CHANGING WHAT'S POSSIBLE

Day 1: Exploration of system technology and performance

Breakout session questions

May 23, 2014

Zero Water usage

- General agreement that allowing some limited water use (or water use sometimes) would dramatically expand the design space. This would give a huge number of additional solutions.
- HOWEVER, plants that would only use water some percentage of the time would still face substantial permitting barriers. (Similar in magnitude to those facing full wet cooling solutions.) Also, sites with fresh water availability are already largely unavailable.

- Absolutely zero water use consensus

ARPA-E's system level vision

- 85-90F in, 110-115F out (30C in to 45C out) --> Water cooled condensers are designed around these values so you want to think about whether that should be a constraint in the FOA.
- #1 Air Cooled Heat Exchanger: Mature technology that is being increasingly deployed today (due to permitting constraints). However, these do not have the performance and they cost too much to satisfy the program goals: Zero Water & No Cost Increase.
- #2 Absorption cooling could come before or in parallel to air cool heat exchanger. Lots of flexibility. Concern over where the heat would be rejected. Expectation among the group that an air cooled absorption chiller would substantially reduce COP. (COP 2 infeasible?)
- #3: Radiative cooling must be at back end (based on current understanding of the technology).
- General agreement some combination #2 and/or #3 could be viewed as a replacement for the water cooled part of a hybrid cooling system. (That is baseline against which #2 and/or #3 would be viewed.)

Continued…

- Discussion of draft towers. No need for shells, existing Air cooled heat exchangers can produce natural draft. Existing towers do generally have sufficient real estate given current heat exchange technologies…..perhaps with a 10X increase in heat transfer coefficient this would become possible…that is the challenge for the program.
- Compatibility of different components: Fix temperature and mass flow rates, to ground individual component innovations. OF course, you could require a full system solution but this was generally seen as impractical, and would unnecessarily constrain teams.
- Lots of other ideas exist that could potentially substitute for #2 and #3. For example thermomagnetic concepts. This is a good reminder that we shouldn't over constrain the solutions to the three specific component system presented. Of course, all component proposals will have to argue for their potential technical feasibility at scale and cost effectiveness.
- Don't over constrain the intermediate temperatures, perhaps specify a range….some components may work best with a 7C drop while others might be very efficient and cost effective with just 2-3 degrees.
- Retrofit opportunities? Shift to air cooling is already happening….with negative efficiency and cost impacts. That is the baseline.