Geothermal Development in Italy

Gruppo Informale per la Geotermia e l'Ambiente - Associazione 'no profit' riconosciuta

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Introduction

Italy is the European Country with the largest geothermal resources, similar to Iceland. Geothermal electrical technology was born here, Actually, in the exploited area of Tuscany, area not much larger than 100 years ago, there is an installed electric power (about 800 MWe) the same order of magnitude of a medium/large nuclear plant. However, geothermal resources in Italy suitable for electrical production, with modern technologies, are much more widespread. They involve at least the whole central-southern Tyrrhenian margin including Tuscany, Latium, Campanian, Sicily, the Western part of Sardinia, part of the Southern and Northern Apennines, an about 50,000 km2 area off-shore among Campanian, Calabria and Sicily. In particular, the volcanic areas of the Tyrrhenian margin contain considerable resources of high and very high enthalpy, whereas all the mentioned areas contain huge resources of medium enthalpy suitable for electrical production.

Then, despite of the large power of Tuscany plants, Italy exploits presently only a small part of the its potential considering only natural, conventional hydrological systems, and a negligible one considering the whole resource including EGS and supercritical fluids.

In order to help the geothermal development in Italy for electrical production, besides simpler regulations and incentives, a critical issue is to convince people that modern geothermal electrical technologies are really sustainable and with negligible environmental impact. This is true because modern technologies, both in the field of medium and high enthalpy, are characterised by geothermal fluids circulating within a closed loop, because they are almost totally re-injected after utilization to feed the production plant. This way, only a relatively small amount of non-condensable deep gases is released to atmosphere, whereas geothermal reservoirs are mantained productive for much time more. The resulting impact on atmosphere and reservoir is hence generally negligible.

The G.I.G.A. no-profit association is aimed to stimulate geothermal development in Italy by helping private companies and public Institutions to locate the resources and to adopt the most innovative exploitation technologies which makes this energy clean, sustainable and eco-friendly.1

The power plant of Hellisheidi, 20 km from Reykjavik (IS). It is a double flash geothermal plant, with a power of 300 MWe, thermal co-generation for district heating and re-injection of 95% of geothermal fluid. It is a good example of clean and sustainable energy production also from a large high enthalpy geothermal power plant.

Electrical Energy Production Systems

- 80° C<T<180° C (Low-Average Enthalpy resources)

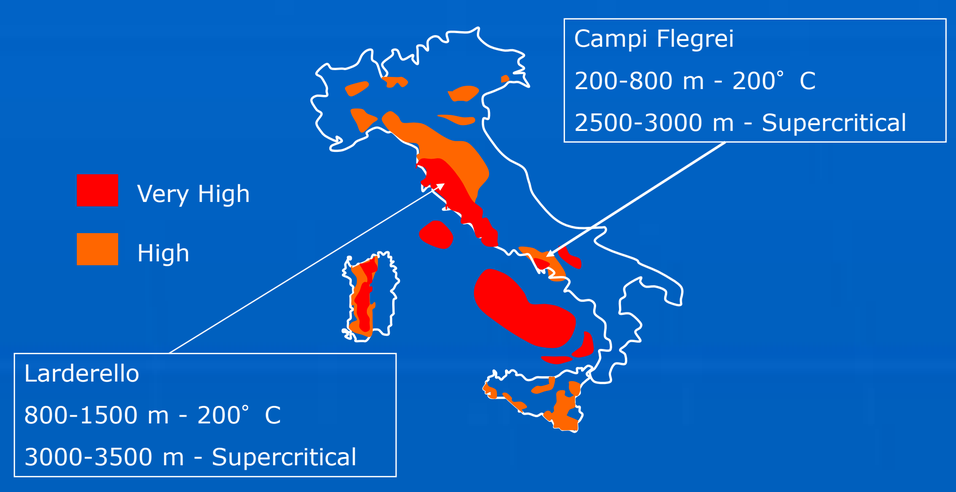
Binary Plants (ORC or Kalina): 0.1-10 MWe Small-Medium plants, co-generation for single edifice to small towns heating – 40%-50% of Italian lands (depth lower than 5 km)

- 180° C<T<390° C (High Enthalpy conventional resources)

Dry Steam, Flash and Hybrid plants: 10-100 MWe, co-generation for large towns heating – 10%-20% of Italian lands, 40,000 km² off-shore Southern Tyrrenian sea

- 390° C<T<600° C (Supercritical unconventional resources) Superheated dry steam plants: 100-1000 MWe - 10% of Italian lands, 40,000 km² off-shore Southern Tyrrenian sea

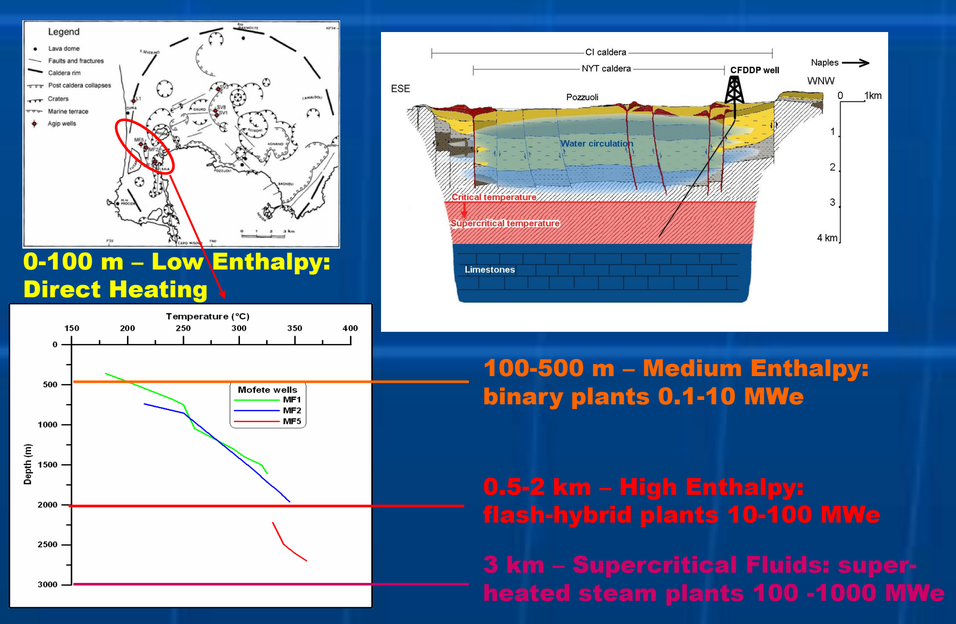
Schematic view of Geoithermal Potential in Italy



What new energy for Italy in the future?

- Solar and Wind: clean, eco-friendly and sustainable. But discontinuos, not suitable for electric base-loading.
- Nuclear (fission): very polluting for Uranium fuel rods production and for scoriae. Uneconomic, strong dependence from few Uranium producing conutries, not sure, not suitable to the volcanically and tectonically active Italian terrain.
- Nuclear (fusion): clean, eco-friendly, sustainable, abundant, suitable for base-loading. But technology not productive yet (early experimental stage).
- Biomass: sustainable. But requires too much land to produce consistent energy quotes.
- Geothermal stimulated (EGS): clean, sustainable, mature technology, possible almost everywhere. But not so diffused yet to be economically viable. Problems of potentially induced seismicity to be solved.
- Geothermal with natural hydrological systems: clean, eco-friendly, sustainable (with almost total reinjection). Economical, continuous (suitable for base-loading), very suitable to the Italian terrain. High Italian technological background.

Exploiting Geothermal energy in other Italian areas: Campi Flegrei



The volcanic area of Campi Flegrei (Naples) has very high geothermal potential, allowing exploitation of medium and high enthalpy resources also at very shallow depths. Supercritical resources are also likely at moderate depth (below 3 km).

Possible Scenarios for Geothermal Development in Italy

- 0-10 years: Widespread diffusion of binary plants for medium enthalpy in the range 0.1-10 MW; increase of conventional, high enthalpy production, also out of Tuscany (eg: Latium, Campania); experiments in unconventional high enthalpy resources. Starting development of EGS
- 10-20 years: Supercritical plants in active volcanic areas (eg: Campi Flegrei, Larderello, Sicily volcanoes); Supercritical EGS with water and CO_2; Supercritical high power plants on platforms in the Southern Tyrrhenian sea.
- Pre-conditions: Political support and simplified regulations; local and National support to exploration plans for basic location and estimation of resources, also aimed to reduce the risks of failure for private investors

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