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L-00000NN-09-0541-00151

Hualapai Valley Solar

Originally faxed on May 27, 2010
RECEIVED
Box 645 Kingman, AZ 86402
healerdealer@engineer.com

2010 JUL -1 P 3: 29

928-757-9303

To: Kristin K. Mayes, ACC Chairman
The Kingman Daily Miner
The Arizona Daily Star

Arizona Corporation Commission

DOCKETED

JUL -1 2010

From: Norman Swartz

ARIZONA CORPORATION COMMISSION
DOCKET CONTROL

Subject: Letter one: Closure in nixing the Unisource sale
(this) Letter two: Efficient Water-cooled desert solar plants

DOCKETED BY

Dear Ms. Mayes:

This is my promised letter on how to cool solar concentrator panels in the desert. The points that come to mind *in favor* of concentrating sunlight on solar panels are two:

Solar concentrators Pro:

- 1. They save space by reason of higher output efficiency
- [2] They use less silicon (sand – an abundant resource)

Solar concentrators Con:

- 1. They waste water for cooling, a precious resource in sunny climates
- 2. They add water bills and maintenance expense to electric utility overhead costs
- 3. They "save space" where none need be saved
- 4. They shorten solar panel life, requiring replacement up to 3 times more often
- 5. System cooling failure leaves all panels vulnerable to permanent sun damage
- [6] Addressing some of these cooling issues with a closed, recirculating system poses an environmental hazard unless water alone is used as the coolant

Setting aside Pro [2] as frivolous, and Con [6] as inapplicable to evaporative systems, I find that the "cons" outweigh the "pros" by five to one. But as an engineer who studies such things, I may be prejudiced – in favor of the zero-maintenance panels that we see everywhere, a high-reliability technology that has proven itself for decades.

So I ask you, how long has this notion been around, of taking an optical whip to solar panels with "concentrators"? Why, until few short years ago, I never heard of such a thing! The attitude seems to be, "Why should we drive 40 mph when we can go at least 120 before hitting panel meltdown?" But this high-speed, high-efficiency, high-temperature "concentrator" approach, requires the constant presence of skilled personnel in the event of cooling failure. This could result in anything from minor damage (lowered efficiency) to *all* of the solar arrays, up to complete meltdown, depending upon concentrator focus – and thereby how much water we are willing to routinely waste for cooling.

In my opinion, it's kind of like big oil's challenge: "Why use old-hat slant drilling technology to reach offshore oil fields from the surface, when we can try out all of this really cool advanced technology of drilling for oil under a mile of sea water?" This is *far* more challenging and exciting! Here is where the *adventure* is! Big oil, with its century-old monopoly, has been "suffering" from an overabundance of profits, and a scarcity of problems. But the current disaster is simultaneously remedying both corporate dilemmas.

There are two terrestrial regions where the smaller surface areas of solar panels with concentrators could outweigh their disadvantages. These are on small islands, and aboard ship. Both have ready access to sea water for cooling. And finally, the advantage of solar concentrators in polar regions is not how much space or sand they save, but rather that concentrators would help melt snowdrifts from the near-vertical panels.

In the desert, however, the use of solar concentrators is contra indicated.

If "big solar", like big oil, persists and gets their way locally, then at least the Arizona Corporation Commission can require that only *closed* water-cooling systems be used. This is the only thing that makes sense in the desert. In a closed system, concentrated sunlight reaches the panel through an extra layer of glass, and a cooling layer of water over the panel. The glass-water sandwich can be *above, below, or on both sides* of the panel.

Underground cooling

Like with your car radiator, the heated water is then circulated away from the panels for cooling. With a constant year-round temperature of about 65 degrees six feet under, the water passes through a series of buried, cascaded cooling tanks. The cooled water then returns to the concentrator-heated panels to keep them at a safe operating temperature. If we are going to insist on speeding, then we can at least build a freeway to travel on!

But *never, ever* release the water to the dry, desert air! That's like setting our forests afire as fireworks to celebrate the 4th of July. Independence from sanity.

And neither should a "more efficient" thermal medium like antifreeze be used as a coolant, making the underground tanks an environmental risk. Plain old demineralized water can circulate in those tanks for years; and if the underground tanks eventually do begin to leak, well, it doesn't matter. The water just returns to the water table.

In conclusion, evaporative cooling of solar panels in the desert is a lunatic proposition. *It wastes our most precious resource, water: the water of life.* Even if concentrator solar plants were built on the Colorado river for cooling you don't spray it into the air! That water is needed in the wetlands of Mexico, and in California to grow our food!

Is California going to boycott Arizona grocery stores, so that we in turn will be justified in punishing California by grabbing more water to spray on solar panels? So that we will then have more electricity to withhold from California in retaliation?

The difference between our two states is so great that it's a wonder we don't have friction-burn at the border! But fortunately, we have to Colorado river to lubricate it.

- Norman Swartz