

IV. Future Geothermal Potentials:
Technical and Economical Factors
Barriers and Opportunities
Estimates and Predictions

**HighTemperature Resources
Potentials for 2030 and 2050**

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Sorry, but the SWINE FLU didn't allow me to move out of my house in Mexico City. I wish you the best in this important Workshop

Saludos!!

Present:

(I am sure that the expert, Dr. Ruggero Bertani will present an excellent update of the installed Geothermal Power. All of it is hydrothermal)

Future:

1. Further development of hydrothermal
2. To develop shallow low enthalpy reservoirs
3. Outbreak of EGS
4. Considering development of isolated regions (Alleutians, Kurils, others)
5. Offshore hydrothermal vents
6. Geopressured

1.-Classical hydrothermal (Present technology)

- **USA** : 3 040 MW today;
5 500 MW Dev. Projcts (GEA March 2009)
USGS talk about 40 000MW more
- Philippines
- Indonesia > 9500 MW
- New Zealand
- PNG
- Japon
- China
- Russia
- Turkey >31 500 MW
- Africa > 7 000 MW
- Caribbean
- Vietnam
- Others
- Mexico
- Italy
- Iceland
- Canada
- Central America
- Colombia
- Ecuador
- Peru
- Chile
- Bolivia
- Hungary
- Armenia
- Iran

USGS,NREL,GEA,GRC and others are updating this information.
The best of it is needed for IPCC SRREN

Comparison of total reserves

Units are 10^9 barrels of oil equivalent

- Magmatic System 2 400 000
- Crustal Heat 9 000 000
- Thermal aquifers 130
- Geopressured basins 410 000
- Total oil reserves 5 300*

**Including heavy oil, tar sands and oil shale*

National Academy of Science 1990

GEA April 7, 1999 Reports total traditional geothermal potential for the world as 35.4 to 72.4 GW

2.- To develop shallow, low enthalpy reservoirs

- Appropriate techniques for their exploration and assessment
- Detailed evaluation per country
- Simpler and low cost techniques for generation with power plants of <500 kW

3.- Enhanced Geothermal Systems (EGS)

- EGS is the big promise for geothermics
- (Special presentation will be made by the specialists in the subject)

4.- Isolated regions

- There are many isolated places, in volcanic arcs, with enormous geothermal potential. Will have to consider them when time comes with solutions to store and transport hydrogen in a safe and economical way
- Need to have a preliminary estimate of the potential in the Aleutians Islands, Kuril Islands, Kamtckacka Peninsula, and others

5.- Offshore hydrothermal vents

- There has been intensive exploration since the discovery of hydrothermal vents in the Galapagos in 1976
- There are very nice and complete reports on mapping and characterization of the vents (Barker et al NOAA 2004)
- There are 67 000 km of Ocean Ridges spreading apart from 1 to 15 cm/year producing vents, springs and hot chimneys
- 280 sites with multiple vents have been identified
- There are very powerful and easy to study vents in the Gulf of California. Up to 20 MWe can be obtained in one regular size hydrothermal vent
- New designs of submarines with ORC are going to be tested
- This is an important new source of renewable energy that should be studied and quantified

6.- Geopressured

- There is not much information in this important resource
- Attention will have to be paid to the subject

Thanks for your attention:

Now we proceed with the presentation of every panelists