Geological data for geothermal evaluation:

Italy

Adele Manzella
Italy is a geothermal country

Geothermal power production:

- 8.5% world’s power production,
- 1.9% national power need
- 25% Tuscany power need
- Larderello and Travale/Radicondoli are two parts of the same field, covering a huge area of approximately 400 km², producing super-heated steam at a pressure of 2 MPa and temperature in the range 150–270 °C. At Larderello, the exploited area is 250 km², with 22 units for a total of 594 MW installed capacity; the Travale/Radicondoli has 160 MW (6 units). The most exploited are the deep reservoirs, with pressure of 6–7 MPa and temperature of 300–350 °C, at depth of 3000–4000 m.
- Mount Amiata area includes two water-dominated geothermal fields: Piancastagnaio and Bagnore. In both fields, a deep water-dominated resource has been discovered under the shallow one, with a pressure of 20 MPa and a temperature around 300 °C. Presently, there are 5 units with 88 MW of installed capacity: one in Bagnore and four in Piancastagnaio.
- Projects for a further 112 MW have been approved and will be developed in the coming years: new plants in Larderello/Travale, Bagnore, and Piancastagnaio, with a net increase of 80 MW (including the decommissioning of some older units).
There is a growing interest for geothermal, testified by the high number of requests for exploration projects. Most of them are located in the high heat flow areas where hydrothermal systems are expected.

Proposed research projects:
- in the volcanic area of Campi Flegrei (Naples) to evaluate the possibility of supercritical fluid utilization.
- In southern Tyrrenian Sea, Marsili project, to exploit a huge volcanic complex.
The inventory of geothermal resources was performed by CNR, ENEA, ENEL and ENI, under Law No 896 of 1986. It resulted in maps and reports. The Geothermal Ranking was based on temperature and fluid availability:

- **A**: areas where at least one aquifer, at depth < 3 km, has temperature > 150°C
- **B**: areas where at least one aquifer, at depth < 3 km, has temperature in the range 150 – 90 °C
- **C**: areas where at least one aquifer, at depth < 3 km, has temperature in the range 90 – 30 °C
- **D**: areas with only minor aquifers and, however, for depth < 3km, temperature < 150°C.
Italian Geothermal DB webGIS
Criteria for classification

E.g., criteria for magmatic or supercritical fluid favourability:
• Active volcanic and magmatic systems
E.g., criteria for geopressurized favourability:
• Foreland areas
• Large thickness

We need a better estimate

3200 well data
590 spring data
The Italian Geothermal database

The Italian National Geothermal Database was built in 1993 by the International Institute for Geothermal Research in Pisa (currently IGG, Institute of Geosciences and Earth Resources) of the National Research Council (C.N.R.) as completion of the Inventory of geothermal resources by CNR, ENEA, ENEL and ENI, under Law No 896 of 1986. Data have been continuously updated until 2001. During 2008, a software and data update have been implemented with the help and technical support of ENI Refining & Marketing, R & S management and in collaboration with CEGL and UNMIG (Ufficio Nazionale Minerario per gli Idrocarburi e le Georisorse – National Office for Mining Hydrocarbons and Earth Resources) department of the National Economic Development Ministry, who guaranteed the access to a new dataset.

The upgrade has produced one of the most complete underground data repository at the national level.
The data contained in the database currently include:

- identification and location of wells and springs (available)
- temperature and depth (in progress)
- temperature gradient and heat flow
- litho-stratigraphic column of the wells (in progress)
- characteristics of the reservoir
- well production
- chemical, physical and isotopic data of water and gas
- well’s technical profile
- correlation between vertical and deviated well
- permeability
- mineralizations in the well
Geothopica webportal

The project name is inspired from the Greek: Geo- γεω indicates the Earth, Th draws heat (θάλπος - θάλπος), and topos - τόπος marks the place.

Currently, Geothopica (http://geothopica.igg.cnr.it) is a webportal including a webgis that allows the use of BDNG data by means of maps ensuring different kind of data access on the base of data and user typologies. It is possible to browse the temperature map at various depths, and the heat flow map for the whole national territory. Also the location and all the relevant data pertaining to the location of the "geothermal objects" (i.e. geothermal wells, geothermal springs, etc.) are available.

3435 well data
590 spring data
Features and high speed
DB and geoDB interface
Standard OGC (WMS-WFS-WCS)

Dott. Geol. Eugenio Trumpy – IGG - CNR
BDNG

Webmapping tools

Stratigraphic column

Temperature graphics
Supporting sustainable development of geothermal power production in the southern Italian regions

WP

- Atlas of GS and UGS similar to those provided in other countries

Realization of Data Centers

- Evaluation of environmental issues and ways of reduction

Information, promotion and training

ATLAS of conventional and unconventional geothermal resources in the Italian southern regions

- EGS;
- Geopressurized systems;
- Magmatic systems;
- Supercritical fluid conditions
Evaluation of Geothermal Potential for the regiOni ConveRgenza

Regional and local assessment, pre-feasibility and feasibility studies, economic feasibility, cogeneration, hybrid plant proposals, information.
- basin layout and sediment-basement interface depth (basin contour, sediment thickness)
- outlines and thickness of granitic-crystalline formations

E.g., Top of carbonatic platform, structural models and maps from various authors
Gravimetric and magnetic data
Isolinee di temperatura a 3 km di profondità

- 70°C
- 100°C
- 200°C
- 300°C

Provincie Tettoniche/Geotermiche

- Settore Alpino
- Fascia preappenninica tosco-laziale-campana
- Catena Appenninica
- Avanfossa Adriatica, Bacino del Po, Piana di Venezia, Fossa Bradanica
- Piattaforma carbonatica Pugliese - Iblea
- Crosta Oceanica
- Manifestazioni magmatiche recenti (anche sepolte)
- Area Etnea
- Arco Eoliano
- Rift di Pantelleria
- Rift del Campidano
Hydrogeological maps: shallow and deep hydrogeological units

They often lack deep characterization

ISPRA (shallow aquifer), universities (fragmented data), Regions, interregional bodies
On GeoThopica we can check the main hydrogeological units.
ISPRA (Italian National Institute for Environmental Protection and Research) has developed the ITHACA project (ITaly HAzard from CApable faults)
Italian National Research Council – Earth and Environment Department, Institute of Geosciences and Earth Resources
Groundwater protection
Salvaguardia delle acque sotterranee

Salinity and sea water intrusion

Salinity distribution in the karst aquifers of Murgia and Salento: Comparison between 1989 and 2000 (from the Apulian PTA).

September 24-26, 2008
Barca E., Passarella G., Optimal integration of the groundwater monitoring network of the Murgia aquifer.
Our experience for data sources:
CNR
ISPRA (geological survey)
INGV (seismological and volcanological data)
Universities
Regions
UNMIG

Other data:
ENI (seismic profile, gravimetric and magnetic data)

Thank you