

GROUND SOURCE VERY LOW TEMPERATURE 5GDHC IN ZORROTZAURRE. BILBAO

22th April 2026

AmsTERdam BiLbao citizen drivEn smaRt cities



atelier
Positive Energy Districts



INTRODUCTION



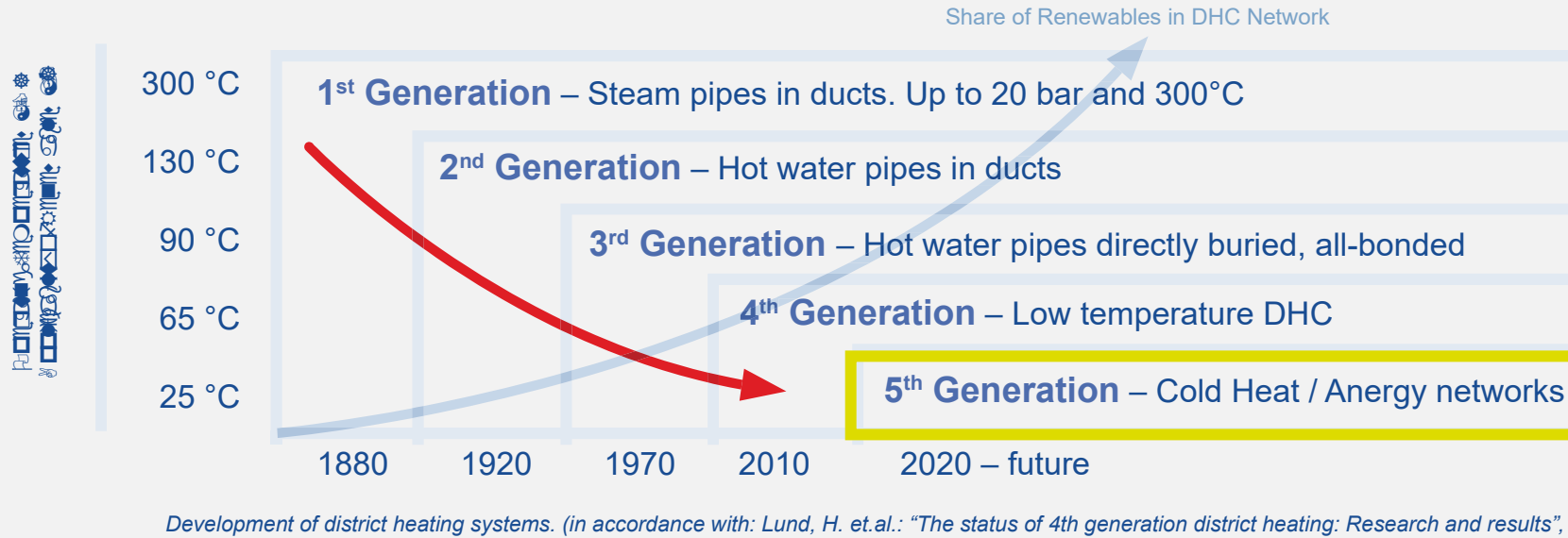
COMPANY DESCRIPTION

- Design and construction of GSHP systems and 5th generation DHC
- Activities across the entire value chain of a geothermal system, from feasibility study to after-sales service
- Promotion of geothermal Exchange systems
- ESCO in GSHP projects

ROLE IN ATELIER PROJECT

- Participation in the proposal
- Promotion of the GSHP among the island's stakeholders
- Design of GSHP systems and 5th generation DHC of Zorrozaurre (Bilbao)
- Construction of GSHP and borehole fields for 2 demo sites in Zorrozaurre (Bilbao)
- Monitoring of the GSHP installed and analysis of results

5G DHC (very low temperature networks)

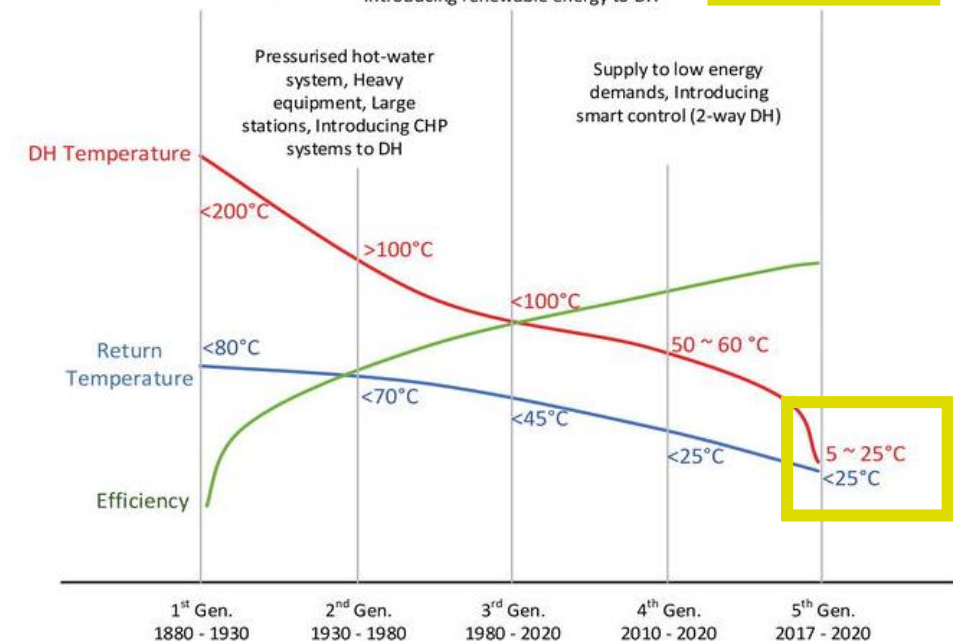


Pre-insulated pipes
Industrialised compact
Substations,
Metering and monitoring.
Introducing renewable energy to DH

Ambient temperature,
Introducing modular
expansion

5G DHC

- Anergy networks
- Supply heat / cold
- Heat flow bidirectional, sources and sinks.
- Large scale integration of renewable energy (GSHP, solar thermal) and waste heat.
- Not heat losses (even heat gain)
- Reduced investment: plastic piping vs steel. 2 pipes to provide cold and heat (not 4).
- Uninsulated HDPE pipes
- Temperatures 10 °C (winter) – 30 °C (summer)
- Ideal for mixes-use areas: residential, services and industrial



ZORROTZAURRE DISTRICT

AREA HEATED	457.000 m ²
NEW DWELLINGS	3.650 (62 BLOCKS)
EXISTING DWELLINGS	400 (46 BLOCKS)
NEW BUILDINGS	17
REFURBISHED BUILDINGS	23
HEATING CAPACITY	21 MW
HEATING DEMAND	12.7 GWh/y
COOLING CAPACITY	13 MW
COOLING DEMAND	8.5 GWh/y



Zorrotzaurre District Thermal Energy Proposals



1

DH with CHP natural gas plant on site (3G DH)

2

DH with Biomass placed in the neighbourhood of the island (3G DH)

3

DH with Waste Heat of Waste incineration Plant of Zabalgardi (distance 10 km)
(3G DH)

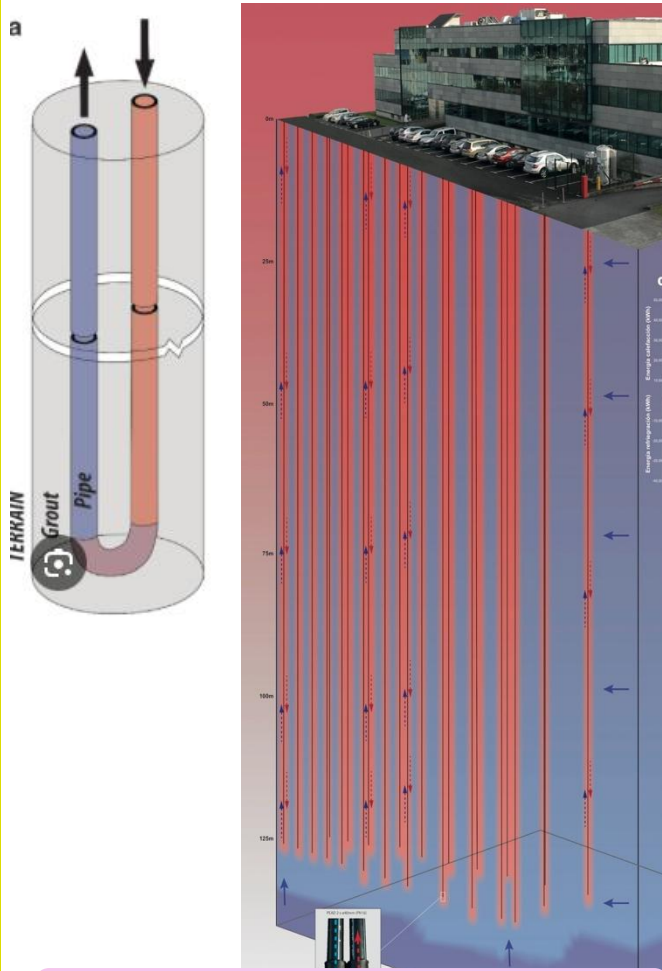
4

5 th generation DHC -> geothermal source: closed and open loop and surface water for peak loads



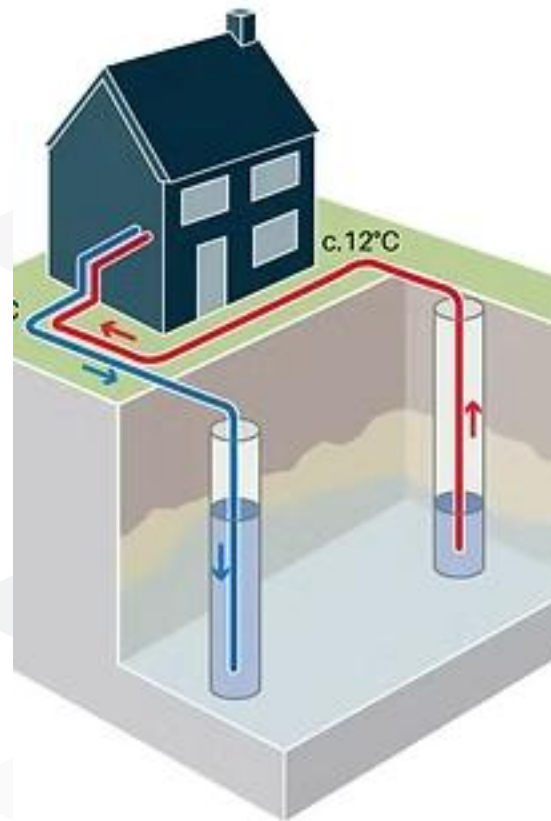
Zorrotzurre 5GDHC WITH WATER-WATER HEAT PUMPS

**CLOSE LOOP
(BOREHOLES)**



4 MW

**OPEN LOOP
(GROUND WATER WELLS)**



8 MW

**SURFACE WATER
(HYDROTHERMAL)**

3 MW

Zorrotzaurre 5GDHC EVOLUTION

2015

5GDHC first proposal: boreholes, groundwater wells and hydrothermal energy support.
First configuration of the network. 19 rings

**2019
November**

EU Atelier project started. Positive energy district.
3 demo areas: North, South, Centre

**2020
October**

Execution of opportunity works. Construction of the intakes to the river (Deusto channel)

**2021
December**

Boreholes field in the centre of the island to connect with Mondragon University, Digipen and dwellings

**2022
December**

5G DHC North Area. Completion of the network

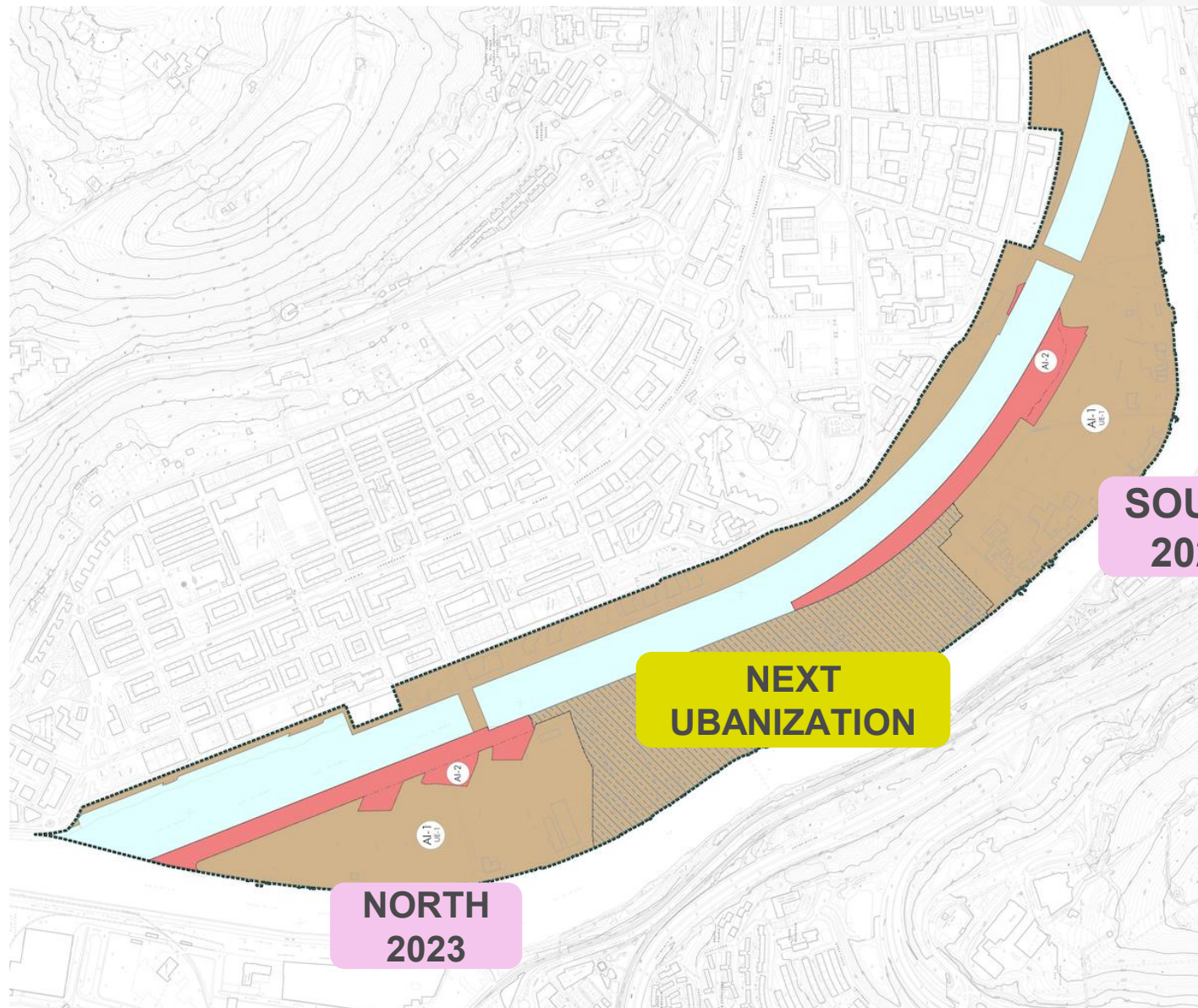
**2023
December**

5G DHC South Area. Completion of the network

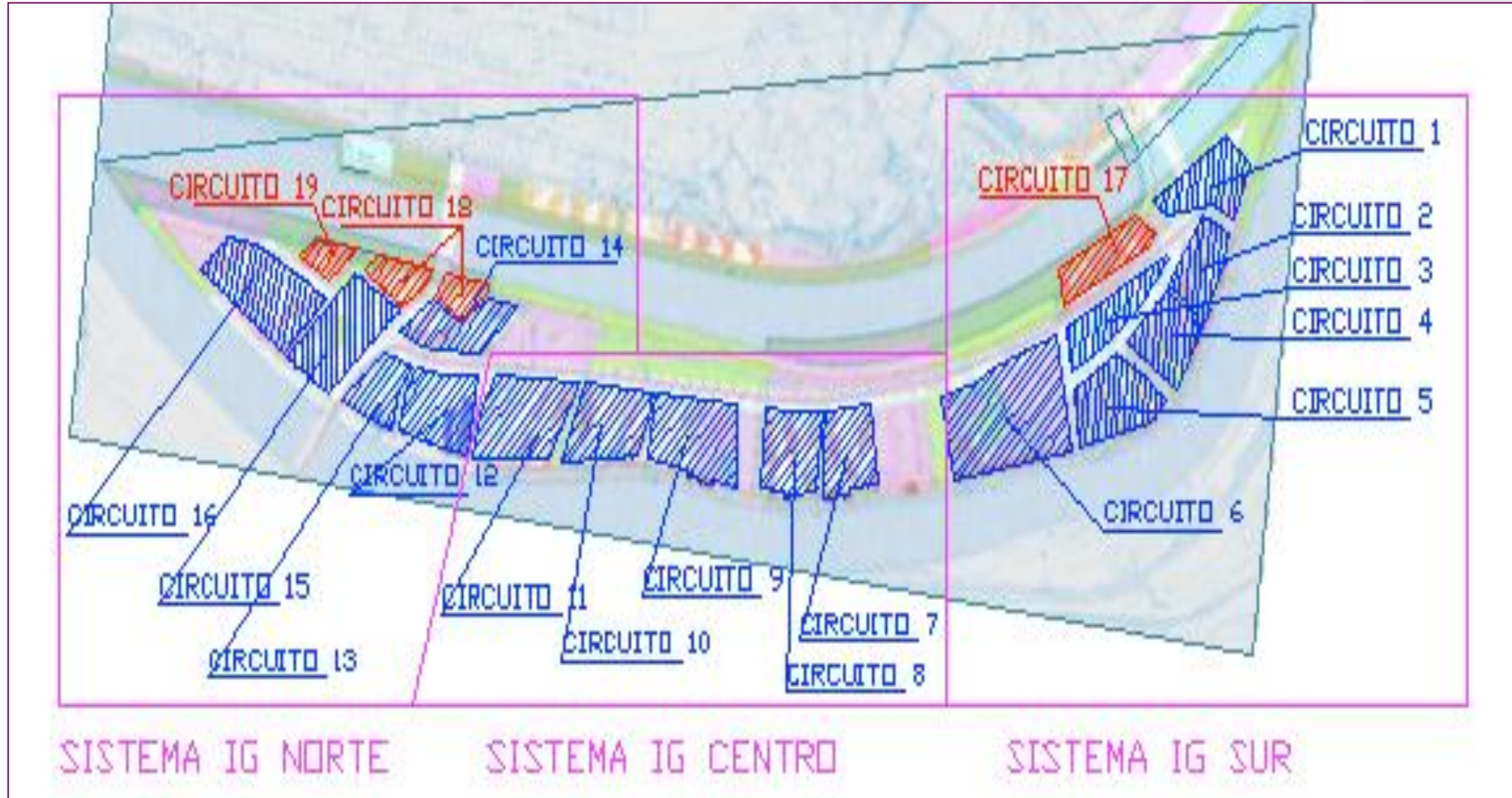
**2025
March**

Subfluvial crossing the river to the left bank

ZORROTTZAURRE URBANISATION PHASES



5GDHC ZORROTZAURRE 2015



5GDHC ZORROTZAURRE 2026

5G DHC
NORTH AREA

Lenth
3.000 m

Capacity
9 MW

Heated/cooled
174.000 m²

37 buildings
24 new dwellings blocks
8 new service buildings
5 reburished service buildings



5GDHC ZORROTZAURRE 2026

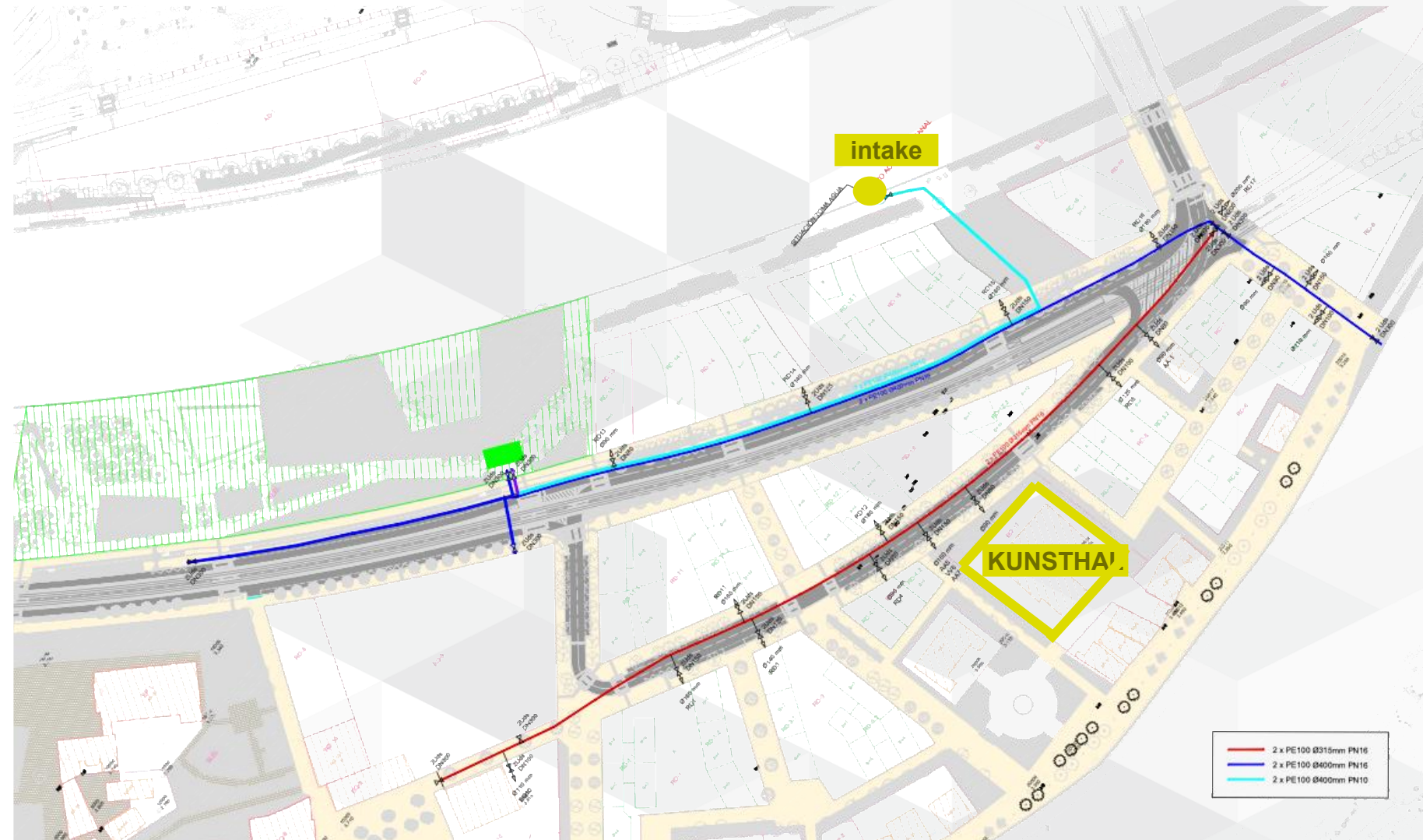
**5G DHC
SOUTH AREA**

**Lenth
3.200 m**

**Capacity
8,2 MW**

**Heated/cooled
156.000 m²**

73 buildings
16 new dwellings blocks
34 existing dwellings blocks
9 new service buildings
14 refurbished service buildings



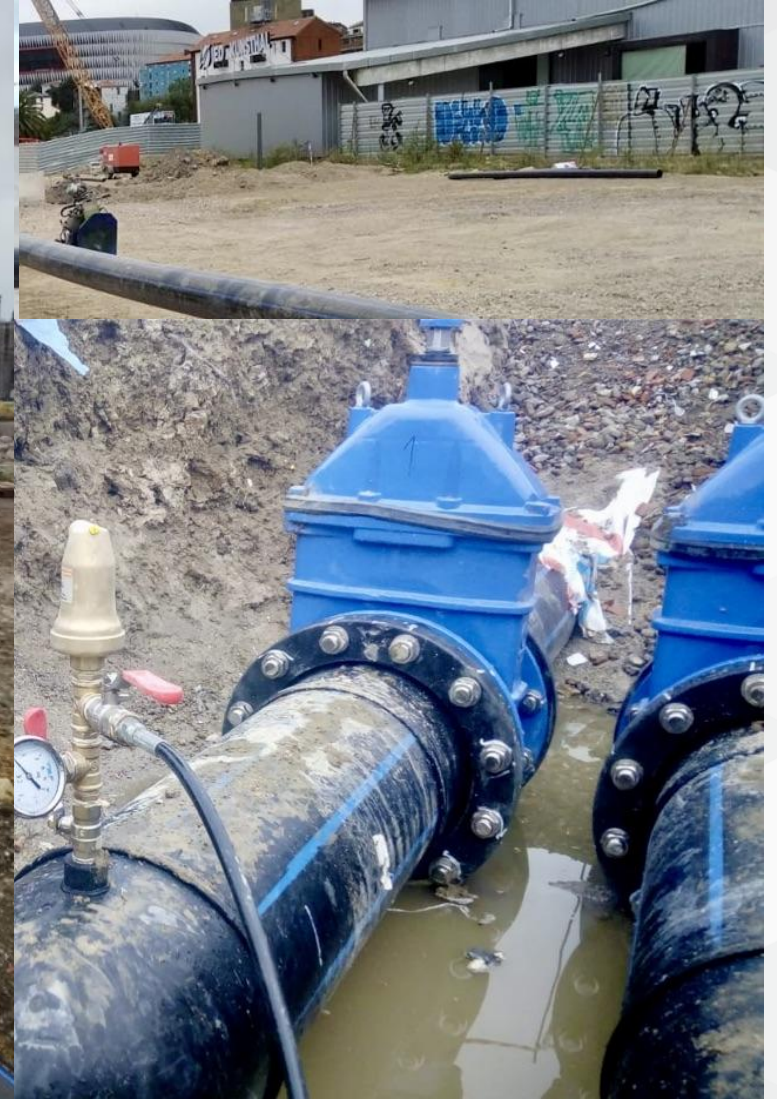
North Edge 5G DHC Piping Works



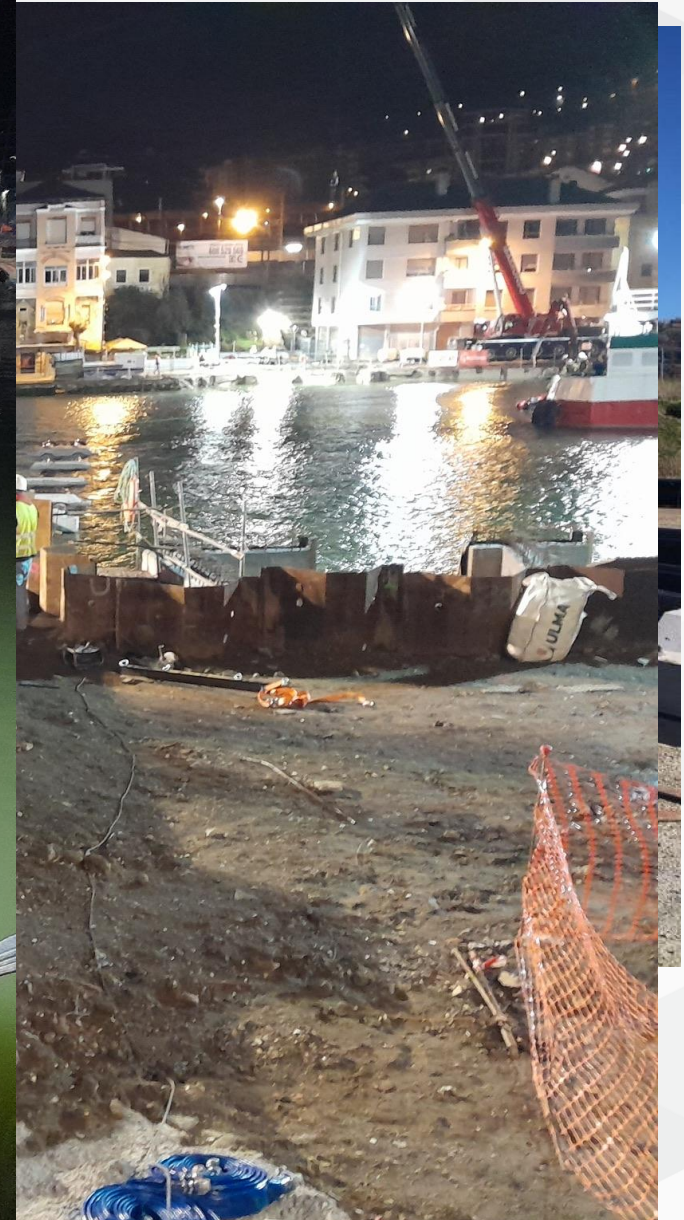
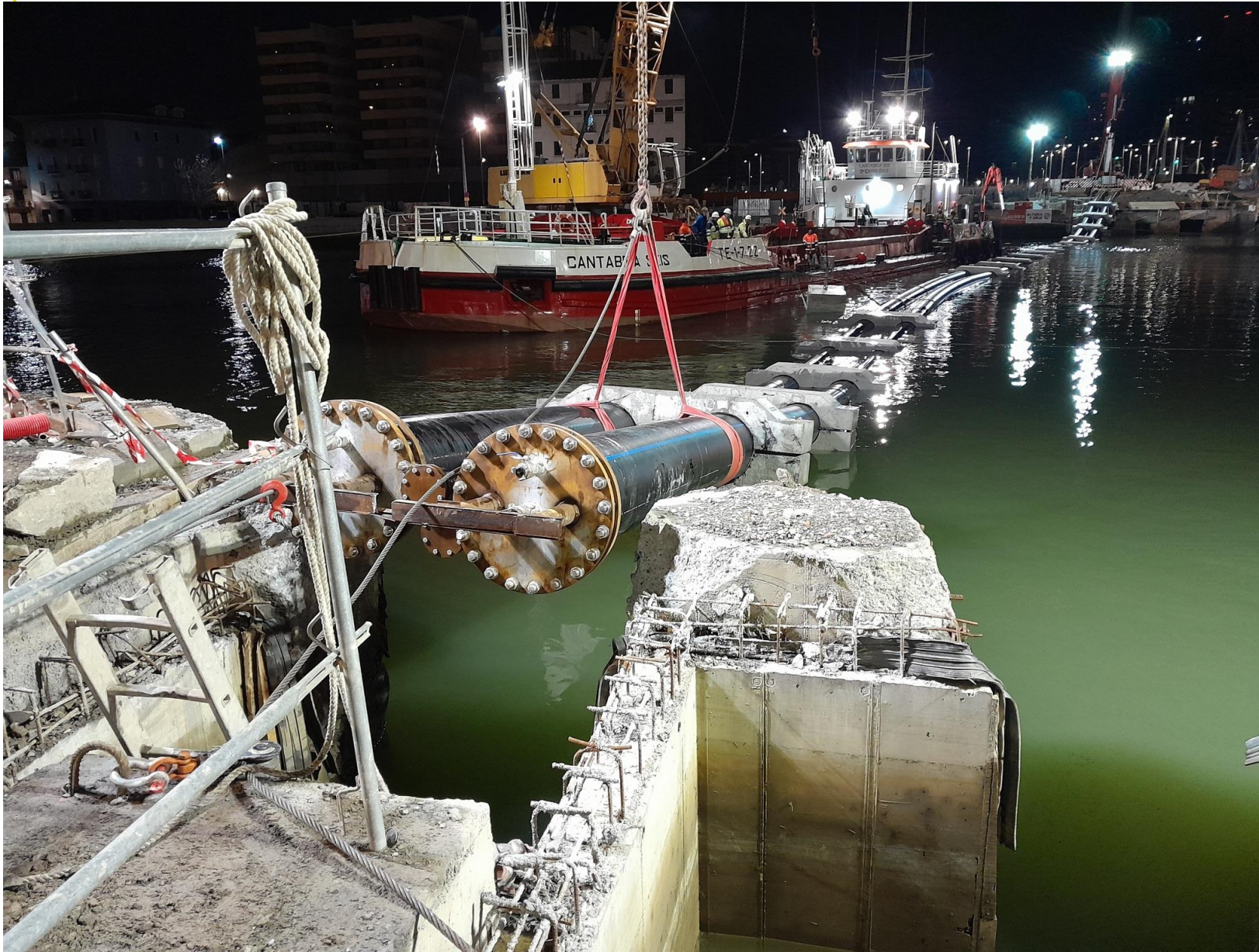
Surface Water Intake (Peak load)



South Edge 5G DHC Piping Works



Sub-Fluvial Crossing



KPI Zorrotzaurre District

ENVIRONMENTAL KPI	CONVENTIONAL BEST TECHNOLOGY CTE ⁽¹⁾ NG Boiler (Condensation) + Solar Thermal + AWP (High Efficiency)	%G DHC (5 th Generation) GSHP	Improvement of 5G DHC vs Conventional Best Technology
Primary Energy Consumption (GWh/y)	30	13	- 17 (- 57 %)
Green House Gas Emissions GGE (t CO ₂ /y) ⁽²⁾	6.000	2.000	- 4.000 (- 68 %)
Renewable Energy Generation in the Downtown (GWh/y)	1	15	+ 14 (x 14)
Renewable Thermal Power in the Downtown (MW) ⁽³⁾⁽⁴⁾	2	21	+19 (x 9.5)

⁽¹⁾ CTE Código Técnico de la Edificación (Building construction regulation of Spain).

⁽²⁾ MINETUR: According Factores de emisión de CO₂ y coeficientes de paso a energía primaria of Spain Peninsular electricity mix and NG.

⁽³⁾ EU Directive 2018/2001 related to the use of energy from renewable sources.

⁽⁴⁾ IDAE: Prestaciones medias estacionales de bombas de calor para producción de calor en edificios (Average seasonal performance of heat pumps for heat production in buildings).

NEXT STEPS

INSIDE THE ISLAND

Public buildings: connected to the grid

Private buildings: keep on with the engagement

New Dwellings: keep on with the engagement

OUTSIDE THE ISLAND EXTENSION 5G DHC

EXTEND TO THE OTHER SIDE OF THE RIVER

BUILDINGS INVOLVED

Hospital

Public University of the Basque Country

Basque television headquarters

Stadium

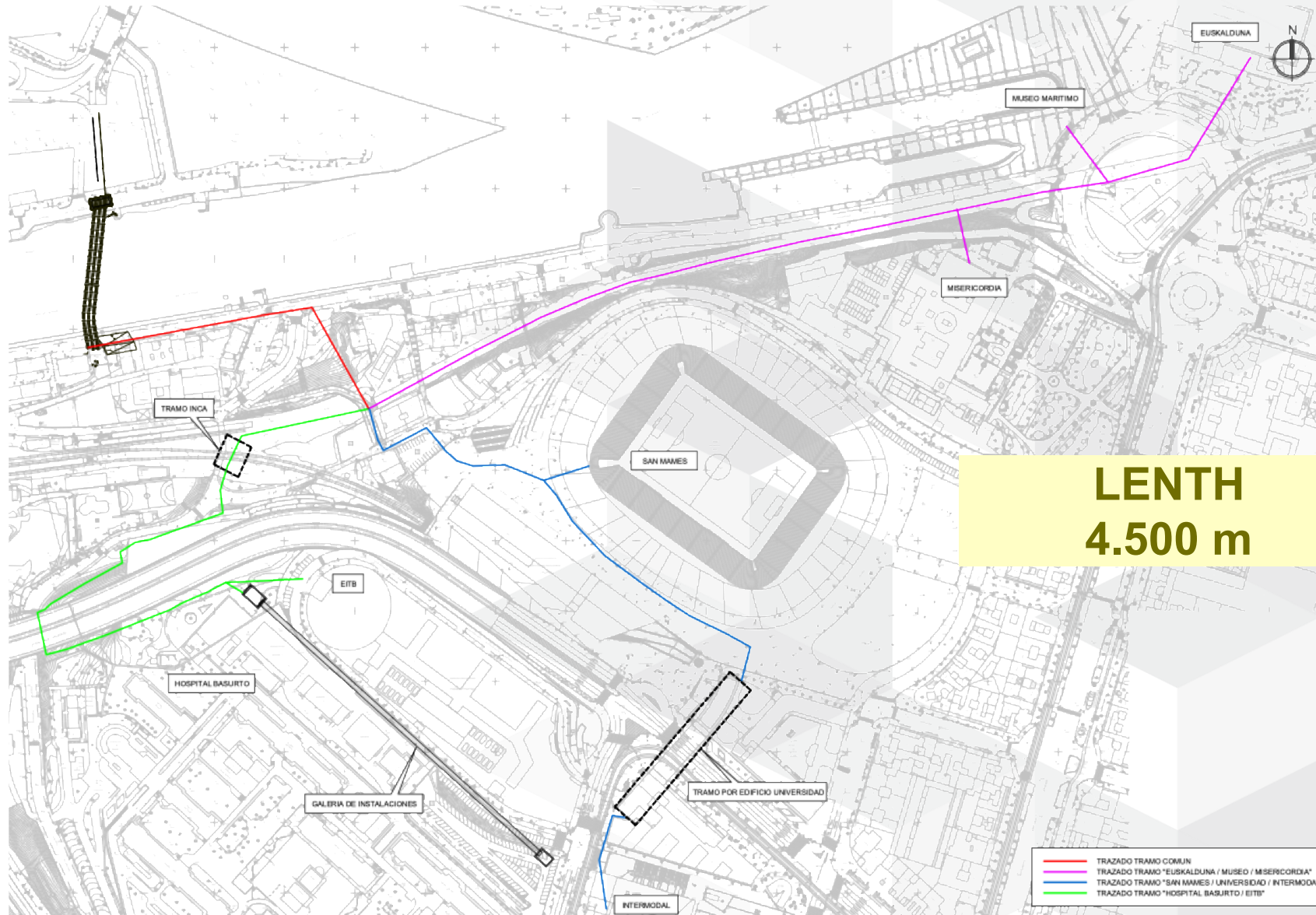
Congress Centre

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5GDHC EXTENSION



5GDHC EXTENSION



5GDHC LEFT BANK BASURTO

HEATING
20 GWh/y

COOLING
12 GWh/y



IMPACT IN BILBAO

BILBAO 150.000 dwellings

BILBAO 350.000
INHABITATS

BILBAO DWELLINGS
GAS NATURAL CONSUMPTION
600 GWh hcv

5th DHC
HEATING DEMAND

ZORROZAURRE
LEFT BANK

40 GWh/año

5th DHC
AVOIDED GAS NATURAL
53 GWh hcv

EQUIVALENT
DECARBONIZATION
9% of the housing sector
BILBAO

Remarks

5th Generation VLT DHC, with ground storage, could be considered as a BAT for renewable thermal energy supply in the cities, at least, in these conditions:

WHAT	WHY
Heating demand bellow 2,500 h/y. DHW service 8,760 h/y, of course.	Minimal thermal loss; minimal investment, operating and maintenance cost.
Cooling demand over 500 h/y, with a raising trend	Heating and cooling with 2 not isolated HDPE pipes. Lower investment and better performance as H&C demands are getting more equalized.
Consolidated urban plot. Historic or Architecture Protected Buildings	No external equipment or noises. As bigger the DHC is as greater synergies achieved it.
Low prices of thermal energy market	Implemented with an utility perspective could be even below 60 €/MWh.
Urban heat island troubles	It can put on value, digest, any type of excess heat over 10°C. Would we arrive to see taxes to waste heat?
Finite electrical generation, storage, distribution and back-up capacity	Peak load shaving and energy storage
Renewable, scalable, replicable, distributed energy in the downtown.	Will we able to implement a regulatory framework and the business models on time?



**Thank you for your
attention**

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