is 14,260,000 Euros, allocated between support for electric vehicles, for infrastructure for recharging and for gas-powered vehicles.
The MOVEA 2017 Plan **will end on October 15, 2017** or when the funds are exhausted *(link here)*.

It provides subsidizes **to individuals, self-employed, companies, regional public administrations and local public administrations:**

- Electric tourism, up to 5,500 Euros (in some cases, the car dealership contributes an additional 1,000 Euros for the purchase of the recharging point)
- Electric quadricycles: up to 2,350 Euros.
- Electric motorcycles: up to 2,000 Euros.
- Recharging infrastructures: between 1,000 Euros (for conventional recharging of more than 7kW) to 15,000 Euros (for 40kW fast load recharging)

Important notes
- Financial support can be granted to electric vehicles up to 9 months old since first registration, so that used cars available in some dealerships can be a good opportunity to purchase.
- The maximum allowable cost is 32,000 Euros for vehicles and 8,000 Euros for motorcycles.
- If the user cancels a vehicle of more than 7 years he shall receive an additional aid of 750 Euros.

This grant is granted in order of entry. In the 2017 call, the budget has been exhausted in 48 hours.

ISBA CAIB 2017 financing program for the promotion of Renewable Energy

Those eligible for this program may be **self-employed individuals and SMEs domiciled or carrying out an investment project in the Balearics in renewable energy facilities for Self-consumption.** Investments can be financed up to November 30, 2017. The loans are guaranteed by ISBA (Reciprocal Guarantee Company). Eligible candidates: SMEs and self-employed individuals who carry out an investment project related to renewable energy production in the Balearic Islands (e.g. photovoltaic solar energy installations and purchase of electric cars)

Economic conditions of the loan:

- Cost of the guarantee: 1.25% per year of the guaranteed amount (CAIB bonus of 100% up to the 4th year).
- Study expenses: up to 0.75%
- Capital retention: 4% of the investment amount, to be returned upon repayment of the loan.
- Interest rates: ISBA Agreement - EEFF / ICO Guarantee SGR 2017 (CAIB bonus of 2% to interest rates).
- Opening expenses: up to 0.75%
- Cancellation: exempt. **Financial support under this program can be formalized under the terms of the ISBA agreement with financial institutions, as well as through the ICO Garantia SGR 2017.**

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