

Clay Nichols
Comments on IPCC Geothermal Paper
(via e-mail; received: 8 June 2008)

Clay Nichols Review Comments on IPCC Paper

First, my thanks as a member of the geothermal community to the contributors who have done so much to draw attention to this important energy option! My suggestions for possibly improving this treatise are:

1. Enhanced Geothermal Systems (EGS) discussion, Pages 17-18. I believe a more positive tone regarding EGS could be conveyed without overstating the “state of the art” now or understating the challenges in full EGS implementation. My suggested rewording to accomplish this include:

Page 17, Paragraph 3: Insert the following lead in under the header, “**Enhanced Geothermal Systems (EGS)**”

The worldwide use of conventional geothermal resources for power production and direct uses is expanding. This utilization, however, is limited to locations where a natural coincidence of geotechnical and socioeconomic conditions lead to their profitability. Meanwhile, a large scientific and industrial community has been involved for more than 30 years in extending this limited natural opportunity through enhancement of the geothermal heat extraction technology. This concept, known as Enhanced Geothermal Systems or EGS (Tester et al., 2006 and Ledru et al., 2007) is simple. In the deep subsurface..

2. Suggested expansion of bullets under EGS second paragraph:

.....The enhancement challenge is based on several conventional methods for exploring, developing and exploiting geothermal resources that are not yet economically viable. This general definition embraces different tracks for enlarging access to heat at depth:

- Stimulating reservoirs in Low Permeability Systems and enlarging the extent of productive geothermal fields by enhancing/stimulating permeability in the vicinity of naturally permeable rocks. **The transfer/refinement/application of petroleum geomechanics developed for unconventional resources will be applied to EGS heat recovery.**
- Improving thermodynamic cycles in order to ensure power production from water resources at medium temperature (from 80 C)
- Improving exploration methods for deep geothermal resources: **refined technologies for fracture mapping and stress measurements “ahead of the drill” will accelerate development.**

- Improving drilling and reservoir assessment technology: **drilling technologies must be improved as EGS resources deeper in the crust are targeted.**
- Defining new targets and new tools for reaching supercritical fluid systems, especially high-temperature down-hole tools and instruments.
- **Combining CO2 sequestration with replacement of water by CO2 as the EGS heat recovery working fluid.**

A recent publication, (continue as written)

3. Environmental Impacts: Concluding sentence on “Some environmental impacts..., first Par, page 18: Insert after last sentence. **“In addition to more technical analysis, the resolution lies in project-specific programs of public information and education regarding the possibility of non-injurious, low magnitude seismic events accompanying EGS stimulation.”**

4. CO2 Emission, The 3rd Paragraph, page 18, contains the statement, “The potential impact of EGS in the future, and also the future benefits such as avoiding additional CO2 emission, cannot yet be satisfactorily quantified.” Note: This does injustice to the positive attributes of most geothermal resources. It possibly reflects an emphasis on present high temperatures production vs. the promise of relatively emission-free EGS technologies. I would suggest deleting this negative statement and inserting the following:

“There is growing recognition that achieving proposed reductions in carbon and other greenhouse gas emissions cannot be achieved by carbon caps alone. The simultaneous achievement of both carbon reduction goals and supporting the expanding energy requirements of the global economy requires major additions to our energy technology production portfolio. An important criterion for targeting these candidates for major domestic and multinational support is that they potentially develop a resource base of a size and within a timeframe to significantly replace carbon-emitting energy technologies. Geothermal energy is such a technology and resource.”

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