

Geothermal District Heating in Madrid Region. Economic-Technical feasibility

R. Hidalgo[(1)], J. Sánchez Guzmán[(2)]

(1) Petratherm España s.l. Avenida Doctor Arce nº 14 28002 MADRID. r_hidalgo@petratherm.es

(2) Tecnología y Recursos de la Tierra S.A. (TRT) Plaza de Castilla, 3 -20º D1 – 28046 MADRID. jsanchez@tecnotrt.es

petratherm

Geothermal District Heating Sketch

Source www.semhach.fr

District Heating in Europe

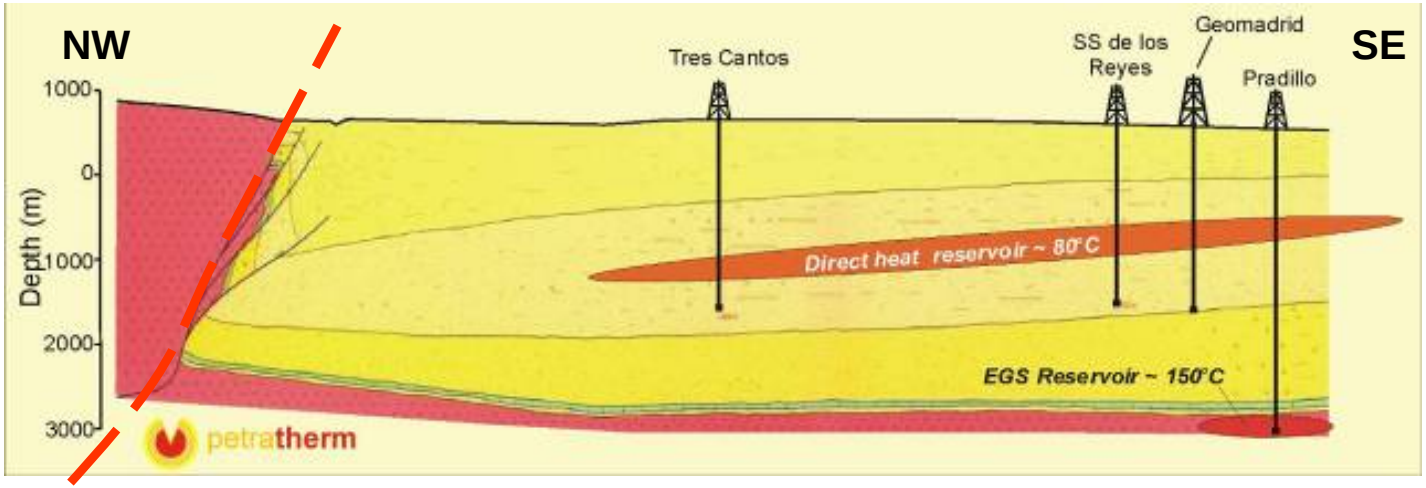
- GDH represents 35% of the installed power dedicated to direct uses
- Installed capacity exceeds the 5,000 MW
- Most important developments are located in Reykiavik (iceland), Paris basin (France) and Molase basin (Germany)

Source EGEC 2007

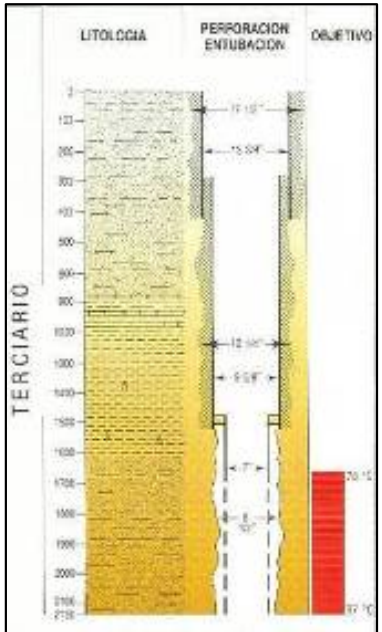
Geothermal Distric Heating in Madrid Region. Economic-Technical Feasibility

petratherm

GeoEner



Source: Mod.from IGME



Feasibility of Geomadrid Project : Key factors

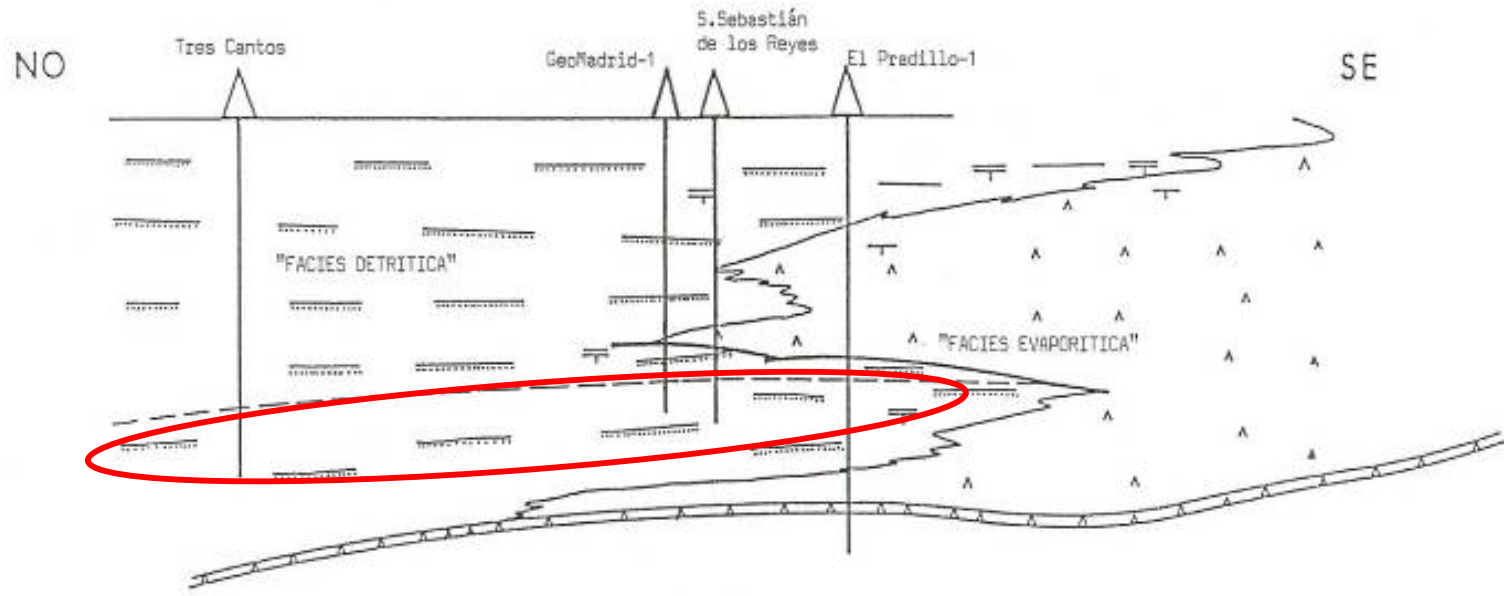
General: Changes in the International Panorama for Energy

Under the surface:

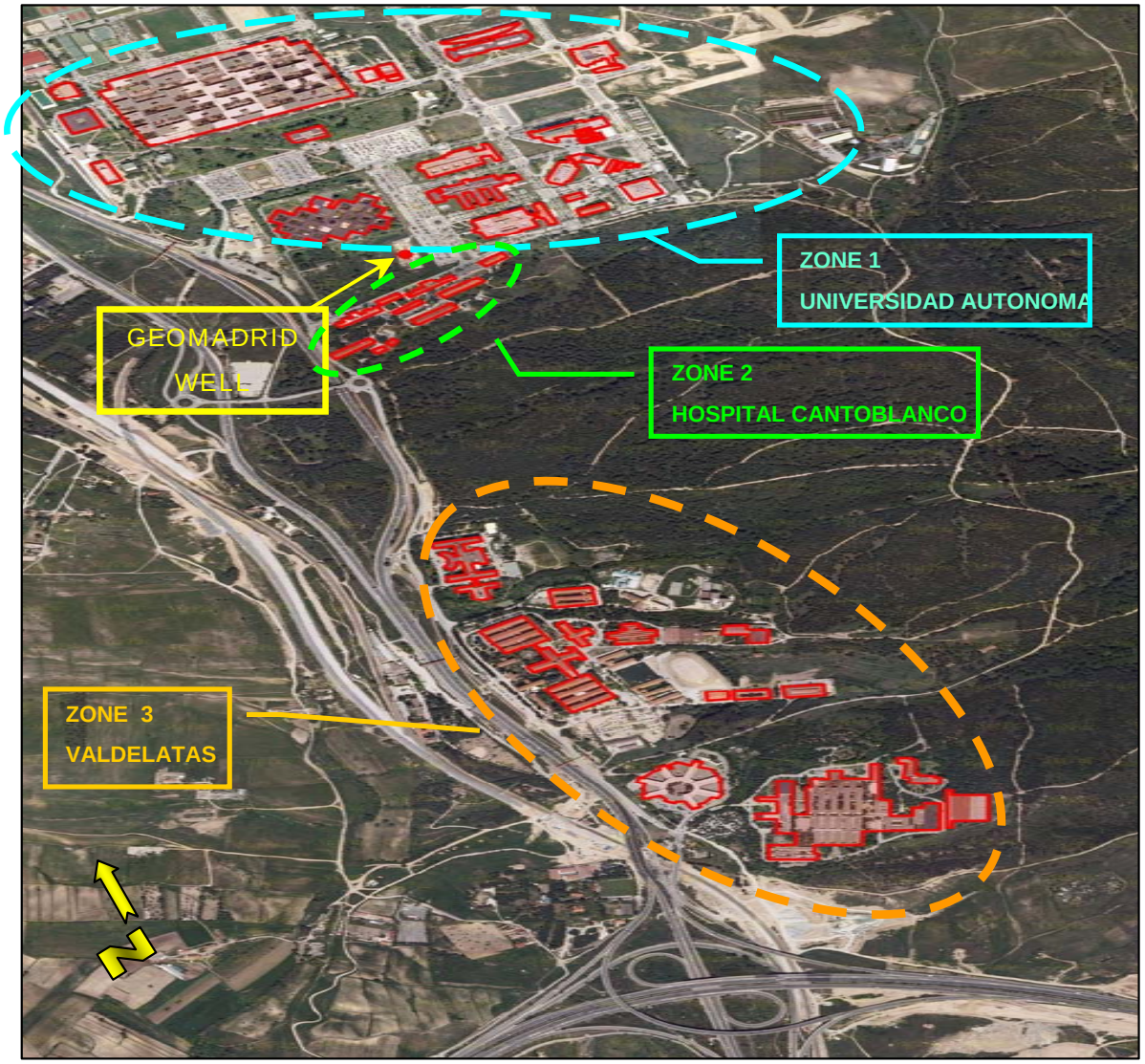
- The resource quality (temperature-flow).
- Old wells conditions and depth.

Surface:

- Heat demand, customers and grid distribution dimensions



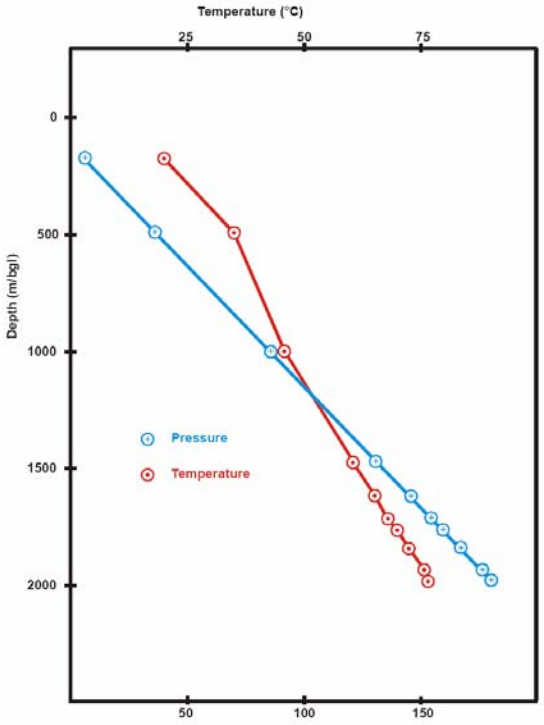
Geomadrid Project

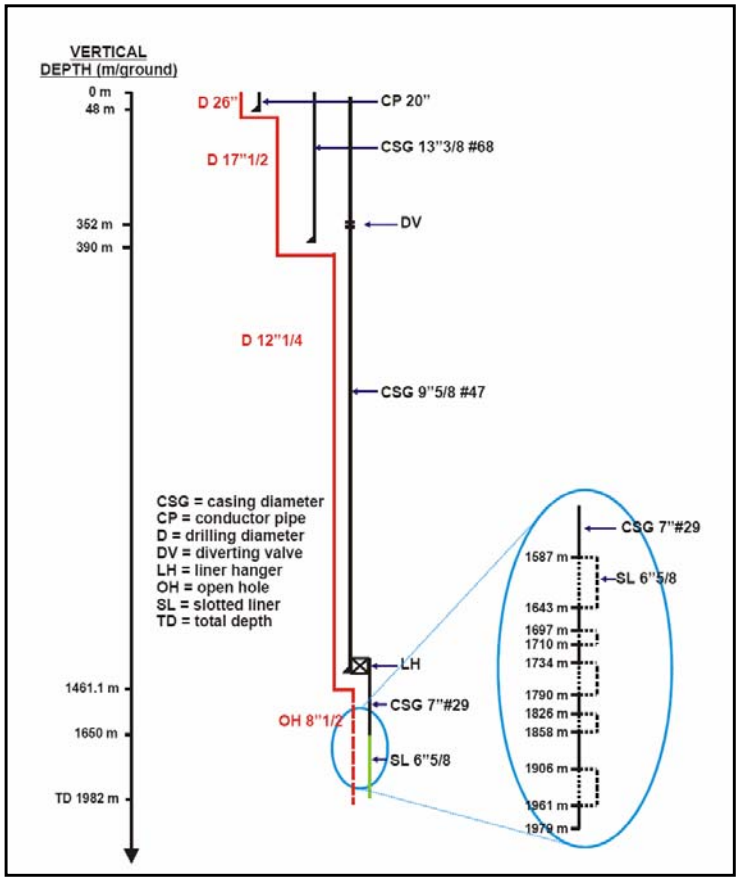


Geomadrid well inspection program

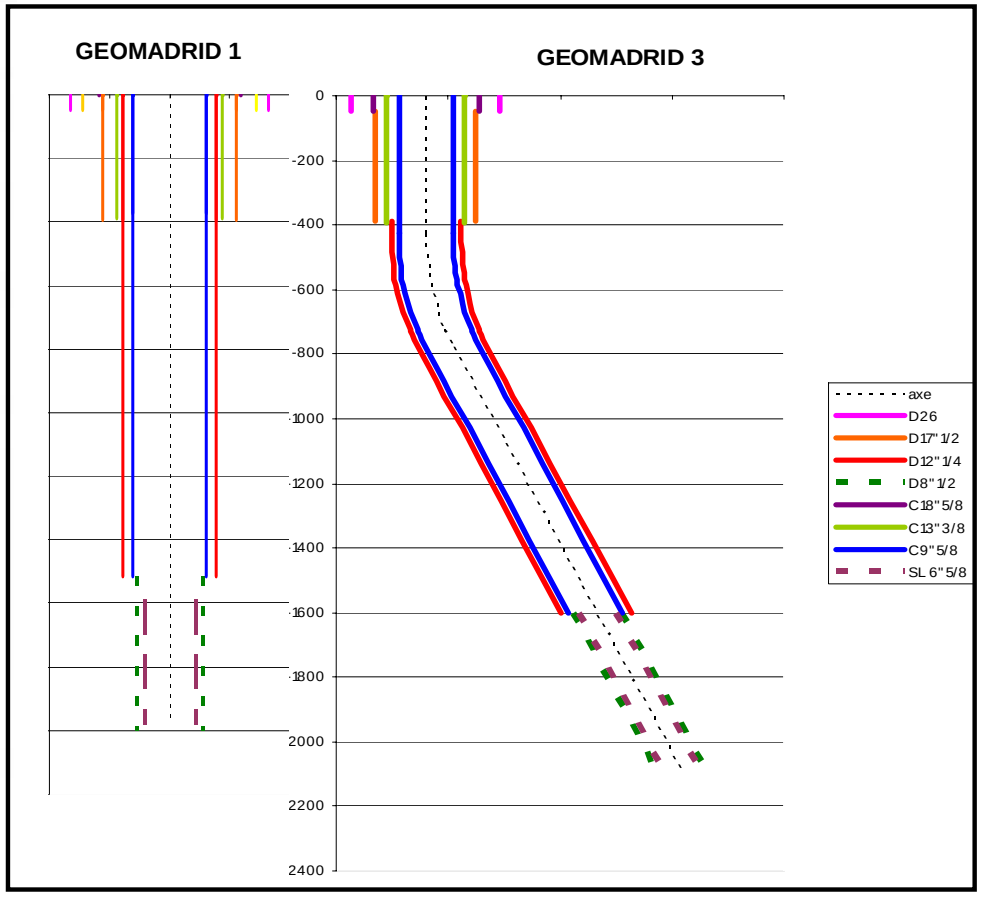
- A detailed well inspection program was conducted in July 2008 corroborating all the well parameters measured in 1990.

- The inspection confirms that Geomadrid well is in good condition and can be used as one of the wells of the new geothermal doublet.





Geomadrid Surface-under the surface



Geomadrid Project

- Final Feasibility Study
- To finish the Geomadrid doublet
- To build a power plant , distribution grid , substations and conexión to the final customers.

Madrid could have the first geothermal district heating grid available in 2010

Economic Analysis

ECONOMIC INPUT DATA SHEET

Project life (n) (yrs)	25
Discount rate (dr) (%)	5
Interest rate (ir) (%)	6
Profit taxation rate (protax) %	30
Geothermal selling price (GSP) (€/MWht)	45
Geothermal water selling price (GWSP) (€/m3)	1.6

FINANCIAL RATIOS	***MAX***
investments (inv) 10^3 €	11,000
net present value (NPV) 10^3 €	3,830
internal rate of return (IROR) %	13
discounted pay back time (DPBT) years	9.4

Project Scenario	**IROR for 45 GW ht sale volumen**
Base data	9.50%
Base + 25% increase the initial investment	7.20%
Base + 50% increase MW sale price	18.60%
Base + 50% granted	13.40%

Geomadrid Project Features

- Resource Temp. 75ºC
- Reservoir depth 1500-1800m
- Flow 200m^3/h
- Installed power 8MWt
- Power production 45.000MWth/a
- Distribution grid 4 Km
- Substations 9
- Investment 11-15 M€
- District heating-cooling and HSW equivalent to 5.000 dwellings
- Save 5.000 TOE/a
- Reduction de 20.000 CO_2 Tn/a