The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

Tech Talk - The Quiet Steps of a Geothermal Movement

Posted by Heading Out on November 4, 2012 - 5:39am

As I write this, the election is now less than a week away, with two entirely different paths possible for our future as we move toward 2013. These two approaches to energy are particularly different, but it is pointless to do any further comparison, since the airwaves have, on the rare occasion these differences are explored, discussed these from all points on the spectrum. Nevertheless, it gives an occasion to step aside from Iran, for a week, and to draw attention to something you may have missed in this debate, yet is starting to happen on university campuses scrambling to meet that ever-rising fuel bill.

In the current debate, both sides seem to anticipate that the energy future is rosy. As an illustration, I was struck by a comment just this last week:

> *"Peak oilers have become almost extinct, destroyed by the arrival of new technologies with the U.S. leading the oil supply change," said David Hufton of oil brokerage PVM.*

Yet the very same week I received another newsletter from Go Haynesville Shale predicting (from Seeking Alpha) that 2013 will see the decline in Hanesville production.

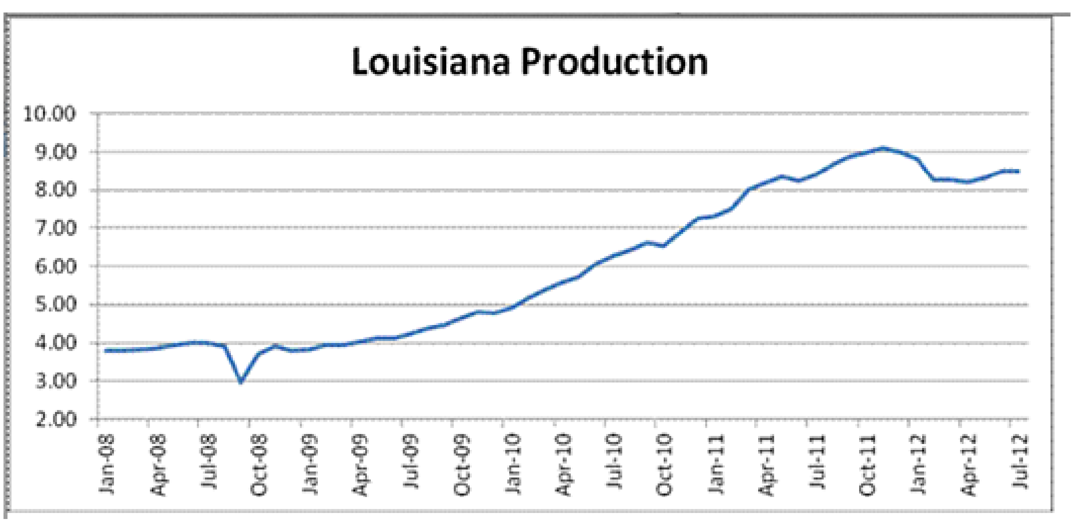

Figure 1. Production from the Haynesville Shale in Louisiana (Go Haynesville Shale)

Now there are a variety of reasons for the decline, a significant one being that the number of wells drilled has fallen dramatically, as the article recognizes. But that is itself, in part, a recognition of the current economics of the business. I had a discussion this past week with the daughter of an investor who had “lost his shirt” over a natural gas well investment. The difference between the hype and the reality is disturbing, and does not bode well for a stable future. Which poses the question: What might the reality of that future be?

I live in Missouri, and a number of years ago some of my colleagues evaluated the potential benefits of renewable energy and were left severely unimpressed with the potential for wind and solar in this state. At the time I was not sure what the answer was for our state.

The campus where I worked until I retired, (Missouri University of Science and Technology – the new UMR) was quite revolutionary some decades ago in starting to burn wood with coal, as a way of controlling both emissions and costs. Now those benefits were disappearing, and the campus faced the prospect of finding about $25 million for a new boiler, at a time when state funds are not likely available, and what philanthropist wants to fund a boiler? So the campus had to be creative. And it was!

Figure 2. Old Campus Power Plant - the question of what to do with the stacks is unresolved.

Beginning in the summer of 2010, the campus proposed the use of a ground-source heat pump system as a method of using the geothermal potential under the campus to lower the overall operating costs of generating power, while at the same time addressing issues regarding the generation of carbon dioxide, and the use of large volumes of water that are one of the costs of conventional coal-fired boiler use.

The initial proposal was approved in remarkable time and over the past summer drilling crews moved in for the initial drilling of the wells. Unfortunately (but realistically) the greatest amount of open space around campus that can be used are the parking lots. And so a number of drilling rigs appeared as the students left for the summer, and proceeded to drill a series of roughly 600 wells, each around 400 ft deep. The last was completed last month, and the wells were then lined with piping and are currently being connected into a triad of networks.

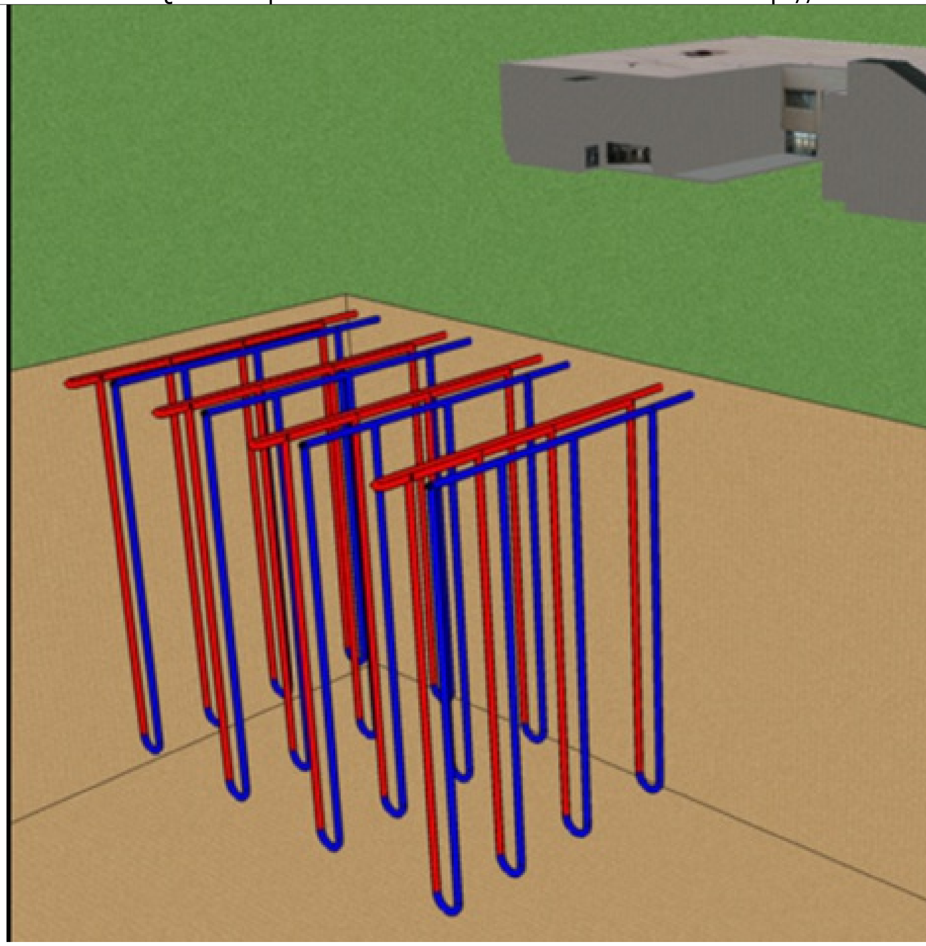

Figure 3. Simplified illustration of the geothermal circuit.

Basically the system works on the idea that the ground, in depth, is at a relatively constant temperature. (For those of us who have mined in depth the old rule of thumb in the Northern UK was 60 deg at 60 ft and 1 degree rise per 60 ft thereafter – but the geothermal gradient varies around the world). Given this relatively consistent temperature, in winter the cool water (the blue line) can be pumped underground, heated and returned through the red line, from which it passes through a heat exchanger system that provides heat to the campus, while being returned via the blue line to repeat the process.

In the summer the flow is reversed. The hot water from the heat exchanger/chiller is returned to the wells through the red lines, releasing the heat into the ground and cooling before it returns back to the surface through the blue line, and into the chiller/heat exchanger to provide a cooling source for the campus.

Current estimates are that the initial costs (paid for with a bond issue) will be no more than the cost of that boiler (which wasn't going to be funded though needed), and that the campus will save, in the beginning, some $1 million in energy costs (the remaining energy will be supplied with natural gas and the boilers will be retired in 2014) and this will service the bond. The funds only allow some 60% of the campus to be initially served, through three separate plants that are set around the campus. In time, as savings mount, it is likely that other buildings will be brought into the loop (though some have sufficiently antiquated heating and cooling systems such that the entire building will need renovation first.

Over the lifetime of the system (and there is not a lot of fragile equipment in the loop, so this may be more than fifty years) energy savings are likely to rise to more than $3 million a year, as the energy crisis that we are currently pretending isn't happening finally comes to pass.

Given the benefits that the system will develop, it is not surprising that MS&T are not alone in this approach. In fact, they learned of the concept at the time that Ball State was beginning their project. That project has just been dedicated and anticipates, being larger than ours, that it will save that campus around $2 million a year. It also includes some 3,600 wells by the time that the second phase of the program is completed.

The idea is beginning to catch on, and there are a small but growing number of campuses now that are in the throes of the same type of effort, though in each case tailored to the individual needs of the different campuses. Hampton University in Virginia is heating their Multi-Purpose Building, Indiana Tech has restored and powered a Civil War era building, Montana Tech will use the heat from mine waters underneath the campus. In Boise, ID, the ground water temperature is a little higher (around 170 degrees) and the city has used geothermal energy since 1983, and now Boise State is joining in with its own plant. As with the Montana project, so the program at New Mexico Tech has also been funded as part of the Recovery Act. Some of the potential benefits of that program have been described by the Department of Energy. However that presentation also illustrates the transience of the funding opportunity.

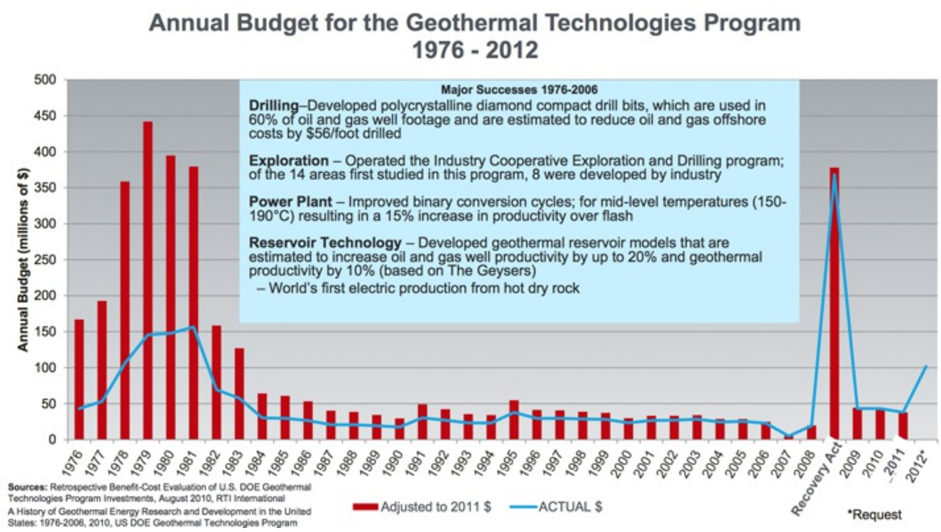

Figure 4. The budget for the Geothermal Technologies Program (DOE)

Given that drop in funding, it is still possible, given the savings projected not only here but elsewhere, that this technology may yet still catch on and become more widely adopted. I'll keep you posted with more details, among other things.