



ENERGY COMMUNITY  
OF PORTELL DE  
MORELLA  
(CASTELLÓN- SPAIN)

Energy Community Project for  
a municipality in the interior of  
Castellón (Spain)

The project consists of a heat  
network to supply the  
residents and companies of  
the municipality and a PV  
installation to supply electricity  
to the same residents.

## **HEAT NETWORK FOR THE ENTIRE MUNICIPALITY**

The purpose of this project is for the construction of the first phase of the municipal heat supply network "district heating" with biomass boilers in the urban area of Portell de Morella.

### ***Users benefited from the action***

The users benefiting from the action will be all the residents of the urban area of Portell de Morella, who use the municipal buildings and those who decide to join the network.

It should also be noted that this measure will mean an increase in security in municipal buildings and in private homes, as it will not be necessary to handle and store fossil fuels and the noise and odor problems caused by diesel boilers will be eliminated.

Centralized management and maintenance, in addition to avoiding inconvenience to each of the individual users will allow optimization of the process.

The use of biomass as fuel will promote the creation of jobs in the area both for obtaining it (mountain cleaning), as well as for its transformation (chip or pellet) and transport. This will contribute to the settlement of the population in the area.

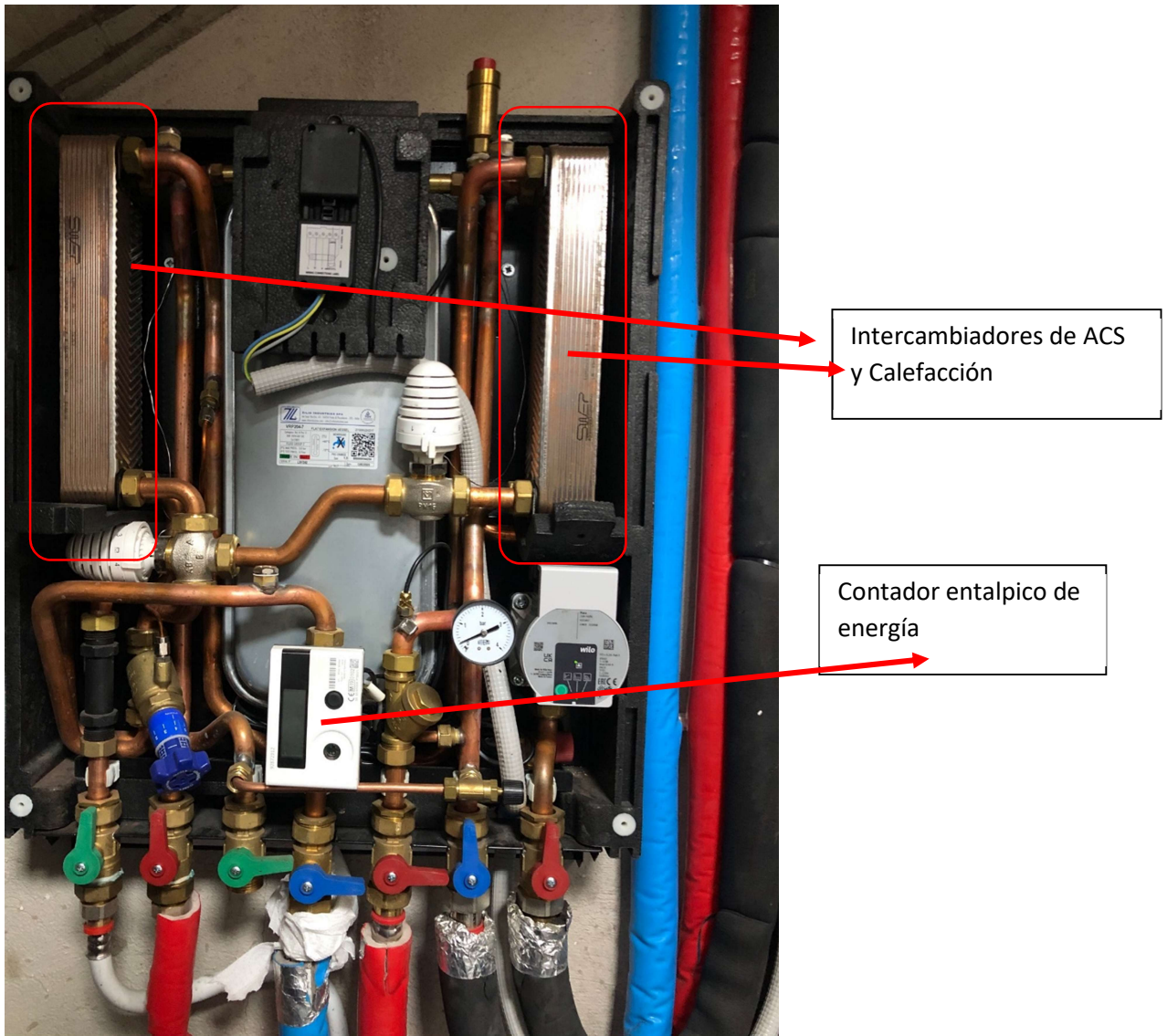
The global project consists of supplying heat and domestic hot water to all the buildings and homes in the urban area of Portell and the generation of electricity for self-consumption and the sale of surpluses to the electricity grid.

In the first phase, heating and domestic hot water will be supplied to all public buildings in the municipality of Portell de Morella.

In this phase, the construction of the silos for the storage of biomass and the heat generation plant - cogeneration is projected. Inside, a high-quality biomass boiler will be installed, which will work in cascade with those installed in the second phase in order to obtain greater performance from the whole.

The heat produced in the plant is distributed through a route of buried and pre-insulated pipes that reach the Town Hall, Home for the Retired, Municipal Apartments, Medical Office, Local Municipal Clapisses, Hotel and the Sports Center.

To transmit the heat and DHW (instantaneous) to the existing installation of each building, an energy station has been placed, which is mainly based on two plate exchangers (one for the heating circuit and the other for the instantaneous DHW) and a energy meter where the kilowatts consumed in each room are counted.



*Estación energética en cada punto de consumo.*

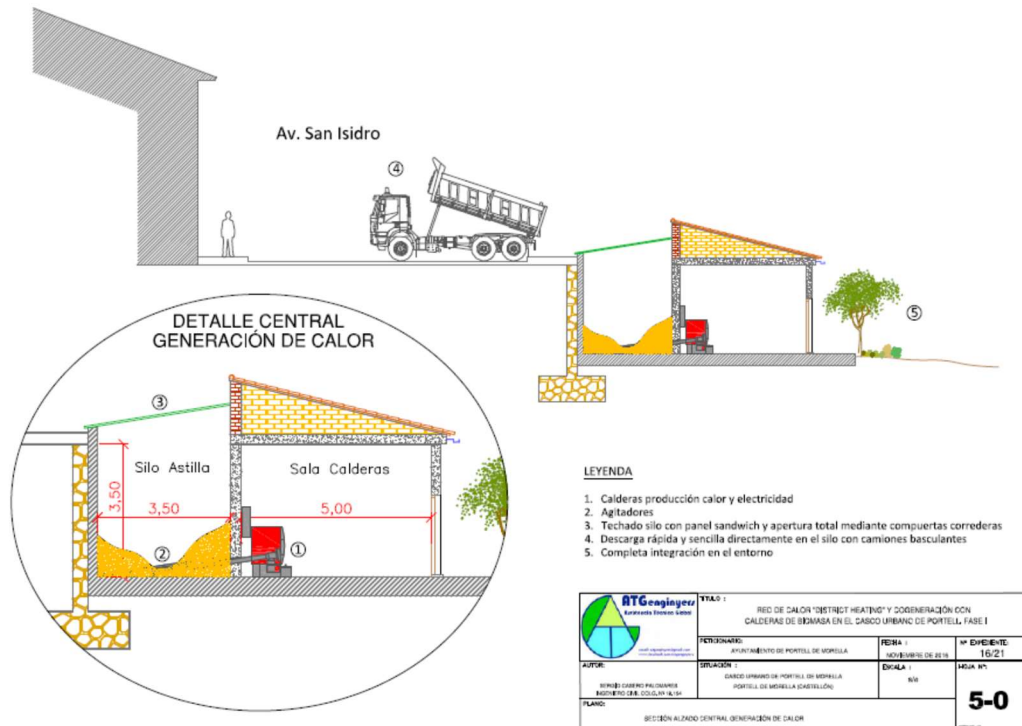
Thus, with two boilers, which means a single silo, a single boiler room, etc., the municipal buildings are supplied and there is the possibility of extending the circuit to the rest of the houses in the urban area of Portell de Morella.



*Sala de calderas*

Regarding the savings, the change from diesel to wood chips is going to mean a saving of 65% for the town council, in addition to being able to provide a very economical service to places where there was previously no heating, such as the sports center.

By locating the heat generation plant in a place where it can be accessed by large trucks, the price of fuel is reduced by around 20%, compared to the supply with a pneumatic tank.



Scheme of the installation, with the silo and the boiler room



Image of the chip silo

Currently, quality chips can be obtained for around €90/ton, which has an energy value of around 3,300 kWh, which means a cost per kWh of €0.027. However, diesel has a cost per liter of approximately €1.5 and an energy value of 10 kWh, which means a cost per kWh of €0.15.

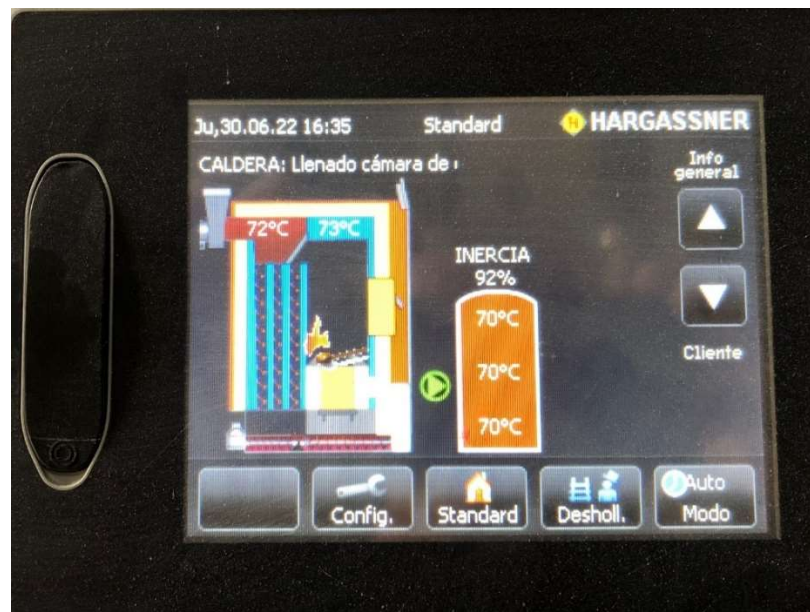
It is estimated that the boilers will be in operation for about 1,800 hours a year at maximum power, which will generate about 360,000 kWh per year with forest chips at a cost of €9,720. In the event that they had to be carried out with diesel, it would entail a cost of €28,800, therefore, there will be a saving of around 65% as specified above.

The following table shows us the consumption in kg in recent years

Año	Periodo	Consumo astillas Tm	Coste medio	Coste total	Energían kWh
2019	Marzo-Diciembre	155,5	90	13.995	513.150
2020	Enero-Diciembre	321,5	90	28.935	1.060.950
2021	Enero-Diciembre	368,5	90	33.165	1.216.050
2022	Enero-Junio	198,5	90	17.865	655.050

### WOOD CHIP INSTALLATION

Two 200 kW HARGASSNER WTH200 RA350 wood chip boilers have been installed, with a basic control and programming system module with lambda probe, fume cyclone, and two 5,000-litre inertia accumulators.



Configuration of the Wood chips



*Boiler room and accumulation or buffer tank*

### **PUMP SYSTEM**

A pumping group consisting of two Wilo 50/170-11/2 monobloc pumps with a frequency variator control system has been installed.

The electrical supply of the system, especially the consumption of the pumps, is carried out through a self-consumption installation on the roof of the building.

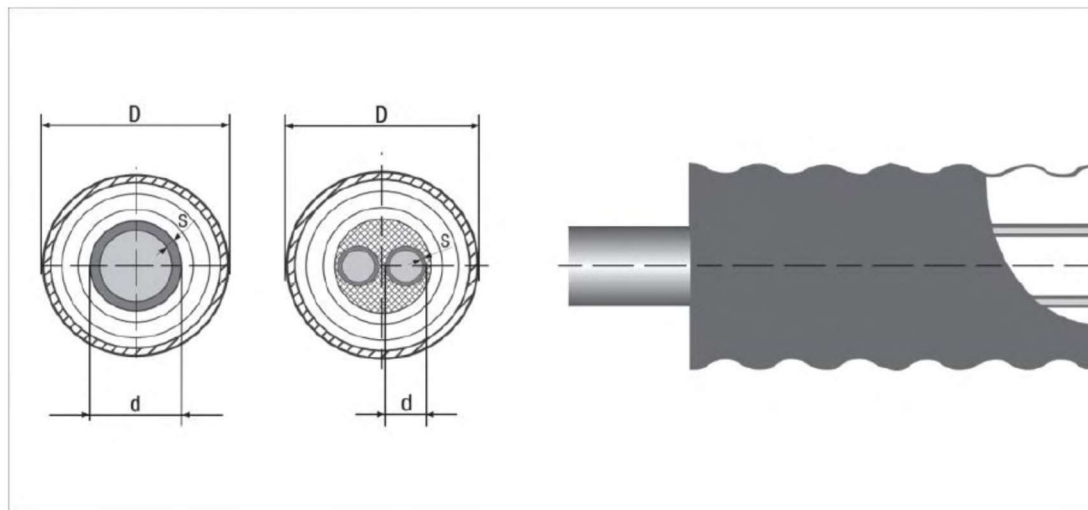
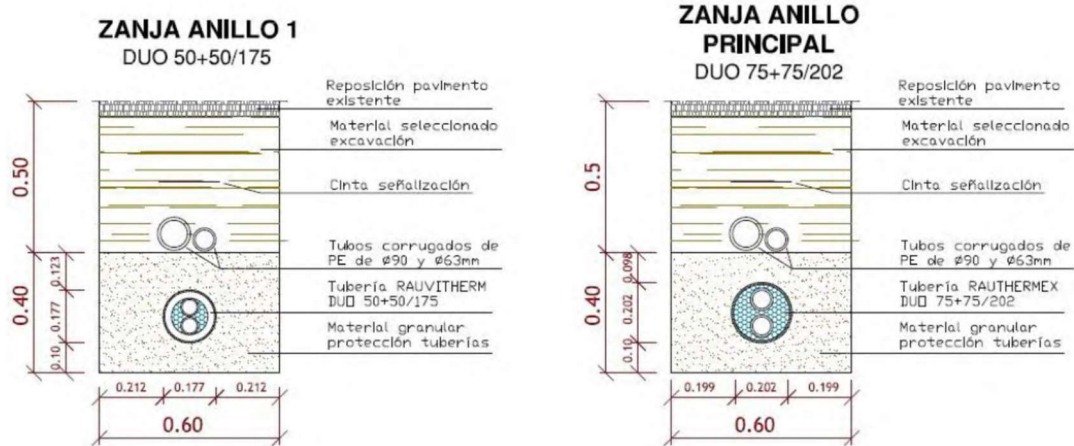


*Self-consumption installation on the roof of the district-heating boiler building*



## DISTRIBUTION PIPING NETWORK

The installed pipes are pre-insulated, RAUVITHERM model, consisting of an inner tube of high-pressure cross-linked polyethylene (PE-Xa), with an oxygen diffusion barrier (EVOH) and an orange protective membrane. Protecting the tubes there is an insulating shell of cross-linked PE. Finally, it is externally protected with a corrugated outer cover and foamed polyethylene insulation.



Esquema de instalación de las tuberías de calor en el casco urbano de Portell de Morella

The RAUTHERMEX are made up of an inner tube of high-pressure cross-linked polyethylene (PE-Xa), with an oxygen diffusion barrier (EVOH) and insulation with CFC-free PU foam continuously manufactured inside. On the outside, seamless overextruded polyethylene cover (PE-LLD).

Once the heat distribution pipes have been fully protected with sand, two double-walled red corrugated polyethylene pipes are installed, which will have a dual purpose: first, it will serve as a witness to warn of the existence of the pipes below. of heat distribution and will also be used to pass different cables that will serve to control the distribution mechanisms of the heat network. A signaling band will be extended over the pipes.

The rest of the trench will be filled with the selected material from the excavation. 8 manholes have been built for the corrugated PVC pipes made with 25x12x9 cm honeycomb brick walls with a 15 cm thick HM-20 concrete floor and a cast iron mark and lid.

### ***NODES AND CONNECTIONS OF THE BUILDINGS***

The Nodes and connections of the buildings are made up of special "T" pieces, large RVT 120-210 T external sleeves, foam for large RVT T sleeve 120-210m stopcocks and all the necessary elements for their correct execution. it will be necessary to cut the stone and concrete pavement and manually dig, cover the trench and place the concrete and stone slabs. The affected facades will also be replaced with the same existing material. It is important to prepare the connections at the time of installing the pipes, even if it is not done in the first phase.

Energy stations will be installed in the buildings, in the first phase they were installed in the City Hall, Retirement Home, Municipal Apartments, Medical Office, Local Municipal Clapisses, Hotel and the Sports Center. All energy stations will have a meter.

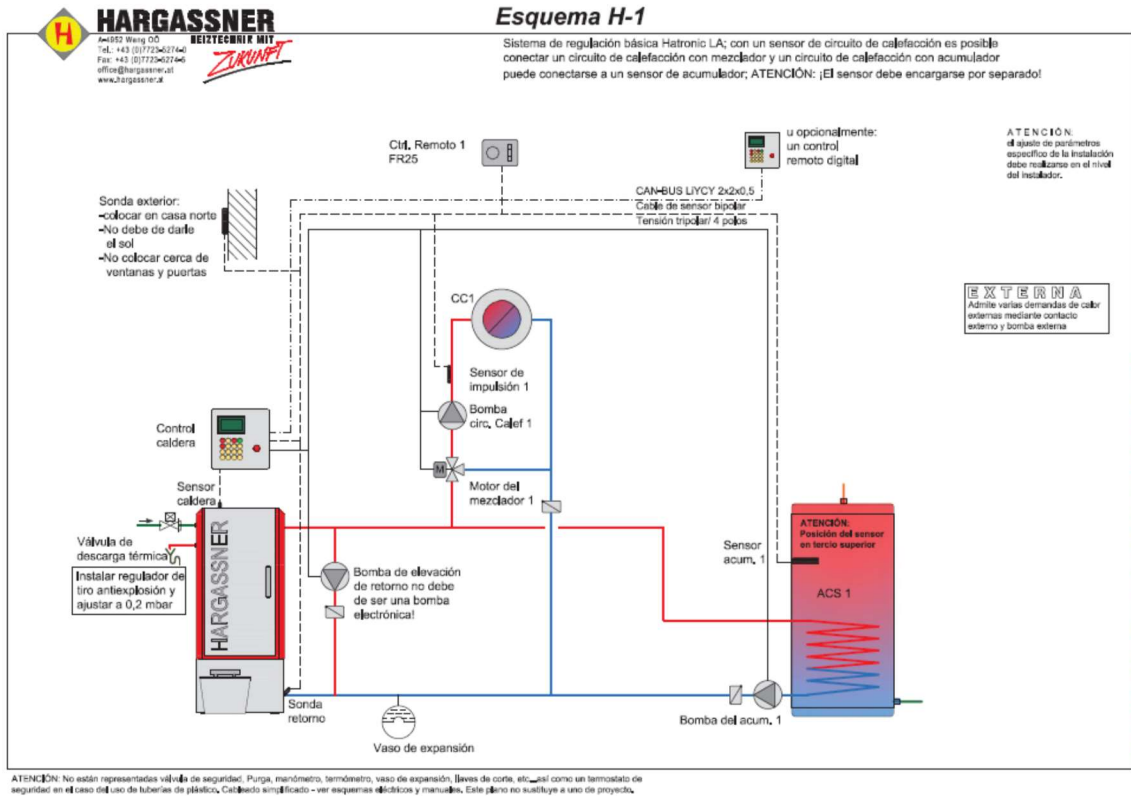
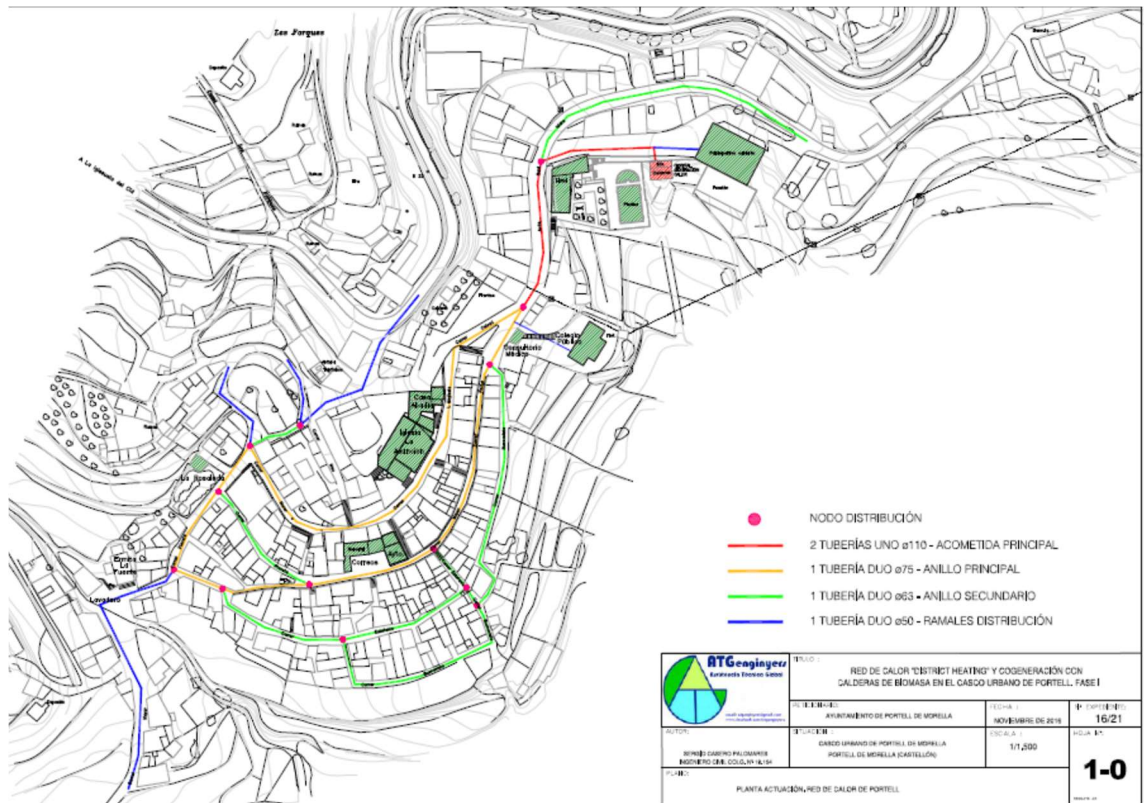
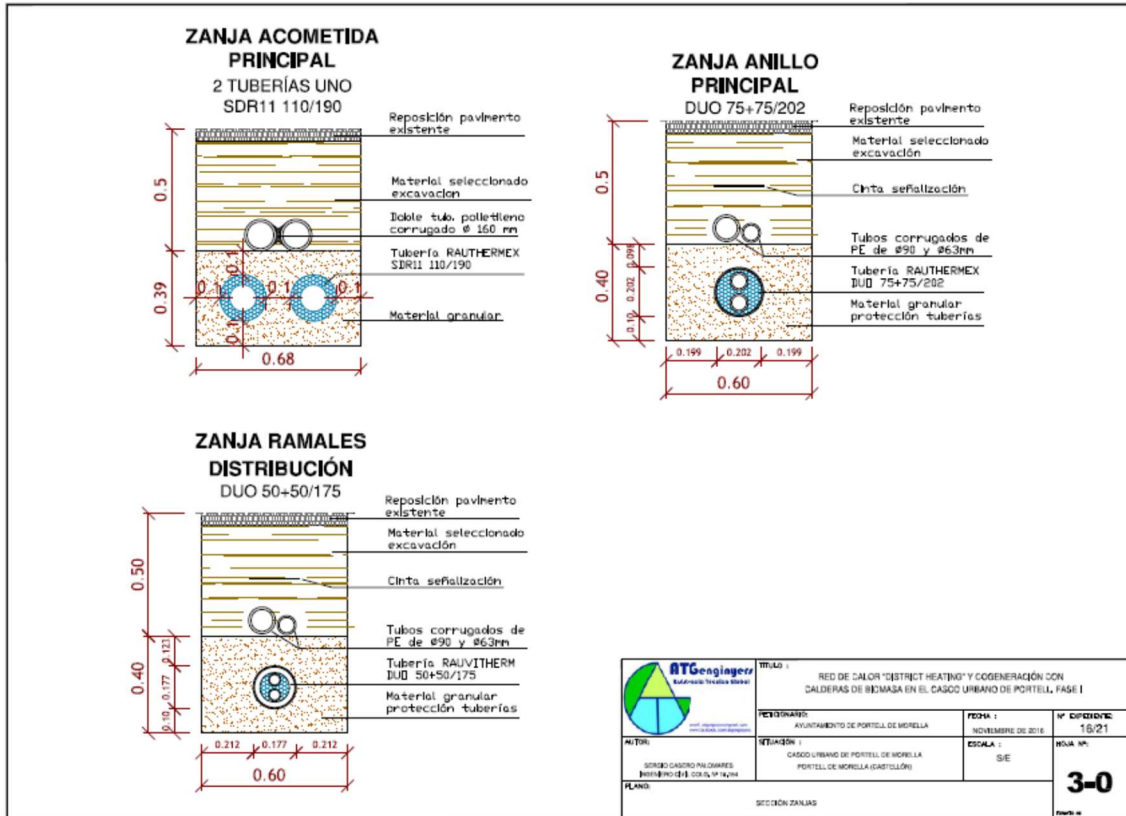


Diagram of the operation of the "district heating", with the boiler, the accumulation or inertia tank and the pumping system to the installation's pipe network.



Distribution of pipes of the "district heating" by the municipality of Portell de Morella



*Different ducts and pipes in relation to their position in the heat network*

### Operation and prices of the service by the City Council

The City Council of Portell de Morella has published a Tax Ordinance regulating the public price for the provision of the municipal heating supply service to the homes and buildings of individuals, companies and municipal buildings of Portell de Morella

It details the public prices for the provision of the heating supply or supply service to homes and private buildings, to companies and municipal buildings in the municipal area in the urban area of the municipality of Portell de Morella. (including down payment and placement rights and use of meters and similar facilities.

Article 3. Obligated to pay

Those who request and benefit from the service or activity covered by this public price will be obliged to pay the public price regulated in this Ordinance.

#### Article 4.- Amount

The amount of public prices to apply is as follows:

a) By annual consumption: The amount to be applied will be based on the following sections

- a.1.- First 10.000 kwh- 0,045 €/kwh
- a.2.- From 10.000 to 20.000 kwh- 0,03 €/kwh
- a.3.- More than 20.000 kwh- 0,045 €/kwh

b) Fixed amount for network connection: 12 €/mes (144 € anuales).

c) Acquisition of the heat exchanger:

The amount to be applied for the acquisition of the heat exchanger is €750 when making the request and another €750 at the time the service is provided.

#### Article 5, Obligation to pay.

- 1 - The obligation to pay arises from the start of the service.
- 2 - The obligation to pay in this public price is for annual consumption and will be effective only once.

## **PORTELLA DE MORELLA PHOTOVOLTAIC ENERGY COMMUNITY**

### **PROJECT**

The City Council of Portell de Morella promotes a photovoltaic solar installation with the collective self-consumption modality with surpluses accepted for compensation and connected through the network. The facility is located in the town of Portell de Morella, with the aim of promoting renewable energy communities, making possible the participation of public entities and part of the citizenry in promoting the use of clean energy and the decarbonization of part of the electrical energy consumed by these actors.

The photovoltaic solar installation is a solar garden that will have the following characteristics:

- Installation on rural land: 121.5 kWp and a 100 kWn inverter with Fronius



*FV solar instalation in Portell de Morella*

The project is based on the collectivization of photovoltaic energy for part of the businesses and homes connected to the same transformer, in order to reduce costs corresponding to the consumption of

electrical energy, improve the energy efficiency of the municipality and reduce CO2 emissions to the atmosphere. In this way, photovoltaic self-consumption is favored in those businesses and families that do not have enough space on their roofs.

The facility will have an innovative energy management system that allows the distribution coefficients to be changed at any time, this being a dynamic coefficient for the best use of the energy generated.

### **SUPPLY DATA**

#### **01. Municipal supply points: 15 unidades**

Contracted electrical power:

- P1: 15,001 kW
- P2: 15,001 kW
- P3: 15,001 kW

The annual consumption in each period per month in kWh is shown in the following table:

Meses	P1	P2	P3	TOTAL GENERAL
Enero	5.317,11	23.291,84	5.798,09	<b>34.407,04</b>
Febrero	4.342,95	16.200,87	5.168,80	<b>25.712,63</b>
Marzo	4.181,28	15.350,27	4.137,61	<b>23.669,16</b>
Abril	2.746,51	9.665,85	3.796,27	<b>16.208,63</b>
Mayo	1.547,57	5.333,48	2.185,71	<b>9.066,76</b>
Junio	3.798,29	14.325,85	3.091,38	<b>21.215,52</b>
Julio	3.519,19	14.783,34	3.808,76	<b>22.111,30</b>
Agosto	6.510,85	18.569,25	5.207,90	<b>30.288,00</b>
Septiembre	7.274,16	18.162,96	7.431,84	<b>32.868,96</b>
Octubre	8.360,30	23.919,68	9.698,36	<b>41.978,35</b>
Noviembre	4.277,59	22.244,22	8.303,27	<b>34.825,08</b>
Diciembre	4.852,74	24.334,02	6.737,83	<b>35.924,59</b>
<b>TOTAL GENERAL</b>	<b>56.728,54</b>	<b>206.181,65</b>	<b>65.365,80</b>	<b>328.275,99</b>

Period P1 represents 17.28% of total consumption.

Period P2 represents 62.81% of total consumption.

Period P3 represents 19.91% of total consumption.

## 02 . Single Family Homes: 65 Existing Units

Average contracted power electrical: P1: 4,6 kW

The average annual consumption of each home will serve as a starting point for the distribution of the generation of the solar plant.

In order to adjust the generation of the PV installations, a distribution of generation is made based on the annual consumption of each of the participants in the energy community.

The power distribution criteria established in the energy community are the following:

<b>CRITERIOS REPARTO POTENCIA COMUNITAT ENERGETICA PORTELL</b>	
<i>Energia anual consumida</i>	<i>Porcentaje asignado</i>
Kwh	
< 500	0
500 -1500	0,5
1501 - 3000	1
3001 - 6000	1,5
>6000	2
<i>El consumo deberá ser homogéneo a lo largo del año</i>	

From this distribution, 55 installations owned by as many neighbors have been registered, in such a way that for the first installation of 60 kWp of the Energy Community the distribution has been established in the following table:



<b>N. INSCRITO</b>	<b>Consumo medio mensual</b>	<b>Consumo anual (kWh)</b>	<b>Reparto</b>	<b>Porcentaje</b>
1	28,42	369,42	0	0
2	71,17	925,17	0,5	0,85
3	133,83	1.739,83	1	1,69
4	773,08	10.050,08	2	3,39
5	287,25	3.734,25	1,5	2,54
6	149,00	1.937,00	1	1,69
7	98,67	1.282,67	0,5	0,85
8	250,00	3.250,00	1,5	2,54
9	127,00	1.651,00	1	1,69
10	122,08	1.587,08	1	1,69
11	67,42	876,42	0,5	0,85
12	162,83	2.116,83	1	1,69
13	66,33	862,33	0,5	0,85
14	536,42	6.973,42	2	3,39
15	191,42	2.488,42	1	1,69
16	179,67	2.335,67	1	1,69
17	462,33	6.010,33	2	3,39
18	49,25	3.210,00	1,5	2,54
19	169,83	2.207,83	1	1,69
20	285,42	3.710,42	1,5	2,54
21		4.122,00	1,5	2,54
22	381,67	4.961,67	1,5	2,54
23	158,25	2.057,25	1	1,69
24	317,83	4.131,83	1,5	2,54
25	104,67	1.360,67	0,5	0,85
26		26.160,00	2	3,39
27	257,42	3.619,42	1,5	2,54
28	108,17	1.406,17	0,5	0,85
29	205,83	2.675,83	1	1,69
30	115,17	1.497,17	0,5	0,85
31	240,25	3.123,25	1,5	2,54
32	128,58	1.671,58	1	1,69
33	407,58	5.298,58	1,5	2,54
34	296,83	3.858,83	1,5	2,54
35	149,33	1.941,33	1	1,69
36	356,83	4.638,83	1,5	2,54
37	223,33	2.903,33	1	1,69
38	74,17	964,17	0,5	0,85
39	82,17	1.068,17	0,5	0,85
40	102,33	1.330,33	0,5	0,85
41	96,92	1.259,92	0,5	0,85
42	131,17	1.705,17	1	1,69
43	382,92	4.977,92	1,5	2,54
44	164,33	2.136,33	1	1,69
45	209,58	2.724,58	1	1,69
46	223,33	2.903,33	1	1,69
47	133,58	1.736,58	1	1,69
48	191,92	2.494,92	1	1,69
49	47,50	617,50	0,5	0,85
50	170,25	2.213,25	1	1,69
51	71,00	923,00	0,5	0,85
52	498,92	6.485,92	2	3,39
53	106,08	1.379,08	0,5	0,85
54	171,67	2.231,67	1	1,69
55	256,50	3.334,50	1,5	2,54
			<b>59,00 kWp</b>	<b>99,9</b>

In the same way that the distribution of generation has been done, a distribution of costs has also been established based on the consumption of each installation, as can be seen in the following table:

<b>CUOTAS COMUNITAT ENERGETICA PORTELL MORELLA</b>	
Alta nuevo socio	10 €
Cuotas anuales	
< 500	0
500 -1500	5 €
1501 - 3000	10 €
3001 - 6000	15 €
>6000	20 €

In this way, a homogeneous distribution of the costs and benefits of the installation is achieved, making it possible to increase the generation power in a second phase to cover a greater percentage of the demand.