

Gilbert, Arizona is Going Green – The Evolution of a 2 Megawatt Solar Project at the Neely Wastewater Reclamation Facility

By Mark Horn, Wastewater Manager, Town of Gilbert, Arizona

Through a public and private partnership, the Town of Gilbert, Arizona commissioned a two megawatt (MW) solar power project at its Neely Wastewater Reclamation Facility in November, 2011. With over 8,000 photovoltaic tracking solar panels this solar power system will off-set over 86 million pounds of carbon dioxide over the life of the system and will generate over 4 million kilowatt hours (kWh) of electricity annually. The solar system, installed over groundwater recharge basins at Gilbert's Neely Recharge Facility, is expected to provide approximately \$2 million in energy cost savings at Gilbert's Neely Wastewater Reclamation Plant over the next 20 years.

Gilbert, Arizona has experienced a rapid transition from a historically agriculture-based community to an urban center and suburb in the southeast valley of the Phoenix metropolitan area. In the last two decades, Gilbert has grown at a pace unparalleled by most communities in the United States, increasing in population from 5,700 in 1980 to over 215,000 in 2011. Gilbert continues to rank as one of the fastest-growing municipalities in the nation and currently ranks 36th out of the top 100 best places to live in America. As Gilbert has grown, the community has developed and maintained its critical infrastructure systems in a manner that will provide community sustainability while preserving its highly desirable quality of life. The solar power system outlined in this article has positioned the Town of Gilbert as one of the key progressive and sustainable municipalities in Arizona.

Financed with no upfront capital costs to the town

The Gilbert Solar Project was made possible through a Land License Agreement and a Solar Power Purchase Agreement (PPA) between the Town of Gilbert and "SPG Solar, Inc". Through the structure of the PPA, Gilbert was not required to pay for any of the capital costs to design and construct the \$10 million dollar solar project. In addition to the design and construction of the solar project, the PPA also requires "SPG Solar" to operate and maintain the solar system over the 20 year term of the agreement. The project was facilitated, in part, by an incentive from the local power utility Arizona Public Service (APS). This program offers financial incentives to customers who add renewable energy systems to their homes or business. The program is funded by APS customers and is approved by the Arizona Corporation Commission. Other key players in the development of the solar project are "Integrus, Inc" who is the investment group and owner of the Gilbert Solar System and "Severn Trent Services" who is the contract operator of Gilbert's Neely Wastewater Reclamation Plant.

A hedge against rising electricity rates

While the solar system itself is not actually owned by Gilbert, it is constructed at the Neely Recharge Facility that is owned by the Town and all power generated by the solar system is dedicated to help off-set approximately 40% of the power needs at Gilbert's adjacent Neely Wastewater Reclamation Plant. The PPA outlines a fixed rate that Gilbert will pay for the power generated by the solar system and the solar rate schedule is anticipated to be less than the

rates that Gilbert would otherwise pay the local power utility during the agreement term. The solar power rate schedule outlined in the PPA has an annual 2.5% escalator over the course of the agreement term. The solar project's financial forecast assumes an annual rate increase of 4% for the power supplied by the local power company. This average increase assumption is considered conservative based on average historical rate increases by the local power supplier over the past decade. The project's forecasted savings over the 20 year term is projected to become more significant as time goes by. As the rate of electricity from the local power company increases during the agreement term, the predictable solar power rates are not anticipated to increase at the same higher levels. While the cost savings during the first 5 years of the agreement is anticipated to only be an average of about \$15,000 per year, the average cost savings during the final 5 years of the agreement is forecasted to be worth just over \$200,000 per year.

Optimized Design

An evaluation of the Neely Wastewater Plant's electrical power demand (both peak and off-peak) from the previous year was thoroughly analyzed and compared to the anticipated future output of power that would be generated by the solar system. This effort was necessary to ensure that the peak power production from the solar system would not exceed the demand required by the wastewater plant. This analysis became critical in determining the solar system's appropriate size and design criteria as to avoid a potential future loss of unused solar power out to the main power grid once commissioned. The analysis also played a role in the solar system's financial forecast details outlined in the PPA.

The project team designed the solar system from an ascetics point of view and also in a manner that would not negatively impact nearby residents. The solar arrays were strategically placed in their specific locations at the recharge facility primarily for this reason. Public involvement was also conducted for the project and involved communications with property management and board-members that represent the adjacent neighborhood Homeowner's Associations. A public meeting was also held where citizens had an opportunity to preview the project design concept prior to construction activity being performed. These public involvement efforts helped provide community buy-in for the project, which in turn, aided in obtaining full support and approval of the necessary agreements associated with the project.

Capitalizing on land space - a solar canopy over operating recharge basins

The primary goal of the facility where the solar power system is constructed is to recharge treated wastewater (i.e. reclaimed water). Reclaimed water meeting specific water quality standards is delivered to this facility from Gilbert's 11 Million Gallon Per Day (MGD) Neely Wastewater Reclamation Plant. The reclaimed water is then introduced into the recharge basins where groundwater percolation and aquifer replenishment occurs. The reclaimed water recharge efforts allow Gilbert to earn and exchange aquifer storage credits for future potable water supplies for the community. The Neely Recharge Facility is one of 3 groundwater recharge facilities that is owned and operated by the Town of Gilbert. It is 75 acre site that has 11 recharge basins that are each approximately 3 feet deep and are 3 to 4 acres in size. The solar arrays were constructed over 5 of the facility's recharge basins in a manner that will allow future water recharge efforts to continue in those basins. The 8000 photovoltaic solar panels

associated with this project are installed on steel beams that have been driven 20 feet into the ground. Underneath each row of panels is a shock absorber system that is designed to allow the system to withstand 90 mile per hour winds. The system's steel support beams are spaced over 15 feet apart and the system also has a height clearance of 6.5 feet under the arrays to allow for water recharge operations as well as maintenance of the basins with small equipment.

The solar power system also has a total of 5 inverters that convert the solar energy to usable power. A series of underground electrical conduits run on the pathways between the recharge basins and connect the solar panel arrays to the inverters and from the inverters to the main power interconnection point. A slight degradation for the solar panel's ability to generate power was also built into the project's financial forecast outlined in the PPA to account for system age through the agreement term. Separate agreements with the local power utility were also required for the solar system's interconnection through the main power grid prior to being fed into the Neely Wastewater Reclamation Plant.

Fifteen Months from Initial Concept to Producing Energy

The project timeline began in June, 2010 when initial project concept discussions began between SPG Solar, Town of Gilbert staff, and Severn Trent Services staff at the Neely Wastewater Reclamation Plant. In August, 2010 the project team became aware of a rebate incentive being offered by the local power utility (APS). The renewable energy incentive program consisted of an application and selection process that had to be submitted for consideration for a specific project (size and location). In August, 2010 an application for the proposed project was submitted to APS and in September, 2010 we were notified that our proposed 2 megawatt solar project had been selected to receive an incentive. The incentive program provides up to 60% of the project capital costs to be paid by APS to the solar system owner over a 10 year time period in exchange for the system's renewable energy credits. The solar system helps the local power supplier meet their future renewable energy goals as well. A Land License Agreement and the Solar Power Purchase Agreement were both negotiated over a two month period and then approved by the Gilbert Town Council in November, 2010. Engineering design work for the solar system began in late November, 2010 through February, 2011. During the early stages of the design effort Town staff and SPG Solar successfully worked together to obtain all necessary permit approvals for the solar project. Following project design, construction activity began in late February, 2011 and continued through early November, 2011. The solar system began producing power on September 24, 2011 and was officially dedicated during a ceremony held on November 16, 2011.

Generating Clean Renewable Electricity

The benefits from this 2 megawatt solar project are many in the eyes of the Town of Gilbert. The project was designed and constructed with no capital cost contributions required by Gilbert. On-going operation and maintenance of the solar system is also covered over the agreement term. In addition to future electrical savings for Gilbert's citizens, approximately 40% of the Neely Wastewater Plant's power will now come from a clean renewable energy source. The Neely Solar Project is also in alignment with Gilbert, Arizona's Strategic Initiative goals and supports its motto of being a community that is "Clean, Safe, and Vibrant".

Mark Horn Bio:

Mark Horn is the Wastewater Manager for the Town of Gilbert, Arizona. Mark has a Bachelors Degree in Business and has worked for Gilbert for 23 years. He is responsible for managing Gilbert's Wastewater Collection System, Reclaimed Water and Groundwater Recharge Systems, Industrial Pretreatment, and Wastewater Treatment. Mark was the recipient of the Arizona Water Association's 2010 "Environmental Stewardship Award".

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