Harnessing the Power of the Sun: Designing Optimized Remediation Systems Using Solar Power at Travis Air Force Base

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Background/Objectives. Jacobs has worked to reduce greenhouse gas (GHG) production at Travis Air Force Base (AFB) by optimizing existing groundwater treatment systems and finding innovative ways to treat chlorinated solvent plumes at several sites across the base. One significant way to reduce GHG production is by incorporating solar-powered equipment into new and existing remediation systems located across the base. A properly designed solar-powered remediation system requires an understanding of how to properly size your solar panel array, and how to select key system components to maximize its effectiveness.

Approach/Activities. Travis AFB is a leader in implementing green and sustainable remediation technologies, and some remediation areas are located in remote portions of the base. The determination of whether solar power can be applied to groundwater remediation is based on the level of effort required to bring grid power to a proposed (or existing) treatment plant location. Once the commitment is made, the system can be designed with solar power in mind.

The decision to design and build a new solar-powered treatment system, or modify an existing treatment system to incorporate solar power, can depend on several factors. A solar powered pump and treat system consists of six main components: 1) the solar panel array, 2) the battery bank, 3) the charge controller, 4) the load controller, 5) the pump controller, and 6) the groundwater extraction pumps. First, the size and number of pumps must be determined based on hydraulic capture or contaminant reduction needs. Next, the energy requirements are calculated so that the solar panel array and battery bank can be appropriately sized. Finally, all the pieces are put together to produce a pump-and-treat remediation system that is run entirely on solar power.

This presentation focuses on how to properly size the solar equipment for pump-and-treat remediation systems. It begins with the energy demand of the pumps to determine the size of the battery bank. From there, the solar panel array can be sized. The other elements then fall into place to ensure system reliability and effective operation.

Results/Lessons Learned. By designing and installing new solar-powered systems, or retrofitting existing pump-and-treat remediation systems to solar power, Jacobs and Travis AFB have reduced electrical consumption by over 790,000 kilowatt hours per year and reduced GHG emissions by over 930 tons per year.

Properly sizing the solar panel array and battery banks for solar remediation systems is the key to system performance and reliability. A good understanding on how to size solar equipment can lead to effective system performance that can last in excess of 15 years.