GROUND SOURCE VERY LOW TEMPERATURE DHC IN ZORROTZAURRE. BILBAO

Prospectivas sobre ciudades, barrios y edificios en 2050. Presentación de resultados.

Madrid 14 de octubre de 2024

Plataforma Tecnologica de Eficiencia Energética de España

AmsTErdam BiLbao cItizen drivEn smaRt cities

atelier
Positive Energy Districts

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No.864374

INTRODUCTION

ATELIER, 30 partners from 11 countries are working together to create and replicate Positive Energy Districts (PEDs) within eight European cities.

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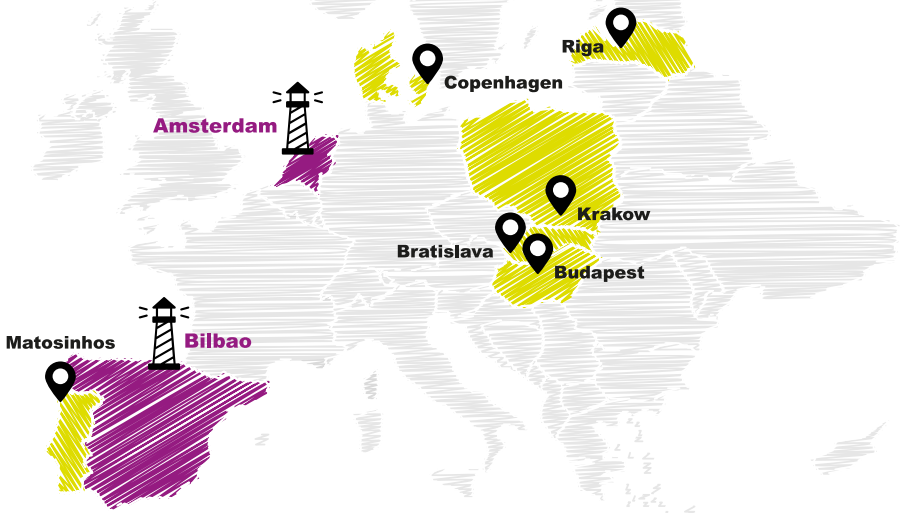
INTRODUCTION

ATELIER PED
TWO LIGHTHOUSE CITIES
SIX FOLLOWER CITIES



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Zorrotzaurre District

ZORROTZAURRE ISLAND ≈ 850.000 m² mainly of brownfield sites.

TELUR Geotermia y Agua, S.A. is the partner in charge of thermal energy issues.

Three demonstrator areas:

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Closed loop in Central Demo

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Closed loop in Central Demo


Drilling Works


Borehole conection to manifold box


Civil Works


Ø200 mm HDPE Grid

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Closed loop in Central Demo

Piping and Trenching.

Final stage of the square

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ßETA 2: HEATING AND COOLING EQUIPMENT

PREVIOUS SITUATION (January 2021 – February 2022)	
HEATING	Ph = 410 kW AIR TO WATER HEAT PUMP (ASHP)
COOLING	Pc = 312 kW WATER TO WATER HEAT PUMP + AIRCOOLER Pc = 547 kW AIR TO WATER HEAT PUMP (ASHP as Back-Up)

GEO-EXCHANGE CIRCUIT (GHX) (since March 2022)	
HEATING	**Ph = 386 kW WATER TO WATER HEAT PUMP + GHX (GSHP)** Ph = 410 kW AIR TO WATER HEAT PUMP (ASHP as Back-Up)
COOLING	**Pc = 312 kW WATER TO WATER HEAT PUMP + GHX (GSHP)** Pc = 547 kW AIR TO WATER HEAT PUMP (ASHP as Back-Up)

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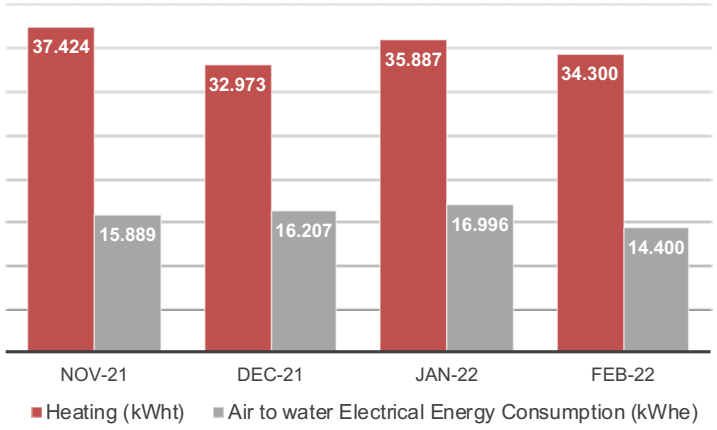
ßETA 2. Monitoring data

Pre GS thermal demand and consumption



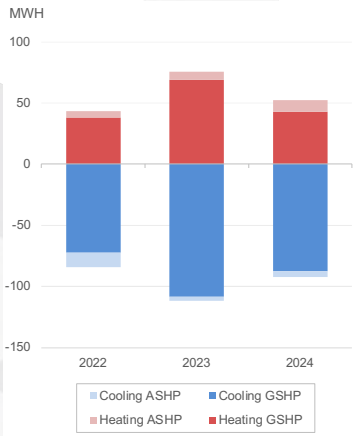
NOVEMBER 2021 TO FEBRUARY 2022

HEAT PRODUCTION: 140,5 MWh
ELECTRICITY CONSUMPTION: 63,5 MWh

SEASONAL PERFORMANCE FACTOR

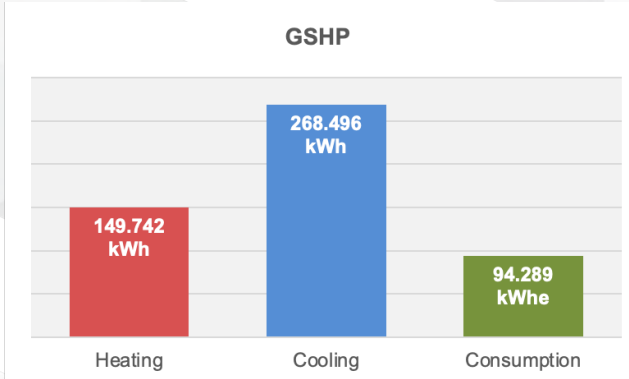
SPF: 2,2

Current situation

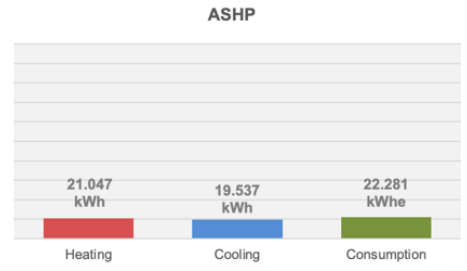


MARCH 2022 – AUGUST 2024

GSHP	ASHP
Heating 150 MWh	Heating 21 MWh
Cooling 268 MWh	Cooling 20 MWh
91 %	9 %



SEASONAL PERFORMANCE
SPF = 4,4



SEASONAL PERFORMANCE
SPF = 1,8

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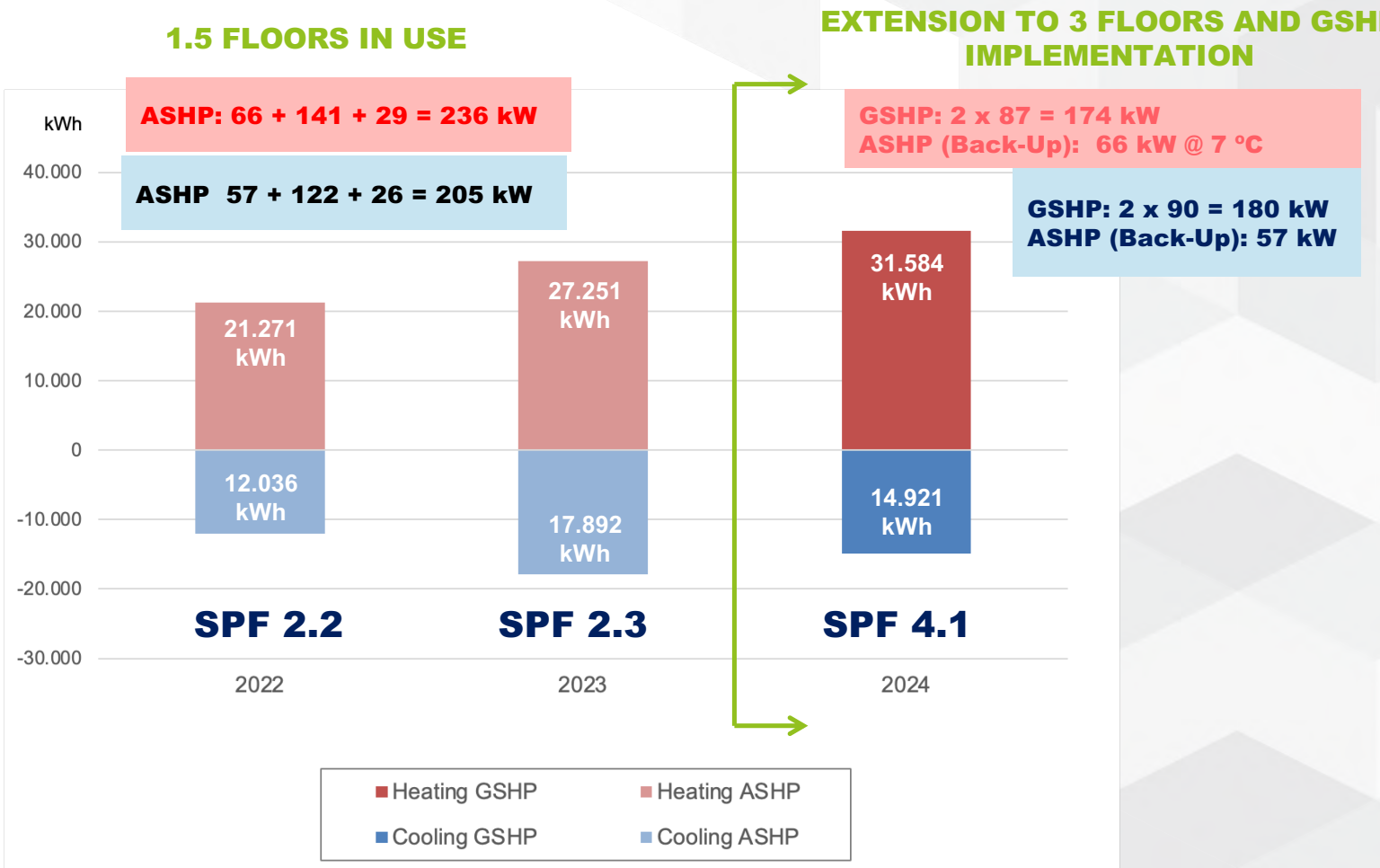
ßETA 1: Monitoring data



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Demo Punta Norte. RZ13

- ✓ 3 edificios residenciales → 172 VPO.

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Demo Punta Norte RZ13 172 VPO

	Bomba de calor Aire/Agua AEROTERMIA (100 kW)	Bomba de Calor Agua/Agua GEOINTERCAMBIO (100 kW)	Mejora BC AGUA/AGUA GEO vs BC AIRE/AGUA PARA 172 VVDAS VPO (548 kW)
Suelo Radiante 30/35 ºC UNE-EN 14825 UNE-EN 14511 EUROVENT	65 kW (7ºC) Pabs: 18,2 kW (Con Ventiladores) COP: 3.6	87 kW (0/-3 ºC) Pabs: 22,3 kW (Con circuladora terreno) COP: 3.9	
Suelo radiante 30/35 ºC Temperatura de cálculo (RITE) BIO: -0,2 ºC	43 kW (-0,2 ºC) x 2: 86 kW Pabs: 18.9 kW x 2: 37,8 kW COP**: 2,3** (Con ventiladores y desescarche)	102 kW (5/2 ºC _Temperatura terreno: 15,5 ºC) Pabs: 23,2 kW COP: **4,4** (Incluso circuladora terreno)	**COP: +2.1**
Nº de BC para la potencia de calefacción de diseño: 100 kW	2,3	1	**-7** Un. (-60%)
Producción centralizada de ACS	58 ºC? 55 ºC? 52 ºC? (Apoyo resistencias para alcanzar la Tª necesaria)	65 ºC	No boostering or Joule Heater needed
Consumo energía eléctrica (kWh/y)	**70.423**	**38.304**	**-187.842 kWh/y (-45.6%)**
Refrigerante (R410) PCA	18 kg * 2,3 = 41,4 kg (**86,4** teq CO_2)	10,5 kg (**21,9** teq CO_2)	**-167 kg (-349** teqCO_2)
Potencia eléctrica pico absorbida (kW)	49	27	**-119**
Potencia sonora (dB) (con atenuadores)	76,3	66	**-10,3**
Peso (kg)	454 X 2,3: 1.044	454	**-3,186**
Huella equipos (m^2)	2,28 m x 1,22 m: **2,78**	099 m x 0,88 m: **0,87**	**-10,3**
TEWI (*Total Equivalent Warming Impact*) grCO_2/kWh$_t$	**103,6** gr/kWh	**49,1** gr/kWh	**-54.5** gr/kWh (-52.6%)
TEWI kgCO_2/año	**14.280** kgCO_2/año	**6.768** kgCO_2/año	**-37,990 kg/y**

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Demo Punta Sur. IED Kunsthal

IED KUNSTHAL
mecanical room retrofit

1^{est} stage 100 kW GSHP implementation conected to a dedicated loop, 1800 m length.

145 MWh/y (91%) of heating + 80 MWh/y (100%) of cooling supplied

2nd stage 200 kW NG boiler total substitution by W/W HP connected to VLTDHC

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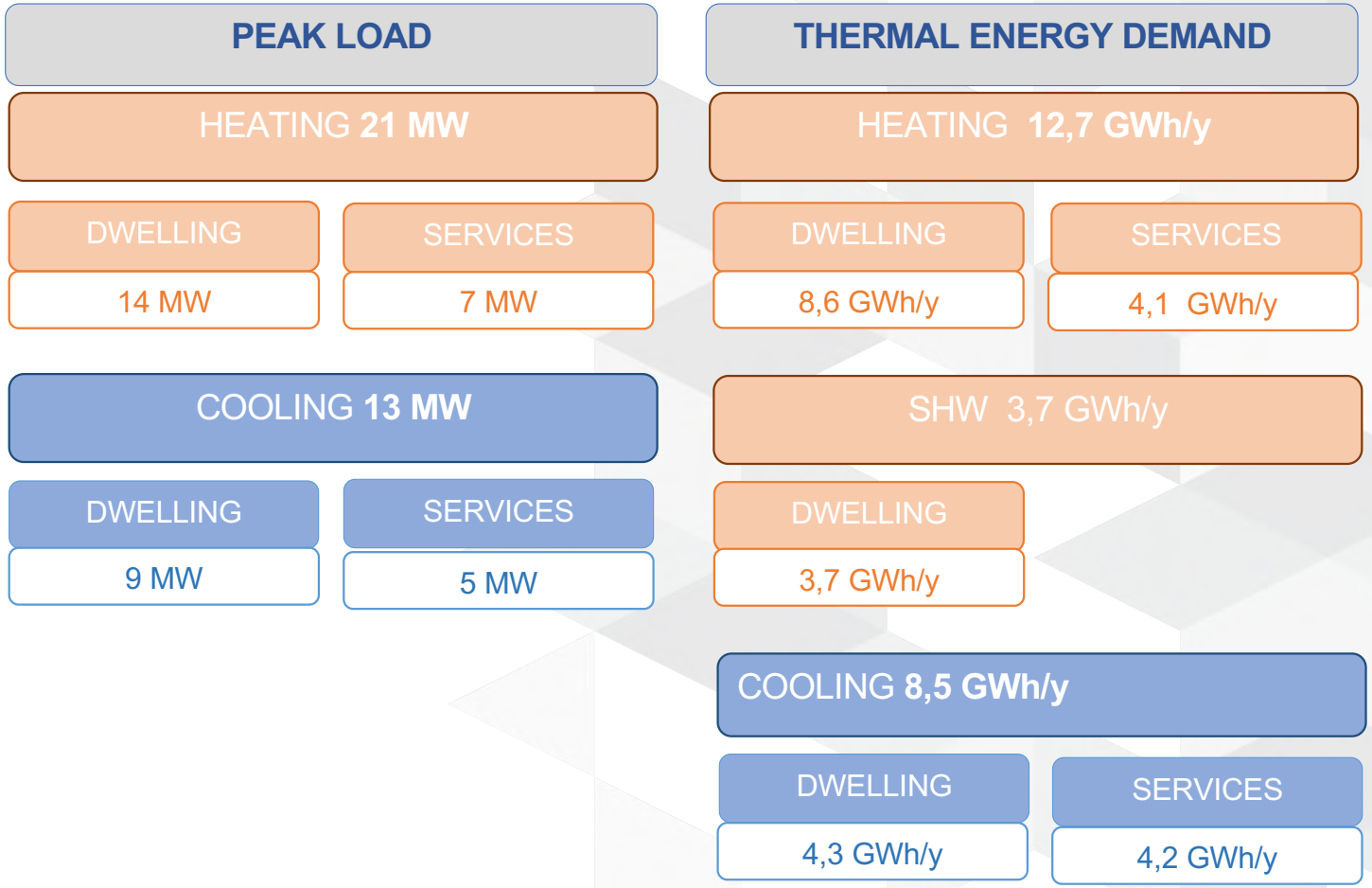
KPI Zorrotzaurre District



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KPI Zorrotzaurre District

INDICADORES	CTE [1] CALDERA CONDENSACIÓN GN+SOLAR TÉRMICA +BC AIRE/AGUA ALTA EFICIENCIA	BC AGUA/AGUA CON DHC DE MUY BAJA TEMPERATURA CON GEO	MEJORA BC AGUA/AGUA CON DHC MBT
REDUCCIÓN CONSUMO ENERGÍA PRIMARIA (GWh/y)	30	13,2	-16,8 (-56%)
EMISIONES GEI (t CO_2/y)[2]	6.062	1.956	-4.104 (-68%)
ENERGÍA RENOVABLE GENERADA EN LA ISLA (GWh/y)	1,1	14,8	+13,7 (x 13,5)
POTENCIA RENOVABLE INSTALADA (MW)[3][4]	1,8	21	+19,2 (x 11,7)

(1) CTE Código Técnico de la Edificación
(2) MINETUR: Factores de emisión de CO_2 y coeficientes de paso a energía primaria del MIX and NG.
(3) Directiva 2018/2001 relativa al uso de energía procedente de fuentes renovables.
(4) IDAE: Prestaciones medias estacionales de bombas de calor para producción de calor en edificios.

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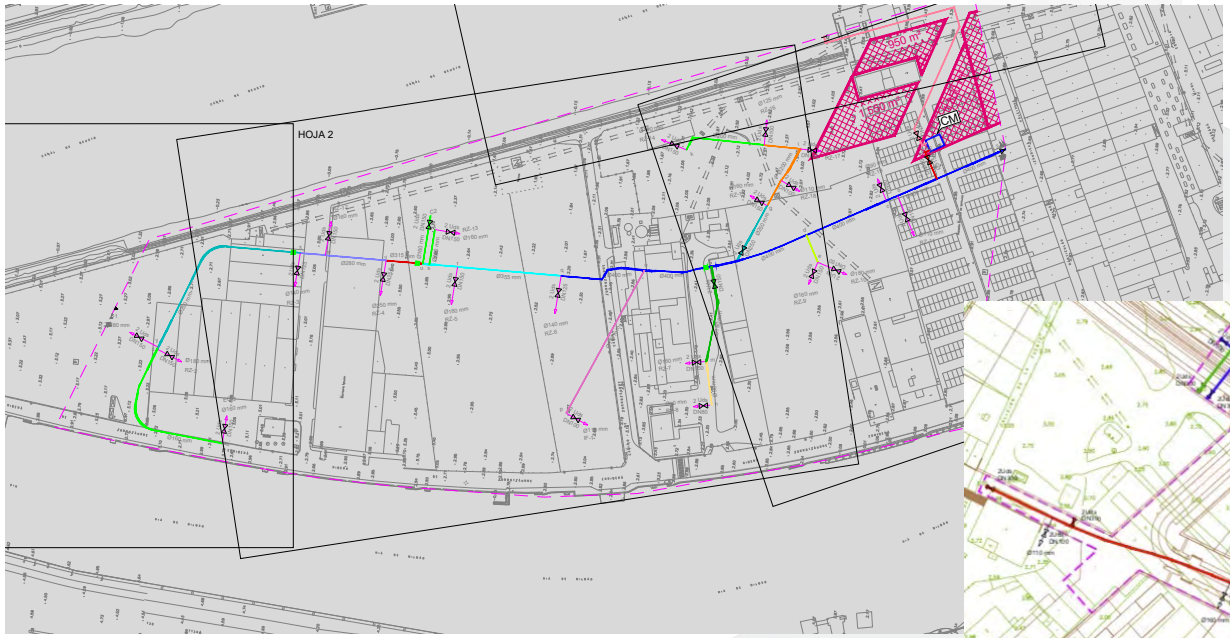
DHC Layout



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North Edge 5G DHC Piping Works

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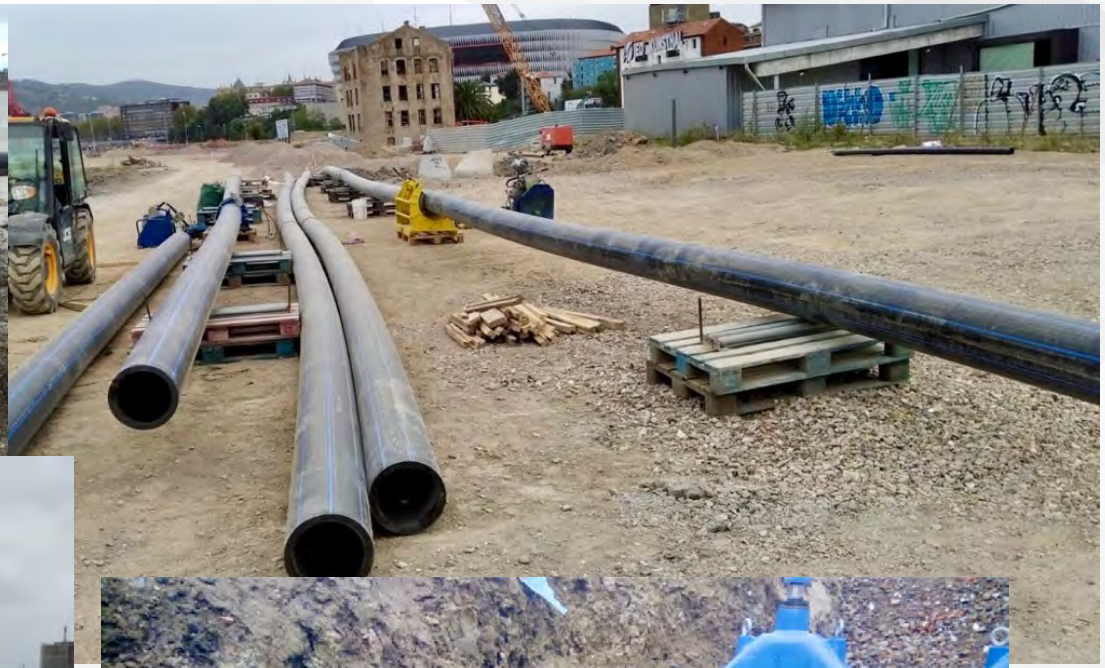
South Edge 5G DHC Piping Works



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