District Heating & Geothermal

in an Urban Context

Technological University Dublin
Grangegorman Campus

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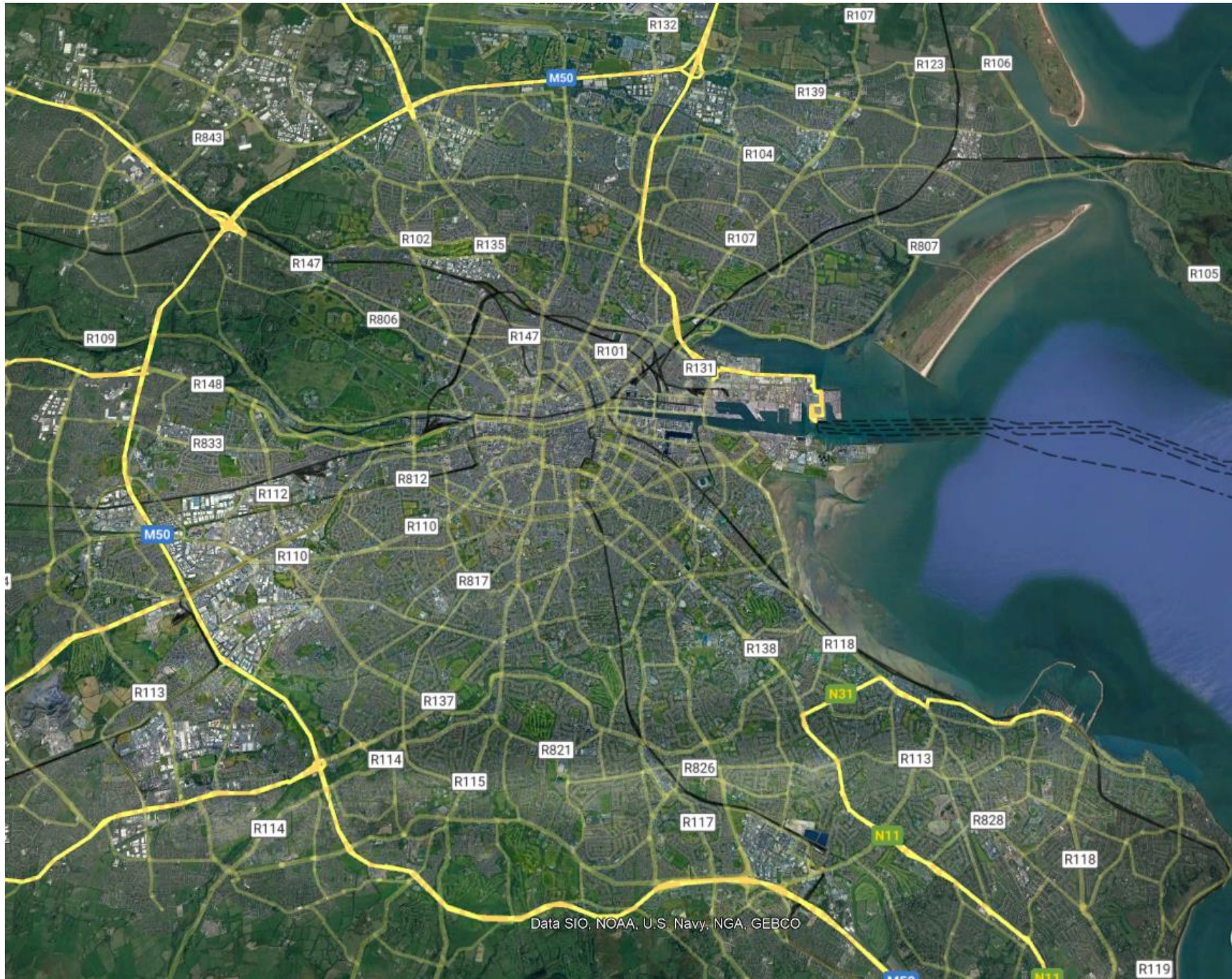


WHY?

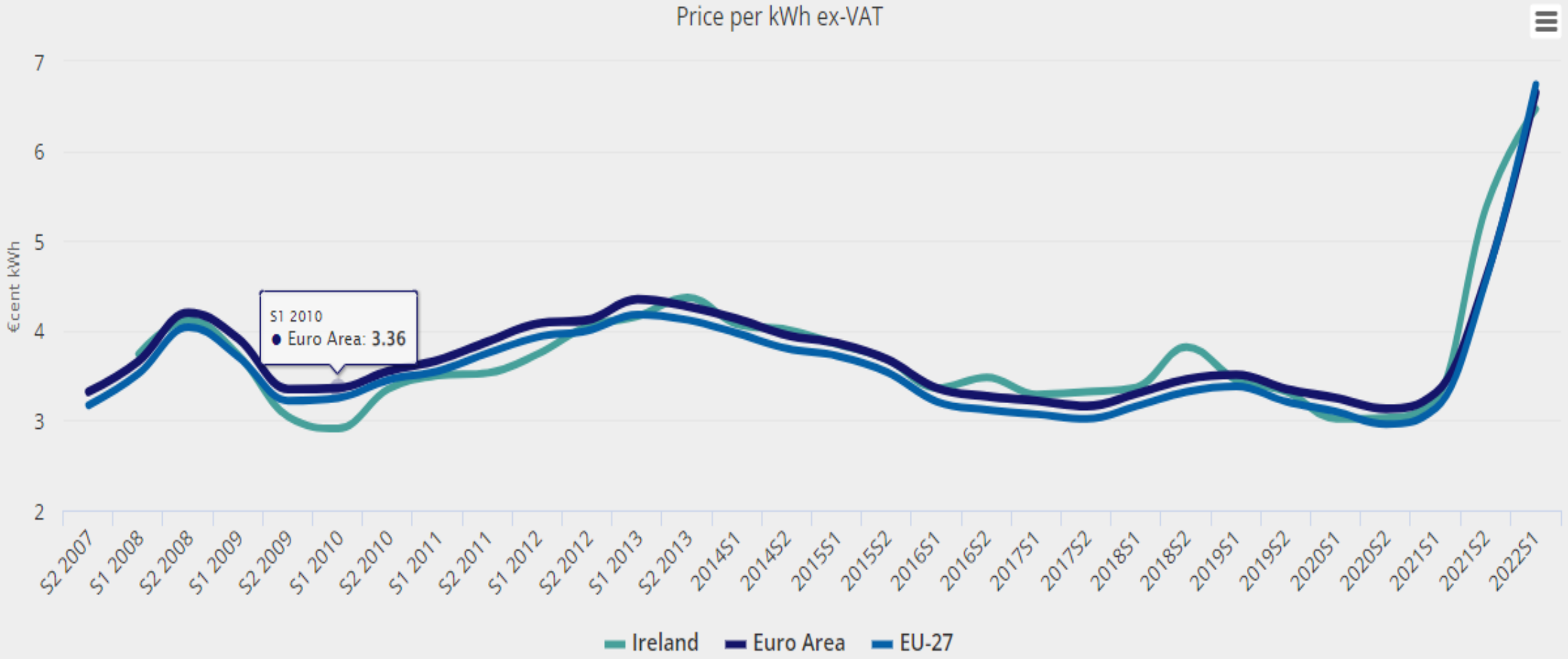
- As a university we submitted our plan to decarbonise our thermal energy , Climate Action Plan action 57(A) Phasing out Fossil Fuel, in April 2021
- We took the decision to avoid reliance on air source heat pumps based on our circumstances (urban locations, grid uncertainty , avoiding 1 source of energy as a strategy)
- Deep Geothermal gives certainty (deep geo meaning below 500 m)
- Existing infrastructure at Grangegorman gives us flexibility , DH is technology/heat source agnostic
- Tallaght District heating, additional secure supply
- Planned Blanchardstown District heating System additional Heat supply Node

Grangegorman District Heating

- Can we add the heat market onto the electrical grid as a single source of supply ?
- Gas turbine installation cost ? € 500 million (ESB Jan 2023, Microsoft data centre, € 100 Million gas turbine)
- Deep Geothermal is too expensive ?
- Remove thermal where ever possible from Electrical supply

Average gas price to business

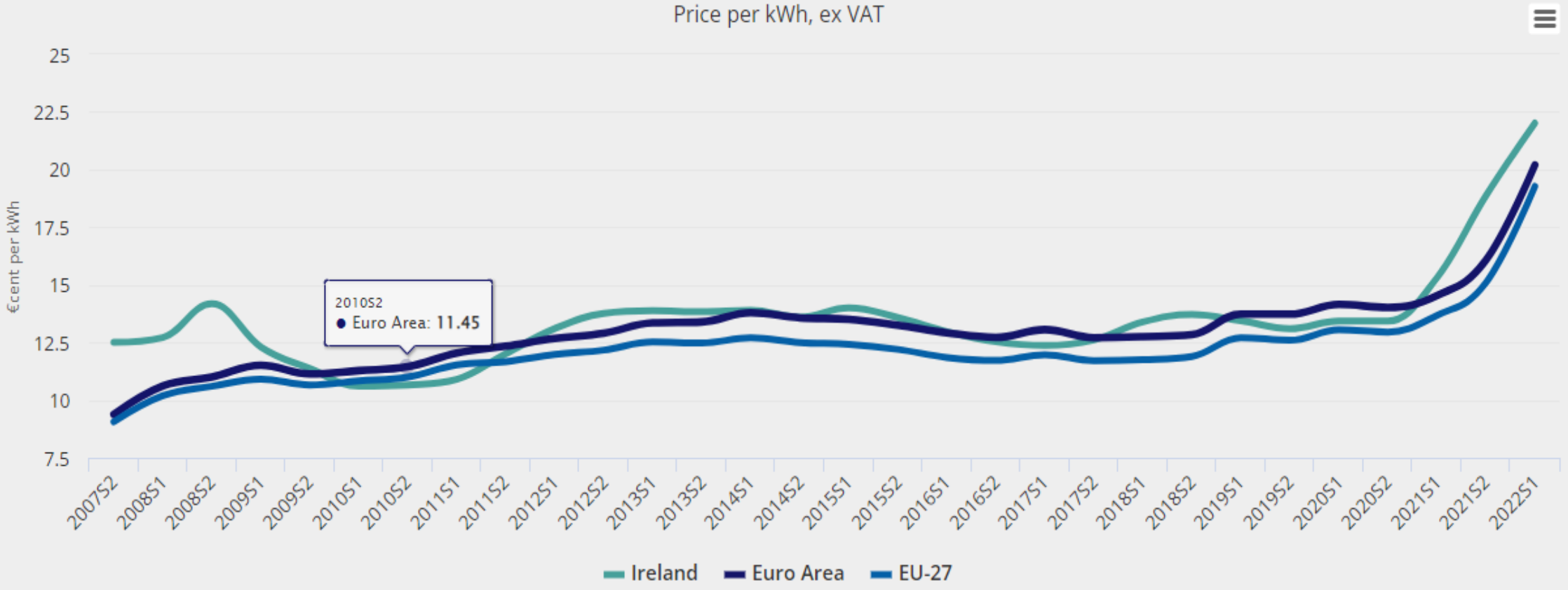
Download average gas price for business data



Source: SEAI based on Eurostat data

Average electricity price to business

Download electricity prices for businesses data



Source: SEAI based on Eurostat data

The weighted* average price of electricity to business consumers in Ireland has been above the European average since the second half of 2011 and has fluctuated above and below the Euro Area since the end of 2016. The latest data available, for the January to June 2022 period is shown above. See EPR Price note above for further details.

Conventional Energy Supply Market 2021/22

- The price of Gas has risen exponentially over the past 2 years
- In the Irish market this had a knock on effect on electrical supply costs
- Advice and soundings from the market are advising companies to budget for a 300% increase in energy cost versus the existing OGP rate available to public sector clients.

District Heating Fuel Source Options

- 4 Mw of PV

  approx. 4000 panels per Mw. 20 acres required. (rugby/soccer pitch is 2 acres)

- 4 Mw of Biomass

At 1MW, a standard heating season of 1,314 hours supplying a suitable load will require 375 tonnes of wood chips or 270 tonnes of wood pellets a year. Burning biomass can also emits more CO2 than fossil fuels per unit energy

- 4 Mw Air Source Heat Pumps

1 MW ASHP requires 275 Kw of electricity (4 MW requires 1 MW of electrical supply)

District Heating Fuel Source Options

- 4 Mw CHP

CHP requires approx. 5000 annual run hours to be efficient with the University only operating 3700 hours. Challenges with dumping/storing surplus return hot water.

- 4 Mw Wind turbine

A 4Mw wind turbine is 130 meters high with 65m rotor blades

- 4 Mw Geothermal

Requires 2.5 Km deep bore doublet and aquifer for best results. Coupled with GSHP where required. Very small surface footprint

Thermal Efficiency

Fuel	Minimum Size	Thermal Efficiency
Biomass Woodchip CHP	1000 Kw	50%
Low-carbon gas CHP	1000 Kw	52%
Biomass Woodchip	1000 Kw	84%
Air Source Heat Pump	1000 Kw	270%
Ground Source Heat Pump	1000 Kw	510%

The Challenges Opportunities

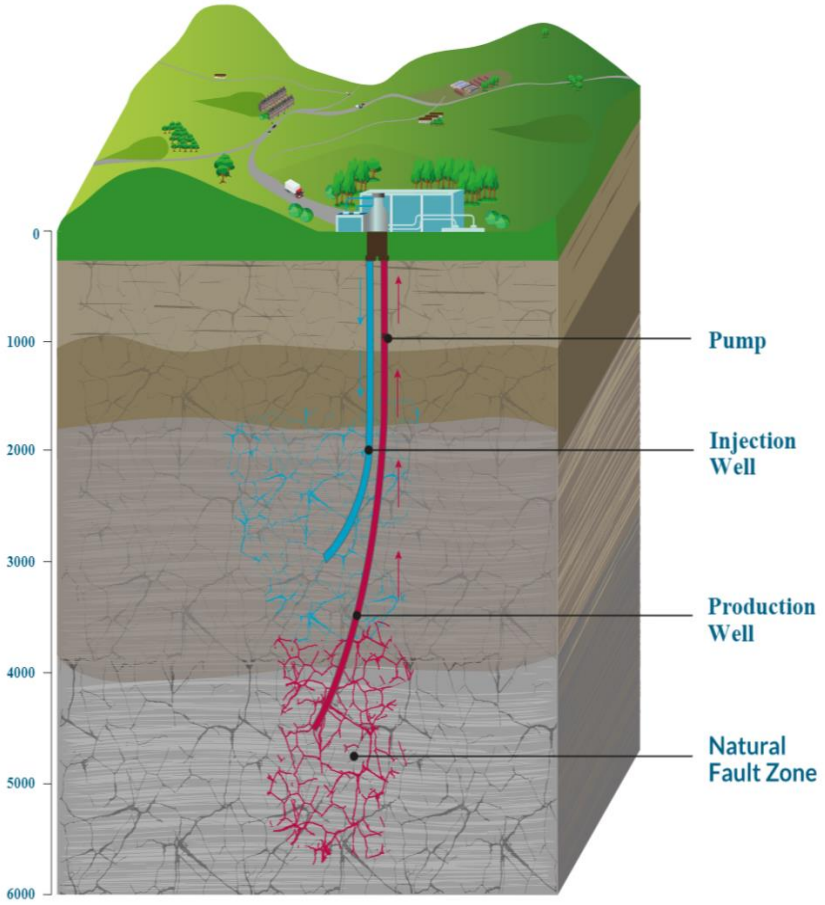
- Central Urban Environment
- Pedestrianised Campus
- 50 acre campus with a 3,000sqm plot for the Energy Centre
- Compliance with emissions targets
- Legislation / Regulation
- Funding
- The unknown
- First on the Island of Ireland
- Meets the alignment criteria of Geothermal & District heating
- University, Research, Data, collaboration with GSI & CODEMA

Land Use

Based on Acres/1GW

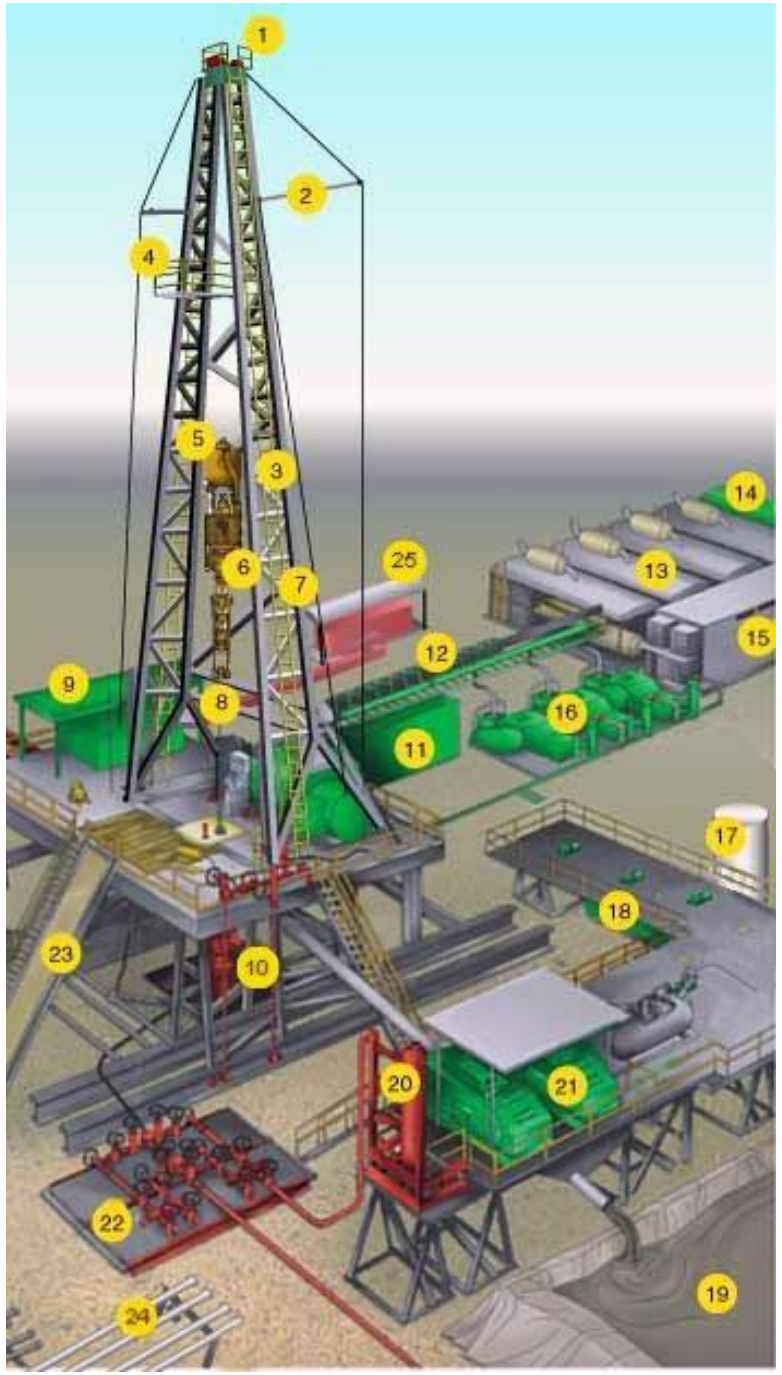
Geothermal has the smallest surface footprint of any land-based energy source and generates minimal waste products.

Project GEMINI



Geological Survey Ireland - GSI
Technological University Dublin – TU Dublin
City of Dublin Energy Management Agency – CODEMA

- 1Km trial hole drilled on site.
- Aligned to a new district heating system.
- Potential to deliver a working geothermal heat source in a short timeframe.
- Exemplar reference project for other potential projects, including geophysical, operational and research data.
- FUNDING €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