

### In brief

With this new Manifesto, UGI wishes to emphasize the strategic role that natural heat can play in curbing Italy's high dependence on energy imports.

The Manifesto is intended for members of the Italian Parliament and institutions involved in energy matters, so that they adopt legislative instruments to foster an accelerated development of all possible applications of geothermal energy. If the strategic role of geothermal energy is not readily understood, the country's difficulties in the energy market may worsen and the achievement of the targets established by the Kyoto Protocol and the EU's 20/20/20 Directive may be jeopardized.

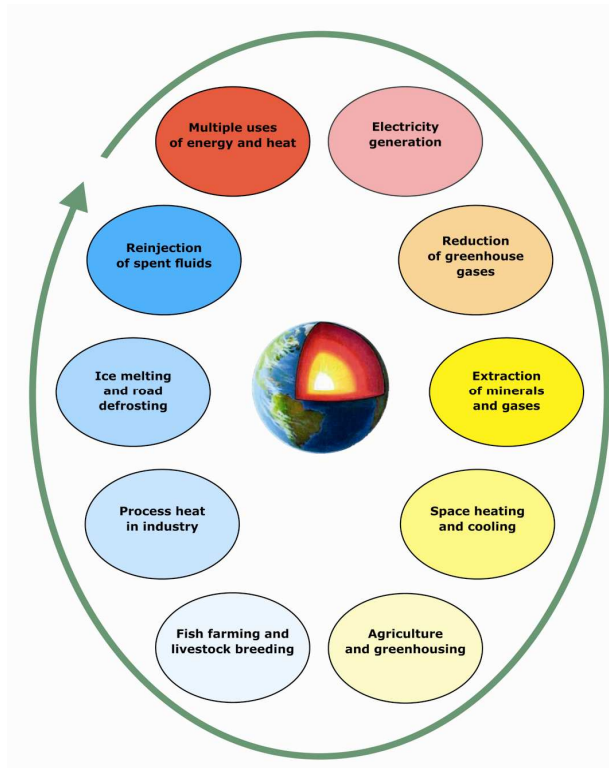
The document is also intended for Regions and local governments, scientific and academic communities, environmental associations and the public at large, so that they fully grasp the importance of using the Earth's heat and take action to attain the targets indicated in Tables 1 and 2.

In many countries, the geothermal potential is lower than the one of Italy. Nonetheless, these countries have already caught the opportunities offered by natural heat to mitigate their dependence on energy imports and improve their environment. As a consequence, their governments have long adopted measures to boost the deployment of geothermal energy.

Saving 3.5-4.5 million TOE/yr thanks to the use of natural heat and avoiding 10-13 million tonnes/yr of CO<sub>2</sub> emissions by 2030 are relatively small figures vs. total energy consumption and greenhouse gas emissions by the same year in Italy; but they are of utmost importance in absolute terms from both the economic and environmental standpoints.

The same applies to the 2% share of geothermal energy in total energy consumption in Italy by 2030: albeit small in percentage terms, it is of paramount importance from the economic point of view.

Finally, as regards direct uses, it is worth recalling that harnessable heat resources at T < 90°C are at least 100 times higher than those needed to reach the 90,000 TJ/yr indicated under Scenario II by 2030. This is tantamount to saying that the targets set for these uses are not an end in themselves, but milestones towards more ambitious geothermal accomplishments to be pursued in the decades after 2030.

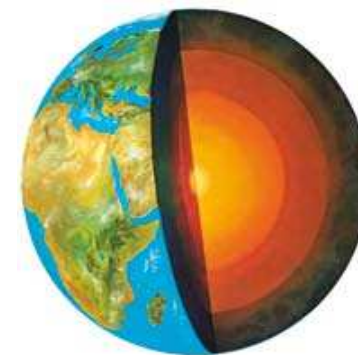


**Strong development  
of geothermal energy  
in Italy is imperative and urgent to:**

- **minimize dependence on imported fuels,**
- **curb the balance-of-payments deficit,**
- **mitigate the environmental impact of greenhouse gases,**
- **contribute to the country's sustainable development.**

## **THE NEW ITALIAN GEOTHERMAL MANIFESTO**

**for  
AN ACCELERATED  
DEVELOPMENT OF THE  
EARTH'S HEAT IN ITALY**



**THE EARTH'S HEAT**

**ENVIRONMENTALLY  
SUSTAINABLE RESOURCE:  
EVERYWHERE, FOR ALL,  
ALWAYS.**

**December 2011**

### Geothermal energy in the Italian energy framework

In 2010, total gross energy consumption in Italy amounted to  $185 \times 10^6$  TOE: 83% from fossil fuels, 5% from imported electricity and 12% from renewable and non-conventional sources.

The share of the latter sources climbed from 7 to 12% of the total, owing to decreased energy consumption (from  $198 \times 10^6$  TOE in 2005 to  $185 \times 10^6$  TOE in 2010) and to the impetus given to their development in the past few years.

In particular, geothermal energy grew from  $1.19 \times 10^6$  TOE in 2005 to  $1.32 \times 10^6$  TOE in 2010. Therefore, its contribution to the country's total gross energy consumption mounted from 0.6% in 2005 to 0.71% in 2010. The increase is mostly due to direct uses, whose yearly average growth was 8.5% vs. as little as 0.6% for geothermal power generation.

At any rate, the aggregate share (0.71%) is very small compared to Italy's large geothermal potential, especially for direct uses.

### Italian geothermal resources

Italy's geothermal potential to 5 km depth is huge. However, high-temperature resources ( $> 90$  °C) suitable to generate electricity at costs competitive with those of other sources exist only in the Tuscany-Latium-Campania pre-Apenine belt and on some volcanic islands of the Tyrrhenian Sea. Conversely, medium- and low-temperature resources ( $< 90$  °C) suitable for direct uses are found both in the above areas and in many other locations. Additionally, thanks to the use of heat pumps, even very low-temperature resources (15-30 °C) could be exploited almost everywhere in Italy.

In short, Italian geothermal resources could be tapped much more intensively than hitherto. They are sustainable, almost always renewable, eco-friendly and cost-effective at all temperature levels.

### Growth projections by 2020 and 2030

They have been formulated by taking into account: *i*) geological setting, heat flow, temperature maps and types of geothermal resources known or supposed to exist down to 5 km depth; *ii*) likely sharp increase of fossil fuel prices in the coming years; and *iii*) expected technological improvements in the utilization of the Earth's heat. Based on this analysis, two growth scenarios have been considered:

- **Scenario I:** current economic trend, use of mature generation technologies, and oil prices at source about three times higher in 2030 than in 2010;
- **Scenario II:** economic trend driven by vigorous environmental policies, use of mature and advanced technologies, and oil prices at source four times higher in 2030 than in 2010.

The projections from 2010 to 2020 and 2030, together with the respective values of oil savings and avoided CO<sub>2</sub> emissions, are shown in Tables 1 and 2 for power generation and direct uses.

Table 1: Growth projections for geothermal power generation

Year	2010	2020	2030
<b>SCENARIO I</b>			
Installed capacity (MW <sub>e</sub> )	882.5	1,080	1,500
Gross production (TWh/yr)	5.3	6.9	9.4
Oil saving (TOE x 10 <sup>6</sup> /yr)	1.02	1.31	1.79
Avoided CO <sub>2</sub> emissions (Tonnes x 10 <sup>6</sup> /yr)	3.2	4.14	5.7
<b>SCENARIO II</b>			
Installed capacity (MW <sub>e</sub> )	882.5	1,150	2,000
Gross production (TWh/yr)	5.3	7.3	12.0
Oil saving (TOE x 10 <sup>6</sup> /yr)	1.02	1.39	2.28
Avoided CO <sub>2</sub> emissions (Tonnes x 10 <sup>6</sup> /yr)	3.2	4.38	7.2

Table 2: Growth projections for direct uses, with heat pumps

Year	2010	2020	2030
<b>SCENARIO I</b>			
Installed capacity (MW <sub>th</sub> )	1,000	2,510	7,400
Gross production (TWh/yr)	12,600	26,350	65,200
Oil saving (TOE x 10 <sup>6</sup> /yr)	0.3	0.63	1.56
Avoided CO <sub>2</sub> emissions (Tonnes x 10 <sup>6</sup> /yr)	0.8	1.64	4.06
<b>SCENARIO II</b>			
Installed capacity (MW <sub>th</sub> )	1,000	2,750	8,800
Gross production (TWh/yr)	12,600	30,660	90,000
Oil saving (TOE x 10 <sup>6</sup> /yr)	0.3	0.74	2.16
Avoided CO <sub>2</sub> emissions (Tonnes x 10 <sup>6</sup> /yr)	0.8	1.92	5.62

The share of energy generated with heat pumps will gradually rise in time, reaching 17% in 2030.

### Benefits of geothermal deployment till 2030

#### • Technical and environmental benefits

##### - Savings in terms of oil-equivalent

Tables 1 and 2 quantify the oil-equivalent saved by 2030 thanks to geothermal deployment:

\* **under Scenario I:**  $1.94 \times 10^6$  TOE/yr by 2020 and  $3.35 \times 10^6$  TOE/yr by 2030;

\* **under Scenario II:**  $2.13 \times 10^6$  TOE/yr by 2020 and  $4.44 \times 10^6$  TOE/yr by 2030.

A comparison of the values in the tables also shows that, by 2030, the tonnes of oil-equivalent saved thanks to direct uses get close to those projected for geothermal power generation.

### - Avoided CO<sub>2</sub> emissions

The oil savings indicated above reduce CO<sub>2</sub> emissions into the atmosphere as follows:

\* **under Scenario I:**  $5.78 \times 10^6$  tonnes/yr by 2020 and  $9.76 \times 10^6$  tonnes/yr by 2030;

\* **under Scenario II:**  $6.30 \times 10^6$  tonnes/yr by 2020 and  $12.82 \times 10^6$  tonnes/yr by 2030.

### - Contribution to coverage of total energy consumption

It will progressively rise from 0.71 % in 2010 to roughly 1 % in 2020 and to 1.5-2 % in 2030.

#### • Economic-social and scientific benefits by 2030

- **Job creation:** gradual increase of new jobs (graduates, technicians and workers) till reaching 100,000 under Scenario I and 200,000 under Scenario II.

- **New investments:** at least 1 billion € in construction of plants and machinery under Scenario I and 2 billion under Scenario II;

- **R & D:** € 200 million under Scenario I and € 400 million under Scenario II.

#### Necessary measures

To achieve the targets indicated by the projections, the following measures are required:

##### • At national and institutional level

- strong commitment by Government, political parties and institutions dealing with energy;

- national energy plan including specific geothermal deployment prospects;

- secure and prolonged incentives for all renewables (RES), particularly for geothermal energy;

- national legislation and guidelines aimed at issuing homogeneous regional regulations;

- R & D programs in the energy sector, with new projects targeted at all RES; multi-purpose R&D project focused on deployment of non-conventional geothermal systems;

- public campaigns to build awareness of the economic and environmental advantages of geothermal energy.

##### • At regional and local level

- energy plan for all Italian Regions, with quantitative targets for each RES (including geothermal), and homogeneous regional regulations, especially on direct uses;

- survey of energy-intensive areas and assessment of heat demand;

- comparative market studies on demand for low-temperature heat for different uses;

- quantification of CO<sub>2</sub> emissions from the different sources of energy used for space heating;

- replacement of old heating systems in at least half of public buildings with systems using RES; however, priority should be given to natural heat;

- financial incentives for installation of geothermal heating & cooling systems in new buildings;

- training of designers and installers of geothermal heat pump systems; - campaigns in schools to raise awareness of the Earth's heat and of its advantages.